Standby letters of credit

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Banks exist because they perform many services valued by the overall economy. One of these services is the centralization of credit evaluation and monitoring, which produces information that cannot easily be made public by the borrower. This centralization exploits cost economies and, together with a diversified loan portfolio, lowers the price of credit. Another service provided by banks is access to the payments system and to a clearinghouse for transactions. Public policies to attain safe and sound banking have traditionally focused on methods to assure the continuous and efficient functioning of this transactions and payment mechanism. Finally, banks offer transformation services that convert claims issued by borrowers into instruments that investors are willing to hold. These claims may be transformed with respect to their maturity, liquidity, or credit risk.[1]

Due to financial and technological innovations in the 1970s and increased competition in the financial services industry, banks have come to realize that the traditional delivery system for these services—warehousing assets funded by deposit liabilities—could be broken down or unbundled into constituent parts. Depending on the specific bank customer, low value-added services (such as bearing interest-rate risk) could be deemphasized and high value-added services (such as underwriting the direct placement of debt) could be highlighted without imparing the provision of services to other bank customers. This unbundling is the primary force behind the significant growth in off balance sheet banking activities and fee income as a source of profitability, especially at the large institutions. Regulatory policy to control off balance sheet banking activities must be careful not to destroy the valuable services embodied therein.

Because off balance sheet activities are largely unregulated and have grown rapidly over the past decade, there is concern that imprudent issuance of these instruments 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 have not been consistently 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 lines of credit were drawn down simultaneously.

This article focuses on one off balance sheet banking activity—standby letter of credit issuance—to understand its value as a banking service, its growth, and its market-related determinants. Empirical findings are presented that show: 1) the important variables in the decision to provide standby letters of credit; 2) the interaction of levels of standby activity and bank equity; and 3) the perception of the market in bank equities concerning the riskiness of issuing bank organizations. The conceptual and empirical analyses provide a basis for taking a look at the recently proposed supplemental capital guidelines for banks (so-called risk-based capital rules), which specifically include off balance sheet instruments such as standby letters of credit. While these supplemental capital requirements may help protect the solvency of the federal deposit insurance fund, it is argued that adoption of these guidelines may have little effect on bank issuance of standby letters of credit.

Institutional aspects

Off balance sheet activities and the services they provide can be loosely categorized into two types: lending-related activities, and derivative market activities. Lending-related activities involve a commitment to extend credit to a beneficiary and, generally, result in a loan to the bank customer if the commitment is exercised. These activities include standby and commercial letters of credit, loan commitments, and interest rate or currency swaps

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where the issuing bank acts merely as an intermediary and guarantor. Derivative market activities are commitments or rights to buy or sell financial assets at a predetermined price for a specific time period. They may be traded on an exchange or over-the-counter. Activities included in this category are: forward, futures, and options contracts, and interest rate or currency swaps when the bank issues them for its own account.

Standby letters of credit, the focus of this paper, guarantee funds availability to the instrument holder and so enhance the credit quality of the borrower. In issuing this off balance sheet instrument, the bank acts as a third party in a commercial transaction, substituting the bank's creditworthiness for that of its customer to facilitate exchange. 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. Standby letters of credit are used as credit enhancement facilities for municipal borrowers and issuers of commercial paper and as liquidity backstops that require the bank to buy bonds put to them.

Table 1 shows the year-end levels of outstanding standby letters of credit and the average relative to primary book capital of issuing banks since 1973, the first year that the Federal Reserve System requested this data on the Report of Condition and Income. Table 1 also breaks the data down by bank asset size, frequency of use, and market share within the banking industry. We can conclude from Table 1 that outstanding standby letters of credit have grown substantially over the past 14 years and that, despite their widespread utilization, large banks issue the vast majority of the dollar values outstanding.

The economics of credit enhancement

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.[2] In a world of transaction costs, Benston and Smith [1976] argue, financial intermediaries achieve economies of scale through specialization in documentation, information collection, and monitoring. In a world of imperfect information, the desire of 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 lead to the existence of intermediaries. By retaining an interest in a particular project at a cost lower than that incurred by individual borrowers, the bank can signal the quality of borrower-specific information more efficiently. Ex ante informational asymmetries arise when the borrower cannot costlessly reveal to the investor the exact *prospects* of his portfolio of potential projects.

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. Ex post informational asymmetries arise when the borrower cannot costlessly reveal to the investor the exact *outcome* of his portfolio of projects. 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 standby letters of credit as financial instruments, these theories of financial intermediation readily encompass credit enhancement as a natural bank activity.[3] When a standby letter of credit is issued, the risk exposure of the bank is similar to that incurred in 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

Table 1
Gross standby letters of credit issued by U.S. commercial banks

Year-end	Outstanding	All banks		Assets > $500 million			Assets > $10 billion		
		Percent reporting	Ratio to equity*	Percent reporting	Ratio to equity	Market share**	Percent reporting	Ratio to equity	Market share
	(in billions $)								
1973	5.0	7.7% (1095)†	8.4%	80.0% (155)	15.9%	91%	72.7% (8)	23.8%	38%
1974	10.6	12.8 (1851)	6.8	92.6 (200)	13.8	94	100 (12)	39.2	68
1975	11.7	14.3 (2092)	6.4	91.4 (201)	13.4	94	100 (12)	41.9	69
1976	15.1	20.1 (2942)	6.5	95.8 (226)	13.5	93	100 (13)	48.2	73
1977	19.7	24.1 (3529)	6.9	95.6 (258)	15.7	94	100 (15)	54.6	74
1978	25.7	29.3 (4286)	7.8	96.1 (297)	20.4	94	100 (17)	61.2	76
1979	34.7	33.7 (4891)	7.9	96.1 (317)	23.0	94	100 (17)	79.5	76
1980	46.9	37.6 (5507)	8.9	96.6 (344)	27.9	94	100 (19)	92.4	75
1981	71.5	43.3 (6297)	10.4	96.7 (385)	33.9	95	100 (22)	125.5	77
1982	100.3	48.1 (7011)	12.6	97.6 (403)	63.1	95	100 (23)	166.8	77
1983	119.6	54.3 (7849)	11.8	98.7 (444)	43.9	96	100 (23)	183.1	77
1984	145.6	47.8 (6920)	12.9	92.8 (450)	48.1	96	100 (24)	194.1	76
1985	175.0	52.5 (7556)	12.7	91.5 (483)	52.2	97	100 (28)	191.2	76
1986	169.5	55.6 (7859)	11.7	93.9 (523)	46.2	97	100 (33)	165.9	76

*Average ratio for issuing banks only.
**Standbys issued relative to total amount outstanding.
†Numbers in parentheses are the number of reporting banks.

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. Depending on the risk-return tradeoff between selling information services and warehousing assets, a bank will divide its business between both balance sheet and off balance sheet financial activities.

On the demand side of the market, an individual bank's issuance of standby letters of credit 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 filters out those banks that are perceived as questionable 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 standby letter of credit 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 to profit from the value of bank information services.[4]

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. The current capital adequacy guidelines may provide an incentive for off balance sheet underwriting because they require holding costly capital against balance sheet assets regardless of the riskiness of those

assets. Off balance sheet activities also generate fees that can bolster current profitability without tieing up capital. (Essentially, this is the argument made by Giddy [1985].) A binding regulatory capital constraint provides a motivation for standby letter of credit issuance as well as other risky activities.

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. Because flat-rate deposit insurance premiums do not penalize a bank for undertaking risky activities and insured depositors have no incentive to monitor bank riskiness, stockholders prefer risky bank activities to increase the value of their investment. Off balance sheet banking is an effective way to avoid binding minimum capital standards, but if deposit insurance premiums were properly priced, regulatory 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 item, a portion of which appears on the bank's income statement as a deduction from net income (called provision for loan losses) as loans are charged off and losses realized. Banks are often unwilling to add to loan loss allocations voluntarily. 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 required reserves bear no interest, they 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 credit enhancement instruments such as standby letters of credit 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 it could allow the bank to avoid holding undesired riskless assets from the very start.

The discussion so far indicates that a bank's activity in the market for off balance sheet credit enhancement is a function of its willingness to accommodate the needs of its customers, the market's perception of bank quality as reflected in balance sheet decisions, and the incentives provided by regulators. How does this guarantee market perform and what does this imply about the riskiness of banking organizations that issue guarantees?

To answer these questions, one needs to focus on the pricing and credit analysis decisions underlying guarantee issuance. Note that all fees charged to the bank's customers to open the credit line can be thought of as a premium on an insurance policy; this premium should compensate the bank for the risk that the credit may be activated. To make the guarantee attractive to its customers, these fees can be no greater than the present value of all default risk premium payments that the direct financing market would charge in the absence of a guarantee. The initial fees can be less than the market's default risk premium to the extent that: 1) the bank perceives an offsetting long-term gain from a strong bank-client relationship; 2) the bank has better information than the market about the quality of its customers; or 3) the regulatory taxes mentioned above reduce the effective cost of bearing the risk. In the first and second cases, the risk borne by the bank's shareholders depends on the accuracy with which the bank is able to evaluate its customers. The more accurate the evaluation, the less the risk to shareholders due to guarantee mispricing and the smaller the required rate of return.

However, if standby letter of credit fees fall because banks save on the regulatory taxes

associated with warehousing assets, both shareholders and regulators have cause for concern. As long as fees fall less than the regulatory tax savings, shareholders gain through greater bank profitability. With a perfectly elastic supply of guarantees, competition among guarantee issuers will cause the fee structure to fall to where the sum of the fees and regulatory tax savings equal the fees that would exist in the absence of regulation-induced supply effects. In a competitive guarantee market with heterogeneous banks, the fee structure will fall by the representative bank's regulatory tax saving. Those institutions facing below average regulatory taxes can only maintain guarantee market share by relaxing their credit standards. The net effect would be to reduce issuance costs and to accept high risk customers. In this case, default risk is being redistributed from the direct-financing investors to the shareholders of the bank and the FDIC. The rate of return required by shareholders will then rise to compensate for the increased risk associated with guarantee issuance.

The price and credit analysis decisions discussed above implicitly assume a given demand for guarantees. But recall that the demand for standby letters of credit will depend on the guarantee market's perception of issuing bank quality. Market discipline is imposed on those banks that are viewed as poor quality guarantors. A bank whose guarantees are not credible will be forced to issue guarantees at fees below the effective market price, if it can issue them at all. Given two banks with the same business mix and customer quality but with different perceptions of soundness by the guarantee market, the low-quality bank will, therefore, have a smaller presence in the market than the high-quality bank. The asset quality and risk management decisions of the bank will be affected by the demand side of the guarantee market, much like the effect that uninsured depositors have on bank decisions. The imposition of demand-side market discipline would then help insulate the bank's shareholders from the risk of guarantee mispricing. If this effect is sufficiently strong, the required rate of return on equity for banks that are able to issue guarantees will be less than for nonissuing banks.

Finally, the link between guarantee issuance and systematic risk must be spelled out. The previous discussion is couched in terms of bank-specific risk due to a possible mispricing of the initial fees on guarantee issuance. If these risk are diversifiable, shareholders of issuing banks would not price these risks in their investment decisions. But it has been shown through an application of the Option Pricing Model that a firm's liabilities have systematic risk that varies in direct proportion to the systematic risk of the firm's assets.[5] Recall that guarantees are a contingent liability; alternatively, the bank writes a put option for the standby beneficiary that conveys the right to sell the borrower's indebtedness to the bank over the life of the commitment. Therefore, if bank liabilities are options with systematic risk related to the value of the bank, standby letters of credit also have systematic risk related to the value of the bank.[6] The Capital Asset Pricing Model can then be used to test the contribution of guarantee issuance to the risk premium required by bank shareholders in the equity market.

Empirical Evidence

Three different sets of empirical results deal directly with the decision to issue a standby letter of credit.[7] Two of the empirical models use cross-sectional data from the quarterly Report of Condition and Income for June 1985; the third combines this information source with banking firm equity prices over time. Given the importance of large institutions in the standby letter of credit market, the results presented here only consider banks with total assets in excess of $500 million.

Determinants of Participation. Because commercial banks are required to report their outstanding standby letters of credit to the Federal Reserve whether or not they participate in such activities, the estimation problem at hand involves an analysis of survey data.[8] The behavioral responses of commercial banks in the sample are taken to be qualitative; either a bank engages in standby letter of credit activity or it does not. Therefore, the dependent variable (standby letters of credit outstanding) in the linear regression model reflects a binary choice 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 issue standby letters of credit. The predicted dependent variable from the regression equation is simply the logarithm of the odds that a bank will issue standby letters of credit.

The selection of explanatory variables for the estimation are based on the economics of credit enhancement services as presented in the last section. Three broad categories of variables are expected to influence a bank's presence in the standby letter of credit market: bank credibility variables, customer accommodation variables, and regulatory incentive variables. Table 2 presents descriptions and summary statistics on the selected explanatory variables. Variables 2 through 7 proxy bank credibility, the next four variables proxy regulatory incentives, and variables 12, 13, and 14 proxy customer accommodation. In general, variables that reveal superior bank quality and guarantee credibility, greater regulatory incentives, or a greater willingness to accommodate customers should increase the likelihood of standby letter of credit issuance.

Table 3 presents the estimated results for this model of the determinants of bank participation in the standby letter of credit market.[9] The variable with the single largest significant effect on participation is *required reserves,* a regulatory incentive variable. A one percent increase in the ratio of required reserves to assets increases the likelihood of standby letter of credit issuance by almost four percentage points. Therefore, the regulatory burden of funding balance sheet assets with reservable deposits appears to be a powerful incentive to participate in the standby letter of credit market. Other variables also influence this decision, however. The greater a bank's absolute size or the more diversified is its loan portfolio, the greater its credibility as a guarantor and the more likely it is to issue standbys. The significant coefficient on CR3 implies that the greater the concentration of the bank's deposit market, the less likely it is to issue standby letters of credit to accommodate the needs of its customers. Surprisingly, this model also suggests that banks with a binding minimum capital constraint are less likely to be a participant in the standby letter of credit market.

Joint capital and standby decisions. In the above model of the determinants of standby letter of credit issuance, the level of primary capital was assumed exogenous and found to be insignificant in predicting the likelihood of market participation. Another viewpoint suggests that a simple uni-directional relationship may not fully capture the interaction between standby letters of credit and bank capital.

On the one hand, the risks of credit issuance may be fully recognized by those banks that issue these guarantees and they may choose to increase their capital position as they increase standby issuance. The bank might raise their capital position because of an internal assessment of increased credit, interest rate, or liquidity risk or because of market discipline imposed by demanders of guarantees. A bank with greater equity is perceived as being more sound by the guarantee market, and hence, it can issue more standby letters of credit. In this view, capital and standby letters of credit are then complementary decisions.

On the other hand, the ability to issue standby letters of credit may depend on other aspects of the bank's overall safety and soundness besides equity capital, such as asset quality, liability mix, and absolute size. A bank will not need to hold as much capital if it is viewed as sufficiently sound to issue standby letters of credit. Thus, the relationship between outstanding standby letters of credit and capital could be negative. If this is the true relationship, it runs contrary to the proposal by the Federal Reserve that banks should hold additional capital against their standby letters of credit.

This section examines the evidence on whether or not banks explicitly increase their primary capital to reflect the potential risk exposure from standby letter of credit activity. To accurately estimate the interrelationship, Koppenhaver and Stover [1987] developed a simultaneous equation model to capture the joint decision process for bank standby letter of credit issuance and primary capital. Starting with the data set utilized above, all banks that did not issue standby letters of credit were dropped, leaving 459 institutions. The standby letter of credit equation in the simultaneous system employs the same explanatory variables as in Table 3. The primary capital equation uses a subset of these variables plus the ratio of cash to total assets (a liquidity measure), the ratio of U.S. Treasury securities held to total

Table 2
Summary statistics and definitions of variables for banks with assets greater than $500 million*
(N=459)

Variables	Mean	Standard deviation	Expected sign	Definitions
1. STANDBY	0.0285	0.0303	na	Net standbys outstanding/Total assets
2. CAPITAL	0.0714	0.0179	?	Primary capital/Total assets
3. SIZE	7.4182	1.0273	+	Logarithm of total assets/1,000,000
4. INDEX	0.3033	0.0854	−	Sum of squared shares of ten loan categories
5. GAP	−0.0149	0.0944	+	One year maturity gap/Total assets
6. BHC	0.9412	0.2356	+	= 1 if affiliated, = 0 otherwise
7. PURCH	0.2435	0.1377	+	Short-term borrowings, foreign deposits, and large CDs/Total assets
8. RESERVES	0.0404	0.0078	+	Required reserves/Total assets
9. LLOSS	0.0079	0.0030	+	Loan loan reserves/Total assets
10. BINDING	0.0588	0.2356	+	= 1 if CAPITAL < 5.5%, = 0 otherwise
11. FDIC	0.0149	0.0747	+	Insured deposits/Total assets if CAPITAL < 5.5%. = 0 otherwise
12. CR3	0.7437	0.1894	−	Three-firm share of total deposits in county
13. CNSTRL	0.0395	0.0421	?	Construction loans/Total assets
14. MUNI	0.0830	0.0437	?	Municipal loans and securities/Total assets

*For those banks that reported outstanding standby letters of credit.
SOURCE: Report of Condition and Income, June 1985.

assets (a measure of the riskiness of the investment portfolio), and the return on assets (a measure affecting necessary capital levels).

The estimated results reveal that large banks, especially those that are affiliated with bank holding companies and/or operating in competitive deposit markets, tend to issue more standby letters of credit and hold less capital than small, independent banks with highly concentrated deposit markets. Relative to the results in Table 3, the level of standby letter of credit issuance is found to be inversely related to the required reserves held by the bank. While required reserves may be an important factor in the decision to enter the standby letter of credit market, the volume of outstanding standbys does not increase with the reserve requirement burden. Increased loan loss reserves, holdings of U.S. government securities, and return on assets are also associated with higher capital ratios, on average.

Most importantly, the results for the endogenous variables (STANDBY and CAPITAL in Table 2) suggest that bank capital is recognized in the standby letter of credit market as an indicator of bank quality, and that a significant and direct determinant of primary capital is the level of outstanding standby letters of credit. A one-standard-deviation increase in the mean capital ratio, for this sample of banks, increases the ratio of standbys outstanding to assets by 0.012. On the other hand, a one-standard-deviation increase in the mean ratio of standbys to assets increases the capital ratio by 0.02. This latter result has implications for the public policy debate surrounding bank off balance sheet activities and the risks they embody, as discussed below.

Table 3
Participation in the standby letter of credit market
(N=490)

Independent variable	Estimate	STD error	Marginal effect
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
BINDING	−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
CONSTANT	−7.813*	3.309	−0.463
R-squared	0.153		

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

Bank equity markets and standbys. As yet another way of investigating the effect that credit enhancement services have on the riskiness of banking organizations, this section reports some results of research on how bank equity investors view the issuance of standby letters of credit. Brewer *et al.* [1986] use a method of analysis based on a version of the Capital Asset Pricing Model (CAPM) that estimates the systematic risk associated with various components of a bank's income statement, balance sheet, and off balance sheet activities. In particular, a time-series, cross-sectional model is formulated to capture the relationship between banking organization returns, market risk measures, and the characteristics of a banking firm's balance sheet and off balance sheet activities. They also investigate a multifactor version of the CAPM in which the second factor is a bank industry returns measure. By holding the overall stock market returns constant, the systematic risk associated with the banking industry alone is estimated.[10]

The technique used assumes that risk premiums on bank stocks are a linear function of the overall market risk premium and the industry risk premium. To incorporate the balance sheet and off balance sheet characteristics of the banking organizations, the market and industry risk measures are further assumed to depend on balance sheet, off balance sheet, and income statement items. Therefore, banking organization sensitivity to variations in market and industry returns can vary with cross-sectional differences in assets and liabilities, off balance sheet guarantee issuance, and income sources. Brewer *et al.* not only investigates standby letters of credit, as an off balance sheet item, but also loan commitments and commercial letters of credit.

The financial data used in this study comes from the semiannual Y-6 and Y-9 reports filed with the Federal Reserve System by large bank holding companies for the 1983-1984 period. They provide both balance sheet and income statement items on a consolidated firm basis, as well as for the parent company only. The off balance sheet items were derived from the Reports of Condition by aggregating the off balance sheet items for all banks owned by each of 63 holding companies as of the semi-annual dates. The stock market portfolio employed in this study was a value-weighted market index containing all stocks traded on the New York Stock Exchange, the American Stock Exchange, and the over-the-counter market. To construct a banking industry stock market index, 68 bank holding companies were used and the aggregate market value of each bank holding company stock was computed each day by multiplying the dividend-adjusted share price by the number of common stock shares outstanding.

The results of the ordinary least squares regression on the complete model yield two interesting insights. First, standby letters of credit are a significant determinant of the market risk premium and are viewed favorably by well-diversified investors. For example, it is estimated that a one percent increase in the ratio of standby letters of credit to total assets lowers the average required risk premium on bank equities by 3 basis points. Second, the estimated signs of the balance sheet and off balance sheet items, when interacting with the bank industry index, are roughly consistent with the idea that bank assets and off balance sheet guarantees increase risk and bank liabilities decrease risk. A bank regulator, or an investor concerned about risk-taking and holding a portfolio of bank stocks only, might then fa-

vor the recently proposed risk-based capital rule because it is strictly asset-based and explicitly taxes off balance sheet guarantees. Unfortunately, those holding a more diversified portfolio of assets would tend to oppose such a regulation, given the overall marginal effect of standbys on the required risk premium.

Conclusion

The purpose of this article has been to investigate a credit enhancement facility offered by banks—the issuance of standby letters of credit. It was argued that such activities have value as a banking service, even in the absence of regulation, and have grown rapidly in response to customer needs and bank willingness to supply these services. Drawing on empirical research from three different sources it was argued that 1) the decision to participate in the standby letter of credit market depends primarily on the regulatory incentives to engage in off balance sheet activities, especially funding balance sheet assets with reserveable deposits; 2) on average, banks hold more primary capital when outstanding standby letters of credit increase; and 3) the issuance of standby letters of credit is priced as a risk-reducing bank activity by well-diversified investors, although not by those investors who hold bank stock-only portfolios.

Public policy concerning bank risk management should be based on an understanding of how bank risk is related to off balance sheet decisions. Recently, the Federal Reserve has proposed risk-based capital guidelines in which banks must hold a minimum level of capital (roughly six percent) against a proportion of their outstanding standby letters of credit.[11] The assumption underlying this proposal is: Because the current minimum capital standards exclude off balance sheet items, bank capital decisions do not offer a prudent buffer for an organization's off balance sheet risk exposure. Federal banking agencies are concerned that banks are bolstering profits and taking risks by shifting out of liquid assets and secondary reserves and increasing their off balance sheet activity. The ability to earn non-interest income while avoiding capital requirements makes standby letters of credit an attractive alternative to booking balance sheet assets.

Will a risk-based capital rule that includes off balance sheet guarantees, as recently proposed, have a significant effect on standby letter of credit decisions? The results presented here suggest it may not. This article shows that other regulatory-based incentives are more important than binding capital requirements in determining the supply of off balance sheet guarantees. It also suggests that large banks may be already taking outstanding standby letters of credit into account when making capital decisions. 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. This justification is also borne out by the analysis of bank equity returns when one views the FDIC as an undiversified investor in the value of bank assets.

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[1] See Diamond and Dybvig [1986] for further discussion of why banks exist.

[2] 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 borrower and lender demands for access to an accounting system of exchange and managed portfolios. Banks earn fees for 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.

[3] 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.

[4] 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.

[5] See Galai and Masulis [1976] and Weinstein [1983]. This idea has been used to show the relationship between systematic risk in corporate bonds and the characteristics of the bond, the issuer, and the capital markets.

[6] A guarantee could then be considered an option on an option, or a compound option. Another example of a compound option is a stock option because the stock share itself can be considered a call option on the value of the firm.

[7] In other studies Goldberg and Lloyd-Davies [1985] found an inconsistent relationship between capital and letter of credit activity; a positive relationship existed only for small banks. Benveniste and Berger [1986] estimate that banks with low capital ratios are more likely to issue standby letters of credit but, given that they do issue these instruments, capital ratios and standby letter of credit volume are positively related. See also Bennett [1986].

[8] See Koppenhaver [1987] for further elaboration.

[9] Because the predicted dependent variable 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 an off balance sheet activity P_j 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.

[10] A two-factor model of asset returns can be justified on the grounds that the market portfolio does not capture all of the determinants of individual returns. That is, the single-factor model is misspecified. Yet another candidate for a explanatory variable is an interest rate factor that measures the change in investment opportunities over time. Since the time series aspects of the data set used here are not extensive, an interest rate factor was not used.

[11] On January 20, 1986, the Board of Governors of the Federal Reserve System proposed rules for implementing risk-based capital guidelines. In the guidelines, revised March 6, 1987, supplemental capital ratios are to be calculated that explicitly include standby and commercial letters of credit, and loan commitments. Standby letters of credit are either given a weighting of 50% or 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.

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