SM-87-6

A Series of Occasional Papers in Draft Form Prepared by Members of the Research Department for Review and Comment

STAFF MEMORANDA

THE EFFECTS OF REGULATION ON BANK PARTICIPATION IN THE GUARANTEE MARKET

Gary D. Koppenhaver

FEDERAL RESERVE BANK OF CHICAGO

The Effects of Regulation on Bank Participation in the Guarantee Market

by

G. D. Koppenhaver
Senior Economist
Research Department
Federal Reserve Bank of Chicago
230 S. LaSalle St.
Chicago, Illinois 60690
(312) 322-5858

September 1986
Revised: February 1987

The author would like to thank George Kaufman, Loyola University of Chicago, Arie Melnick, University of Haifa, Larry Mote, Federal Reserve Bank of Chicago, and William Scott, Illinois State University, for helpful comments and suggestions. All errors are the responsibility of the author alone. All views expressed here are those of the author and are not necessarily those of the Federal Reserve Bank of Chicago or the Federal Reserve System.

The Effects of Regulation on Bank Participation in the Guarantee Market

Abstract

Because bank off balance sheet activities are largely unregulated and have grown rapidly in the past decade, bank regulators are concerned that imprudent use of these instruments could pose a risk to the stability of individual banks and the banking system as a whole. In view of this concern, this paper estimates the probability that an institution will issue a given off balance sheet guarantee by modeling the principal determinants of the off balance sheet decision. The three off balance sheet items investigated here are loan commitments, standby letters of credit, and commercial letters of credit. It is estimated that the single strongest motivation in issuing off balance sheet guarantees is the opportunity cost of funding assets with reservable deposits, and not a binding capital constraint.

The Effects of Regulation on Bank Participation in the Guarantee Market

Because bank involvement in off balance sheet underwriting is largely unregulated and has grown rapidly over the past decade, there is concern that imprudent underwriting decisions could strain the stability of individual banks and the banking system as a whole. Unlike balance sheet assets, these potential obligations need not be funded and are not considered in determining a bank's capital requirement. Because bank guarantees are often used to enhance the credit quality of a customer seeking direct access to capital markets, they also serve to bind bank and nonbank participants in financial markets more closely together. This interdependence suggests that a default or problem in a nonfinancial market could threaten the stability of the banking system if many credit lines are drawn down simultaneously.

Banks have several reasons for issuing off balance sheet guarantees: to profit from the underwriting fees earned by following their customers into the capital markets, to strengthen the bank-customer relationship over the long-term, and to avoid the regulatory burden of booking balance sheet assets. The question is: to what extent is guarantee issuance fostered by existing bank regulations and what type of regulation is the culprit? If the avoidance of regulatory burden is a primary determinant of bank participation in the guarantee market, then the policy alternatives are to either widen the scope of bank portfolio regulation or change existing regulation to keep from fostering underwriting activities. The purpose of this paper is to find an answer to these questions and add to the empirical research that has been done on the characteristics of banks that issue these instruments (see Wolkowitz et al. [1980], Goldberg and Lloyd-Davies [1985], Bennett [1986], and Berger and Benveniste [1986]).

This paper models and estimates the determinants of three off balance sheet items that guarantee funds availability to the beneficiary: loan commitments, standby letters of credit, and commercial letters of credit.[1] These instruments are not perfect substitutes for one another, but are modeled with several common elements to capture the guarantee characteristics of each. After a brief discussion of the institutional aspects of each of these instruments, section II of the paper discusses why banks would issue guarantees even in the absence of regulation. The argument starts with a discussion of the reasons for the existence of financial intermediaries, in general, from which it follows that guarantee issuance is a natural activity. Theories of the existence of financial intermediaries also suggest that bank regulation is not the sole determinant of off balance sheet underwriting. Bank size, the willingness to accommodate customers, asset diversification, and balance sheet signals of credibility should also be fundamental to guarantee market participation, at a given point in time.

The empirical section of the paper, section III, employs logit analysis to estimate the models with cross-sectional data from the June 1985 Report of Condition and Income for 14,382 U.S. commercial banks. The explanatory variables in the models fall into one of three groups: regulatory variables, credibility variables, or customer accomodation variables. The results indicate that the regulatory variables have the greatest impact on bank participation in the guarantee market, although variables in the other two groups are also significant. Surprisingly, the most important regulatory variable explaining guarantee issuance in all three models is the reserve requirement variable and not a binding capital constraint.[2] The cost of funding assets with reserveable deposits provides a major incentive to underwrite the direct financing of bank customers.

The implications of this research are that regulatory burdens provide an additional incentive for banks to engage in off balance sheet underwriting. However, increasing the burden through risk-based capital rules, for example, may not reduce market participation.[3] An alternative policy to achieve this goal, if it is desirable, would be to pay interest on reserves to reduce the costs of funding balance sheet assets.

I. Off Balance Sheet Guarantees

All three off balance sheet instruments considered here can be conceptualized as guaranteeing funds availability to the instrument holder. In using these three off balance sheet instruments, a bank acts as a third party in a commercial transaction, substituting the bank's credit worthiness for that of its customer to facilitate exchange.

Loan commitments. In the Federal Reserve's June 1985 Report of Condition, 44% of all U.S. commercial banks reported loan commitments outstanding. Although frequency of use tends to rise with bank asset size, banks in all asset size categories issue loan commitments (30% of banks with assets less than $100 million are issuers). A fixed-rate loan commitment obligates the bank to lend funds on demand up to some previously determined quantity at a constant known rate. In a variable-rate loan commitment, the lender provides credit on demand up to some maximum quantity at a price determined by a previously specified formula, calculated after the realization of a future price. In addition, banks can earn fees on establishing the initial credit line or on any unused credit over the life of the commitment. The risk of a loan commitment issued by a bank depends on the legal caveats (material adverse change clauses) written into the commitment that permits a bank to cancel its obligation when a borrower's financial condition deteriorates over the commitment's life.

Standby letters of credit. Typically, three parties are involved when a bank issues a standby letter of credit: the issuing bank, its customer, and the beneficiary entitled to draw down the credit. The bank's customer and the beneficiary initiate the process by entering into a contractual obligation. The standby letter of credit enters the transaction when the terms or conditions of the underlying contract can be facilitated by the bank's formal substitution of its own credit worthiness for that of its customer. The bank makes an irrevocable commitment to pay the beneficiary the credit amount when the beneficiary presents certain documents to the bank. These documents must offer evidence that the bank's customer failed to fulfill the obligations of the underlying contract. If the customer does not default, the credit expires unused and the bank retains the initial fee required to open the pledge. These pledges include credit enhancement facilities to municipal borrowers and issuers of commercial paper and liquidity backstops that require the bank to buy bonds put to them. In June 1985, 50% of all U.S. commercial banks reported standby letters of credit outstanding.[4]

Commercial letters of credit. This off balance sheet item is similar in many respects to a standby letter of credit. Like a standby letter of credit, the purpose of a commercial letter of credit is to insure or guarantee that the beneficiary either receives contractual performance from the bank's customer or a cash settlement from the bank. Unlike a standby letter of credit, however, the stipulated documents that must be presented to draw down the credit are evidence of conveyed title or contract completion. Commercial letters of credit are primarily used to facilitate the international exchange of physical goods. The major difference between standby and commercial letters of credit, under normal circumstances, is that with the former the bank's expectation is that payment will not be demanded and it will expire unused; with the latter, the bank's expectation is that payment will be

demanded by the goods seller. Of all U.S. commercial banks in June 1985, 21% reported commercial letters of credit outstanding.

II. The Economics of Off Balance Sheet Guarantees

What motivates financial intermediaries to participate in a market for off balance sheet guarantees? First, consider a world without banking regulation of any kind. Would intermediaries exist and if so, what roles would they perform?

It is well accepted that financial intermediaries owe their existence primarily to a world of imperfect markets. It follows that the role a financial intermediary performs in the financial system depends on the type of market imperfection that gives rise to its existence.[5] In a world of transacton costs, Benston and Smith [1976] argue that financial intermediaries achieve economies of scale through specialization in documentation, information collection, and monitoring. In a world of imperfect information, the desire by borrowers to retain the property rights to proprietary information can create a role for intermediaries as credit monitors without disclosure (Campbell [1979]). Leland and Pyle [1977] maintain that ex ante informational asymmetries between borrowers and lenders provide an opportunity for intermediaries to signal the quality of borrower-specific information by retaining equity in a particular project at a lower cost than individual borrowers. Both Diamond [1984] and Ramakrishnan and Thakor [1984] argue that intermediaries are useful for resolving ex post informational asymmetries between borrowers and lenders because intermediary diversification lowers the cost of information production. Finally, Campbell and Kracaw [1980] suggest that intermediaries exist because the production of information, the provision of transaction services, and the protection of confidentiality are complementary activities.

Although none of these articles explicitly consider bank off balance sheet guarantees as financial instruments, these theories of financial intermediation readily encompass guarantee issuance as a natural bank activity.[6] When a guarantee is issued, the risk exposure of the bank is similar to matching the duration of an asset with its funding source. The bank retains responsibility for the borrower's credit risk, but interest rate (market) risk is transferred to the bank's customer and the guarantee beneficiary. By guaranteeing funds availability (writing a put option on the bank customer's indebtedness), the intermediary has an incentive to efficiently monitor borrowers, produce information and signal its credibility, and specialize in credit evaluation. Because guarantee issuance and outright loans or investments represent substitute methods for allocating credit with complementarities in production, there should be a relationship between standby letters of credit used to back up a municipal bond issue and municipal bond portfolio holdings or note issuance facilities (a form of revolving loan commitment) and the purchase of Eurobonds. Depending on the risk-return tradeoff between selling information services versus warehousing assets, a bank will divide its business between both balance sheet and off balance sheet activities.

On the demand side of the market, an individual bank's issuance of guarantees depends on the market's perception of the bank's quality. A bank may not be asked to issue an off balance sheet guarantee unless the quality of the guarantee is made credible to the beneficiary. In this sense, the market mechanism rations out those banks that are perceived as questionable quality guarantors; banks that can issue guarantees are perceived as superior quality institutions by the market. The point is that bank lending, investment, and credit analysis decisions will have an effect on the bank's ability to participate in the guarantee market. A bank may signal the quality

of its information by increasing its capital-to-asset ratio but loan diversification, interest rate risk exposure, and ready access to purchased funds may also serve as quality signals. In sum, a market in credible off balance sheet guarantees would exist even in the absence of bank regulations to accommodate the needs of bank customers and profit from the value of bank underwriting services.[7]

Next, consider the potential effects of bank regulation. Benston and Smith [1976] argue that bank regulations reduce the transaction cost advantage that banks have over direct financing. The arguments behind the recently proposed risk-based capital guidelines emphasize that existing capital policies provide incentives to avoid low-yield activities in favor of high-yield activities. Given a sufficient return to guarantee issuance, the current capital adequacy guidelines may provide an incentive for off balance sheet underwriting. Off balance sheet activities generate fees that can bolster current profitability without tieing up capital. Essentially, this is the argument made by Giddy [1985]. Therefore, a binding regulatory capital constraint provides a motivation for off balance sheet banking.

However, Laub [1985] and Pyle [1985] maintain that a binding capital constraint in conjunction with risk-independent deposit insurance premiums generate the real motivation for off balance sheet banking. This interaction between capital adequacy and deposit insurance premiums is also suggested by Buser et al. [1982], although not in the context of off balance sheet banking. Regulatory standards for capital adequacy determine the net value of deposit insurance to stockholders as a function of bank leverage. Off balance sheet banking is an effective way to avoid binding minimum capital standards, but if deposit insurance premiums were properly priced, market discipline would be exerted on a bank's off balance sheet risk-taking by the deposit insurer.

Another regulatory tax designed to buffer asset quality decisions is related to the bank's allocation for loan losses. This is a balance sheet stock, a portion of which appears in the bank's income statement as a deduction from net income (called provision for loan losses) as loans are charged off and losses realized. Usually banks are unwilling to add to loan loss allocations voluntarily and do so only after a bank examination. In an effort to maintain bank profitability in the face of loan charge-offs, the fees earned from issuing off balance guarantees may be attractive since the amortization of fees over the life of the guarantee is not required. Hence, the greater the burden of asset reclassification, the greater the motivation for off balance sheet banking.

Regulatory taxes also appear when a balance sheet asset is funded. Reserves must be held against deposit liabilities such as transaction accounts, nonpersonal time deposits, and Eurodollar deposits. Because these funds are held idle, required reserves represent a significant cost of redistributing funds through the banking system. The incidence of this tax may fall on either the borrowers or the depositors, depending on the bank's funding source (see Fama [1985]). To circumvent such a cost, banks may issue off balance sheet guarantees to allow their customers direct access to financial markets. Alternatively, one could view the reserve burden as forcing the bank to hold more riskless assets than it desires. To achieve a target risk-return tradeoff it will then acquire other risky assets to compensate for required reserves. Off balance sheet guarantee issuance could be part of this riskier portfolio or allow the bank to avoid holding undesired riskless assets from the very start.

Overall, any model of off balance sheet banking should include the regulatory incentives that exist from binding capital requirements, fixed-rate deposit insurance premiums, loan reclassification, and reserve requirements.

The greater a bank's exposure to any of these regulatory burdens, the greater the incentive to engage in off balance sheet guarantees.

III. Empirical Specification

Because commercial banks are required to report their off balance sheet activities to the Federal Reserve whether or not they participate in such activities, the estimation problem at hand involves an analysis of survey data. The behavioral responses of commercial banks in the sample are taken to be qualitative; either a bank engages in a given off balance sheet activity or it does not.[9] Therefore, the dependent variables (loan commitments, standby letters of credit, and commercial letters of credit outstanding) in the linear regression models reflect binary choices on the part of the bank. A binary-choice model assumes that an individual bank is faced with two alternatives and the choice it makes depends on the characteristics of the institution. Given information on bank attributes and the off balance sheet choices they make, the problem is to estimate an equation which predicts the likelihood that a bank with given characteristics will engage in off balance sheet guarantees. Throughout this paper the probabilistic nature of the decision process is assumed to follow the cumulative logistic probability function.[10] That is, the dependent variables in the regression equations are simply the logarithms of the odds that a particular choice will be made for a given off balance sheet item.

Because all of the off balance sheet items studied here have characteristics of a guarantee, a common set of independent variables reflecting bank credibility and regulatory incentives are used in each model. Besides a common customer accommodation variable in each model, additional independent variables are included in the loan commitment and standby letter

of credit models to capture specific customer needs. No satisfactory proxies for specific customer accommodation variables in the commercial letter of credit model could be specified from the data set. The data used in estimating the logit regression models are from the Federal Reserve System's Reports of Condition and Income for June 1985. The sample size was reduced to 14,382 banks by eliminating those institutions that reported zero loans or zero deposits.

The independent variables used in the estimation are described as follows. The first six variables proxy bank credibility, the next four variables proxy regulatory incentives, and the remainder proxy customer accomodation variables.

1. Bank asset size [SIZE]. This variable is calculated as the logarithm of total bank assets expressed in millions of dollars. Total bank assets are taken to be total reported assets plus allowance for loan and lease losses exclusive of allocated transfer risk reserves and less goodwill. Absolute bank size is an important quality indicator in estimating the likelihood of off balance activity because, among other things, large banks can utilize specialized management skills needed to effectively ration credit through guarantees.

2. Primary equity capital ratio [CAPITAL]. This variable is the primary equity of the bank divided by total assets as defined above. Primary capital is taken to be common stock outstanding, perpetual preferred stock, surplus, undivided profits and capital reserves, and allowance for loan and lease losses exclusive of allocated transfer risk reserves and less goodwill. This is the definition of primary capital established by the Federal Reserve System for state member banks. The impact of primary capital on guarantee market participation is not clear-cut. The higher a bank's primary capital ratio the more sound it is, all other things equal, but a well-managed bank portfolio,

which also can signal soundness, reduces the need for capital as a buffer against income losses.

3. Loan portfolio diversification [INDEX]. This variable is calculated as the sum of squared shares of lending in a particular loan category relative to the total size of the bank's loan portfolio. If INDEX equals one, little or no diversification in the bank's loan portfolio is present and the smaller the INDEX value the more equal the loan shares. Ten different loan categories are used to calculate the shares.[11] The greater the concentration in a particular category the greater the bank's loan market risk and the lower the market's perception of bank soundness.

4. Asset-liability maturity gap [GAP]. The more mismatched are a bank's asset and liability terms to maturity, the greater the bank's exposure to interest rate risk should off balance sheet guarantees be taken down. The GAP variable is calculated as the dollar difference between bank assets and liabilities maturing or repricing in one year or less as a percent of total bank assets. Assets include loan and lease financing receivables, debt securities, and other interest-bearing assets. Liabilities include time and open-account time deposits in domestic and foreign offices, nondeposit interest-bearing liabilities, money market deposit accounts, and Super NOW accounts. A positive relationship between balance sheet interest rate risk as measured by GAP and the probability of issuing off balance sheet guarantees might reflect an effort by banks to diversify their income sources. Because a high value for GAP indicates the bank would profit from a rise in rates and a rise in rates is likely to be associated with takedowns on off balance sheet guarantees, the bank can insulate itself from off balance sheet risk by simultaneously running a positive maturity gap.

5. Affiliation with a bank holding company [BHC]. This is a dummy variable equal to one if the bank is affiliated with a bank holding company

and zero otherwise. Although the affiliate is legally separate from the parent company, the market may perceive an affiliate as being of higher quality than an independent bank because the parent is unlikely to let an affiliate's off balance sheet problems destroy its investment.

6. Access to purchased funds [PURCH]. This variable calculates a bank's purchased liabilities as a percent of total bank assets. The greater a bank's access to purchased funds the less likely a funds availability problem will be created by a simultaneous takedown of guarantees. Purchased funds are liabilities that are elastically supplied to the bank at competitive interest rates; they include federal funds purchased, repurchase agreements, time and open account certificates of deposit of $100,000 or more, demand notes issued to the Treasury, and other borrowed money. Furthermore, the greater a bank's use of purchased funds, the more likely is the imposition of market discipline on bank risk-taking, given the competitive nature of these markets.

7. Required reserves [RESERVES]. This variable calculates a bank's current reserve burden that must be held idle against net transaction accounts, nonpersonal time deposits, and Eurocurrency liabilities as a percent of total assets.[12] The higher the reserve requirement the greater the probability that the bank will engage in off balance sheet activities, if the alternative is to fund balance sheet assets with reservable deposits.

8. Binding capital constraint [KBINDING]. While the variable CAPITAL, above, measures a bank's actual capital position, the discussion in the preceding section argues that a binding capital constraint should also be important in the off balance sheet guarantee decision. KBINDING is a dummy variable equal to one if the bank's primary capital ratio is less than 5.5% (the established minimum for banking organizations) and zero otherwise. This variable should yield insight into the effectiveness of raising capital adequacy guidelines to discourage the issuance of off balance sheet guarantees.

9. Deposit insurance subsidy [FDIC]. Calculated as an interaction variable between KBINDING and the percent of total assets funded by insured deposits (accounts less than $100,000), this variable proxies the risk-taking incentives inherent in fixed-rate deposit insurance premiums when the bank faces a binding capital constraint. The greater the assets funded by insured deposits, the less likely it is that market discipline will be imposed on the risk-taking decisions of bank management and the more likely it is that bank management will seek off balance sheet fee income to preserve capital. The difficulty in measuring off balance sheet risk relative to balance sheet risk suggests that FDIC should be positively related to the likelihood that a bank engages in off balance sheet guarantees.

10. Loan and lease losses [LLOSS]. Given the typical reluctance of a bank to reallocate assets for loan and lease losses except at the suggestion of bank examiners and regulators, this variable proxies the regulatory burden associated with loan reclassification. LLOSS is the percent of total assets allowed for loan and lease losses.

11. Market concentration [CR3]. This variable calculates the largest three banks' deposits as a percent of total county-wide deposits and assigns this ratio to all banks in that county. CR3 proxies the competitiveness of the bank's market, assuming the relevant market is a county. Admittedly, this is a questionable assumption for money center and regional banks, but a more accurate measure of competition is not readily available.[13] It is hypothesized that the greater is banking market concentration the less likely a bank in that market is willing to accommodate customer needs for off balance sheet guarantees. Balance sheet activity is relatively more profitable since risks can be passed on to customers through the exercise of monopoly power, resulting in high and variable loan rates and low deposit rates.

12. Commercial and industrial loans [CILOAN]. This variable focuses on a customer need associated with the issuance of loan commitments. It is calculated as the percent of total assets that are commercial and industrial loans. This seems natural given the type of customers most likely to use loan commitments.

13. Construction loans [CNSTRL]. Because one of the most common uses of standby letters of credit is to back up a contractor's obligation to complete a construction project, the ratio of construction loans to total assets should be important in the bank's standby letter of credit decision.

14. Municipal loans and securities [MUNI]. This variable is calculated as the percent of total bank assets that are used for the purchase of securities issued by and loans made to state and political subdivisions in the U.S. Because standby letters of credit are often issued as liquidity backstops for municipal bonds, this balance sheet variable is suggestive of a bank's willingness to accommodate specific customer needs. Like the preceding two variables, it is difficult to know apriori what the influence of this variable will be on the issuance of off balance sheet guarantees. Complementarities may exist because similar skills in default risk analysis, for example, are needed in both balance and off balance sheet decisions; substitutability may exist because both balance and off balance sheet decisions facilitate the customer's financing needs.

The general empirical form of the logit regression equation for predicting the likelihood of a bank issuing an off balance sheet guarantee is

$$
\begin{aligned}
(1)\ \log(P/(1-P)) = {} & a_0 + a_1\,\mathrm{SIZE} + a_2\,\mathrm{CAPITAL} + a_3\,\mathrm{INDEX} + a_4\,\mathrm{GAP} \\
& + a_5\,\mathrm{BHC} + a_6\,\mathrm{PURCH} + a_7\,\mathrm{RESERVES} + a_8\,\mathrm{KBINDING} + a_9\,\mathrm{FDIC} \\
& + a_{10}\,\mathrm{LLOSS} + a_{11}\,\mathrm{CR3} + \begin{cases} a_{12}\,\mathrm{CILOAN} \text{ (for loan commitments) or} \\ a_{12}\,\mathrm{CNSTRL} + a_{13}\,\mathrm{MUNI} \\ \quad \text{(for standby letters of credit)} \end{cases}
\end{aligned}
$$

where P is the probability that a bank engages in an off balance sheet guarantee and the other variables are as defined above. Given the discussion in this and the preceding section, the expected signs for Equation (1) can be expressed as follows:

$a_1, a_4, a_5, a_6 > 0; a_3 < 0; a_2 \gtreqless 0;$ (credibility variables)

$a_7, a_8, a_9, a_{10} > 0;$ (regulatory variables)

$a_{11} < 0; a_{12}, a_{13} \gtreqless 0.$ (customer variables)

Overall, the logit model will test which of the broad categories of variables and which variables within a category are most important in the off balance sheet banking decision.[14]

IV. Results

Equation (1) was estimated for each of the three off balance sheet activities and the results are presented in Tables 1 and 2. Results are reported for the entire cross-section of banks in the sample and a large bank subsample. Although the vast majority of banks are in the small bank category, roughly the top 500 banks in terms of asset size are analyzed separately because it is this group of banks that is most likely to be affected by the imposition of risk-based capital rules and can most readily threaten the stability of the banking system should a problem in off balance sheet underwriting arise. Because the estimated parameters cannot be directly interpreted as the partial or marginal effects of the independent variables on the probability of engaging in off balance sheet guarantees, the marginal effects are calculated as a separate column in each table.[15]

Table 1 shows the results for each commercial bank off balance sheet guarantee, for all banks in the sample. Estimates significantly different

from zero generally carry the expected sign; only one variable, KBINDING in the standby letter of credit model, is statistically significant with the wrong expected sign.[16] Although the standby letter of credit model fits the data better than the other two models, the negative estimated coefficient on KBINDING implies a binding capital constraint makes a bank less likely to issue standby letters of credit. Table 1 shows that the two variables with the largest marginal effect on the issuance of off balance sheet guarantees are regulatory variables--required reserves and loan losses. A 1% increase in RESERVES increases the probability that an institution issues loan commitments, standby letters of credit, and commercial letters of credit by roughly five, six, and five percentage points, respectively. The marginal effects of a 1% increase in LLOSS range from roughly four to two percentage points across the three models. Contrary to the conventional wisdom, the two variables associated with a binding capital constraint, KBINDING and FDIC, are significant influences only in the standby letters of credit model and their marginal effect is small.

Table 2 shows the results for the large bank subsample. In general, the empirical specification explains less of the behavior of large bank off balance sheet guarantees than in the total sample. Although fewer variables are significant, the signs on coefficients that are significant are as expected with the exception of KBINDING in the loan commitment and standby letter of credit models. The strength of RESERVES and LLOSS in predicting large bank issuance of off balance sheet guarantees is less than in the total sample, although the former variable is significant in the standby and commercial letter of credit models. More important, the bank quality index of loan portfolio diversification, INDEX, assumes a relatively large and significant role in all three models. A 1% decrease in loan diversification decreases the probability of that an institution issues loan commitments,

standby letters of credit, and commercial letters of credit by roughly 0.6, 0.3, and 0.6 percentage points, respectively.

Finally, these results lend support to and extend the findings of Goldberg and Lloyd-Davies [1985] that there is little, if any, relationship between bank equity and off balance sheet guarantees. In Tables 1 and 2, the variable KRATIO is insignificantly different from zero in all models except the standby letter of credit model that uses the entire sample of banks. For this exception, a 1% increase in a bank's equity-to-asset ratio decreases the likelihood of standby letters of credit issurance by less than 0.3 percentage points. Although this is a small marginal effect, it may be that the market rations guarantees to those banks that are managed soundly and therefore, require less equity.

V. Conclusion

The results of this paper indicate that a commercial bank's ability to engage in off balance sheet guarantees such as loan commitments, standby letters of credit, and commercial letters of credit significantly depends on variables relating to bank credibility, regulatory incentives, and customer accommodation. The model discussed in section two, however, needs to be formalized mathematically to better grasp the interrelationships between variables; otherwise, subtle dependencies that may be captured in the logit analysis can go unnoticed. This extension is beyond the scope of the present paper. The purpose here has been to investigate the determinants of U.S. commercial bank activity in the market for off balance sheet guarantees.

Do the results presented here suggest U.S. commercial banks are making unwise off balance sheet decisions in the market for off balance sheet guarantees? This is an important question for bank regulators and uninsured investors interested in safety and soundness issues. The results do reveal a

consistent, positive relationship between bank asset size and the issuance of off balance sheet guarantees. The role that large banks play in the stability of the banking system as a whole is substantial; therefore, the stability of the banking system might be improved by a close monitoring of the off balance sheet activities of these banks. Moreover, since large banks tend to operate in more competitive markets than small banks, the indirect effect of market concentration on guarantee issuance further supports this concern. Attempts to increase competition in banking markets will likely result in greater off balance sheet banking. On the other hand, the results show that banks without diversified loan portfolios, holding company affiliation, or access to purchased funds are less likely to issue off balance sheet guarantees. These banks may be rationed out of the market. There is also support for the idea that the banks issuing standby letters of credit are of high quality and, consequently, need less capital to operate than those not issuing these guarantees.

Finally, will a risk-based capital rule that includes off balance guarantees, as recently proposed, have a significant effect on these off balance sheet decisions? The results presented here suggest it may not. In the entire sample of banks, the effect of a binding capital adequacy standard on the decision to issue off balance sheet guarantees is quite small.[17] For the large bank subsample, the effect of a binding capital constraint on the issuance of loan commitments, standby letters of credit, and commercial letters of credit is +0.86, -0.13, and +0.36, respectively. This paper shows that other regulatory-based incentives are more important than binding capital requirements and flat-rate deposit insurance premiums in determining the supply of off balance sheet guarantees. Although the results here suggest that a binding capital constraint has very little effect on the decision to issue off balance sheet guarantees, the imposition of a binding risk-based

capital standard would still be useful in protecting the solvency of the deposit insurance fund because it provides an additional buffer against the loss of market value.

But most noteworthy in this paper is the direct effect of required reserves and loan loss allocations on the probability of a bank engaging in off balance sheet activities. The opportunity cost of funding assets with reservable deposits is the single strongest motivation in the off balance sheet decision. Those banks with a heavy concentration of their deposit business in reservable liabilities are most likely to take advantage of the market in off balanace sheet guarantees. If off balance sheet risks are a regulatory concern per se, then lowering reserve requirements appears to be an effective policy option. Unfortunately, the role that reserve requirements play in monetary control imply that such an action to control off balance sheet banking would have serious side effects. Perhaps a better policy option would be to pay market rates of interest on reserves to reduce the relative advantage of off balance sheet banking for these institutions.

Furthermore, bank examiner pressure to reclassify assets for loan losses may also motivate banks to engage in fee-generating off balance sheet activities. Off balance sheet guarantees cannot be written down until the implied put option is exercised. In sum, the off balance sheet decision is complex; perhaps the most intelligent public policy with respect to off balance sheet guarantees is to try to further understand the parameters of choice and monitor the pricing of the obligations that are created. If banks underprice guarantee risks because of the existence of regulatory taxes associated with warehousing assets, both shareholders and regulators have cause for concern.

Footnotes

[1]Of course, this is only a subset of all off balance sheet items that banks engage in and report. Other activities that are not investigated here are: futures and forward contracts, when issued security contracts, option contracts, participations in bankers acceptances, and contracts in which securities are borrowed and lent. In general, the three off balance sheet items studied here where chosen because of their potential for creating portfolio risk and their popularity in use.

[2]The insignificance of a binding capital constraint in explaining standby letter of credit issuance is also reported by Benveniste and Berger [1986].

[3]On January 20, 1986, the Board of Governors of the Federal Reserve System proposed rules for implementing risk-based capital guidelines. In these proposed guidelines, supplemental capital ratios are to be calculated that explicitly include standby and commercial letters of credit, and loan commitments. Loan commitments are in the money market risk category (weight = 30%), commercial letters of credit are in the moderate risk category (weight = 60%), and standby letters of credit are in either the moderate risk category or the standard risk category (weight = 100%) depending on their reason for issuance. The weights determine the quantity of each item that are included in risk assets and then compared to primary capital.

[4]In determing whether or not a bank issues standby letters of credit in the empirical analysis below, the amount of standby letters of credit conveyed to others through participations are netted out.

[5]Fama [1980] and Black [1975] do not appeal to market imperfections to justify the existence of financial intermediaries. The argument is that banks exist as a passive response to borrowers and lender demands for access to an accounting system of exchange and managed portfolios. Banks earn fees for

Footnotes (Cont'd)

their clearinghouse and management skills. An off balance sheet guarantee may be valuable to investors because it insures access to a clearinghouse in the event of borrower default.

[6]Given the existence of off balance sheet guarantees, several authors have investigated the determinants of the decision to seek or issue these instruments, theoretically. Loan commitments have been investigated by Campbell [1978], Deshmukh et al. [1982], Ricart I. Costa and Greenbaum [1983], Bartter and Rendleman [1979], Thakor [1982], and Thakor et al. [1981]. The first three articles examine the bank's loan commitment decision problem, while the last three articles focus on the customer's valuation problem. Greenbaum and Venezia [1985] examine the partial takedown of loan commitments in a model where the bank and borrower interact. They derive several determinants of the optimal takedown and show how commitment prices change in response to takedown behavior.

[7]Kareken [1987] argues that the rapid growth in off balance sheet guarantee issuance since 1973 is due to technological advances that decrease the cost of acquiring and processing information and open the direct credit markets to a greater number of issuers. In the model here, this implies a greater need to accommodate bank customers and an enhanced value of bank guarantees.

[8]Based on the foregoing arguments, a structural model of the guarantee market could be conceptualized as:

$$Q_s = \alpha_0 + \alpha_1 C + \alpha_2 R + \alpha_3 F + \varepsilon_1, \text{ and} \quad \text{(supply)}$$

$$Q_d = \beta_0 + \beta_1 S + \beta_2 F + \varepsilon_2 \quad \text{(demand)}$$

where Q_s and Q_d are guarantees supplied and demanded, C is a set of customer accommodation variables, R is a set of regulatory incentive variables, F is fee income from issuance, S is a set of bank quality variables, and ε^i (i=1,2) are

Footnotes (Cont'd)

random errors. Ex ante, α_1, α_2, α_3, and $\beta_1 > 0$; $\beta_2 < 0$. Because data on fee income is not readily available, this paper estimates the reduced form

$$Q = \alpha_0 + \alpha_1 C + \alpha_2 R + \alpha_3 S + \varepsilon,$$

assuming $Q_s = Q_d = Q$. Ex ante, all coefficients in the reduced form are positive.

[9]Those that are familiar with the data set used in this study, discussed below, will realize that the Federal Reserve System collects quantitative as well as qualitative data on off balance sheet positions. The size of off balance sheet positions represents additional information that could be used in the estimation of the models. This data set suggests an appropriate estimation technique is tobit analysis. Such refinements in estimation are not attempted here to keep the analysis focused on bank participation in the market.

[10]Logit analysis was selected over probit and linear probability specifications due to the restrictive assumptions and characteristics of the latter two approaches (see Amemiya [1981]).

[11]These loan categories are: loans secured by real estate, loans to depository institutions, agricultural loans, commercial and industrial loans, acceptances of other banks, loans to indivduals, loans to foreign governments, municipal loans, other loans, and lease financing receivables.

[12]These calculations are based on a three percent and 12% reserve requirement on net transaction accounts less than $32 million and greater than $32 million, respectively; a three percent reserve requirement on time deposits less than 1.5 years in maturity; and a three percent reserve requirement on all types of Eurocurrency liabilities.

Footnotes (Cont'd)

[13]While this may not be a restrictive assumption for banks in rural areas, it does present a problem in describing markets in urban areas. For urban areas, the effect is to bias a bank's market share of deposits upward. Also, the exclusion of thrifts in this calculation biases market deposit share as a measure of a bank's monopoly power upward.

[14]Since the independent variables are a mixture of demand and supply variables as discussed in section II, the regression can be conceptualized as a reduced form equation assuming market equilibrium.

[15]Because the dependent variable in each model is the logarithm of the odds of choice, not the actual probability, the marginal effect on the probability due to a change in an independent variable will depend on the probability itself. For the logit model, the marginal effect of a change in the independent variable X_i on the probability of engaging in a given off balance sheet activity Pj is given by $\partial P_j/\partial X_i = P_j(1-P_j)\beta_i$ for each continuous explanatory variable. The value of P_j chosen for the tables is the sample frequency of use, equal to the mean predicted probability.

[16]Statistical significance is based on Wald's chi-square statistic (see Houck and Donner [1977]).

[17]The marginal effect of an increase in KBINDING on the likelihood of off balance sheet activity is calculated as the marginal effect of a_8 plus the product of the marginal effect of a_9 and the mean value of the percent of total assets funded by insured deposits in the sample. For all banks, this mean value was 0.701; for the large bank subsample, 0.482. Given this an the results in Table 1, the effect of KBINDING ranges from -0.03 to +0.03 across the three models.

References

1. Amemiya, T. "Qualitative Response Models: A Survey." Journal of Economic Literature 19(December 1981): 1482-1536.

2. Bartter, B. and R. Rendleman. "Fee-Based Pricing of Fixed-Rate Bank Loan Commitments." Financial Management 8(Spring 1979): 13-20.

3. Bennett, B. "Off Balance Sheet Risk in Banking: The Case of Standby Letters of Credit." Economic Review, Federal Reserve Bank of San Francisco (Winter 1986): 19-29.

4. Benston, G. and C. Smith. "A Transactions Cost Approach to the Theory of Financial Intermediation." Journal of Finance 31(May 1976): 215-231.

5. Berger, A. and L. Benveniste. "An Empirical Analysis of Standby Letters of Credit." Proceedings of a Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago (1986), forthcoming.

6. Black, F. "Bank Funds Management in an Efficient Market." Journal of Financial Economics 2(December 1975): 323-339.

7. Buser, S., A. Chen, and E. Kane. "Federal Deposit Insurance, Regulatory Policy, and Optimal Bank Capital." Journal of Finance 35 (March 1981): 51-60.

8. Campbell, T. "A Model of the Market for Lines of Credit." Journal of Finance 33(March 1978): 231-244.

9. Campbell, T. "Optimal Investment Financing Decisions and the Value of Confidentiality." Journal of Financial and Quantitative Analysis 14 (December 1979): 913-924.

10. Campbell, T. and W. Kracaw. "Information Production, Market Signalling, and the Theory of Financial Intermediation." Journal of Finance 35 (September 1980): 863-882.

References (Cont'd)

11. Deshmukh, S., S. Greenbaum, and G. Kanatas. "Bank Forward Lending in Alternative Funding Environments." Journal of Finance 37(September 1982): 925-940.

12. Diamond, D. "Financial Intermediation and Delegated Monitoring." Review of Economic Studies 51(July 1984): 393-414.

13. Fama, E. "Banking in the Theory of Finance." Journal of Monetary Economics 6(January 1980): 39-57.

14. Fama, E. "What's Different About Banks?" Journal of Monetary Economics 15(January 1985): 29-39.

15. Giddy, I. "Regulation of Off-Balance Sheet Banking." The Search for Financial Stability: The Past Fifty Years, Federal Reserve Bank of San Francisco, 1985, pp. 165-177.

16. Goldberg, M. and P. Lloyd-Davies. "Standby Letters of Credit: Are Banks Overextending Themselves?" Journal of Bank Research 16(Spring 1985): 28-35.

17. Greenbaum, S. and I. Venezia. "Partial Exercise of Loan Commitments under Adaptive Pricing." Journal of Financial Research 8(Winter 1985): 251-263.

18. Houck, W. and A. Donner. "Wald's Test as Applied to Hypotheses in Logit Analysis." Journal of the American Statistical Association 72(December 1977): 851-853.

19. Kareken, J. "Contingent Commitment Banking: Risk and Regulation." Paper presented at a Conference on Asset Securitization and Off Balance Sheet Risks of Depository Institutuions, Northwestern University, February 15-17, 1987.

References (Cont'd)

20. Laub, P. "Regulation of Off-Balance Sheet Banking: Discussion." The Search for Financial Stability: The Past Fifty Years, Federal Reserve Bank of San Francisco, 1985, pp. 179-183.

21. Leland, H. and D. Pyle. "Informational Asymmetries, Financial Structure, and Financial Intermediation." Journal of Finance 32(May 1977): 371-387.

22. Pyle, D. "Regulation of Off-Balance Sheet Banking: Discussion." The Search for Financial Stability: The Past Fifty Years, Federal Reserve Bank of San Francisco, 1985, pp. 185-189.

23. Ramakrishnan, R. and A. Thakor. "Information Reliability and a Theory of Financial Intermediation." Review of Economic Studies 51(July 1984): 415-432.

24. Ricart I. Costa, J. and S. Greenbaum. "Bank Foward Lending: A Note." Journal of Finance 38(September 1983): 1315-1322.

25. Thakor, A. "Toward a Theory of Bank Loan Commitments." Journal of Banking and Finance 6(March 1982): 55-83.

26. Thakor, A., H. Hong, and S. Greenbaum. "Bank Loan Commitments and Interest Rate Volatility." Journal of Banking and Finance 5(December 1981): 497-510.

27. Wolkowitz, B., P. Lloyd-Davies, B. Gendreau, G. Hanweck, and M. Goldberg. "Below the Bottom Line: The Use of Contingencies and Commitments by Commercial Banks." Staff Studies #113, Board of Governors of the Federal Reserve System, January 1982.

TABLE 1
LOGIT ESTIMATES FOR U.S. COMMERCIAL BANK
OFF BALANCE SHEET GUARANTEES
JUNE 1985
(N = 14,382)

INDEPENDENT VARIABLE	ESTIMATE	STD. ERROR	MARGINAL EFFECT
1. LOAN COMMITMENTS			
CONSTANT	-2.898*	0.171	-0.714
SIZE	0.514*	0.022	0.127
CAPITAL	-0.042	0.540	-0.010
INDEX	-0.393*	0.190	-0.097
GAP	0.299*	0.141	0.074
BHC	0.201*	0.039	0.049
PURCH	0.889*	0.189	0.219
RESERVES	21.242*	4.861	5.230
KBINDING	0.503	0.536	0.124
FDIC	-0.883	0.765	-0.217
LLOSS	7.118**	3.642	1.752
CR3	-0.349*	0.087	-0.086
CILOAN	2.595*	0.219	0.639
R-squared	0.105		
2. STANDBY LETTERS OF CREDIT			
CONSTANT	-2.887*	0.207	-0.722
SIZE	0.822*	0.027	0.205
CAPITAL	-1.028**	0.612	-0.257
INDEX	-1.191*	0.206	-0.298
GAP	1.118*	0.153	0.279
BHC	0.117*	0.041	0.029
PURCH	1.633*	0.212	0.408
RESERVES	24.046*	6.207	6.011
KBINDING	-1.513*	0.579	-0.378
FDIC	2.326*	0.812	0.581
LLOSS	16.249*	3.897	4.062
CR3	-0.714*	0.095	-0.178
CNSTRL	6.754*	0.680	1.688
MUNI	-1.302*	0.384	-0.325
R-squared	0.165		
3. COMMERCIAL LETTERS OF CREDIT			
CONSTANT	-4.147*	0.193	-0.678
SIZE	0.558*	0.026	0.091
CAPITAL	-0.815	0.775	-0.133
INDEX	-0.410**	0.239	-0.067
GAP	0.695*	0.174	0.114
BHC	0.017	0.050	0.003
PURCH	1.529*	0.202	0.250
RESERVES	32.801*	4.785	5.360
KBINDING	0.048	0.507	0.008
FDIC	0.086	0.761	0.014
LLOSS	9.488*	4.408	1.550
CR3	-0.390*	0.105	-0.064
R-squared	0.123		

*Significantly different from zero at the 5% level.
**Significantly different from zero at the 10% level.

TABLE 2
LOGIT ESTIMATES FOR U.S. COMMERCIAL BANK
OFF BALANCE SHEET GUARANTEES
JUNE 1985
(BANKS WITH ASSETS GREATER THAN $500 MILLION, N=490)

INDEPENDENT VARIABLE	ESTIMATE	STD. ERROR	MARGINAL EFFECT
1. LOAN COMMITMENTS			
CONSTANT	-4.108	2.555	-0.370
SIZE	1.143*	0.304	0.103
CAPITAL	4.848	9.179	0.436
INDEX	-6.759*	1.674	-0.608
GAP	1.056	1.497	0.095
BHC	1.089*	0.456	0.098
PURCH	-0.705	1.570	-0.063
RESERVES	7.813	24.500	0.703
KBINDING	-2.906**	1.668	-0.262
FDIC	25.944	34.078	2.335
LLOSS	21.292	52.730	1.916
CR3	-2.152*	1.001	-0.194
CILOAN	3.265**	1.830	0.294
R-squared	0.152		
2. STANDBY LETTERS OF CREDIT			
CONSTANT	-7.813*	3.309	-0.463
SIZE	1.563*	0.401	0.093
CAPITAL	3.880	11.497	0.230
INDEX	-4.434*	2.250	-0.263
GAP	2.593	1.641	0.154
BHC	0.720	0.592	0.043
PURCH	2.454	1.924	0.146
RESERVES	61.937**	32.729	3.672
KBINDING	-3.486*	1.411	-0.207
FDIC	2.594	3.003	0.154
LLOSS	-14.886	61.007	-0.883
CR3	-2.628*	1.275	-0.156
CNSTRL	3.627	7.758	0.215
MUNI	-4.152	4.737	-0.246
R-squared	0.153		
3. COMMERCIAL LETTERS OF CREDIT			
CONSTANT	-6.005*	2.183	-0.845
SIZE	1.207*	0.240	0.179
CAPITAL	-5.095	7.472	-0.717
INDEX	-3.910*	1.485	-0.550
GAP	1.162	1.257	0.163
BHC	-0.384	0.513	-0.054
PURCH	1.199	1.220	0.169
RESERVES	50.768*	21.012	7.143
KBINDING	-1.004	1.493	-0.141
FDIC	7.412	7.863	1.043
LLOSS	44.198	44.158	6.219
CR3	-1.981*	0.830	-0.279
R-squared	0.145		

*Significantly different from zero at the 5% level.
**Significantly different from zero at the 10% level.