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AN EMPIRICAL TEST OF THE RELATIONSHIP BETWEEN THE INTEREST RATE AND OTHER COMMERCIAL LENDING VARIABLES: A CONTINGENT CLAIMS APPROACH

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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CHAPTER I

INTRODUCTION

Commercial banks are financial intermediaries that acquire funds by creating claims on themselves in the form of deposits and subsequently provide funds to borrowers. Commercial banking has provided the link between depositors and borrowers that has fostered economic development and growth. Depositors benefit by being able to securely accumulate wealth and borrowers benefit by being able to acquire investment capital.

Commercial banks fulfill the functions of (1) enabling investors to acquire needed capital, (2) reducing the risk of accumulating wealth, and (3) providing liquid assets for depositors. Of these functions, creating credit through loans is the most important activity.[1] The focus of all other commercial banking activity revolves around lending

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[1]Oliver G. Woods, Commercial Banking: Practice and Policy (New York: D. Van Nostrand, 1978), p. 6.

funds and serving borrowers since the major source of commercial bank income is lending.[2]

The terms of lending - which include such factors as the interest rate, compensating balance, collateral, loan size, and maturity date - depend on the customer bank relationship. From the bank's perspective, the more favorable the relationship, the higher the profitability of the customer and the more favorable the borrower's terms of lending. When loans are extended, commercial banks are concerned with the financial stability of the business and, in effect, become a partner in the business since financial difficulties for the business impact the bank. The relationship is symbiotic with the commercial bank providing a variety of services that enable borrowers to improve efficiency and profitability and the borrower providing the bank with a source of revenue.

Various models have been used to value lending decisions, such as the net present value and marginal cost-marginal revenue models, but these models have been plagued with unrealistic assumptions and nebulous data requirements. The approach tested in this dissertation is a new approach

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[2]Donald R. Hodgman, Commercial Bank Loan and Investment Policy (Champaign: Bureau of Economic and Business Research, University of Illinois, 1963), p. 97.

that circumvents some of the past problems in application.

The contingent claims approach views loan value as being dependent on the characteristics of the terms of lending. From the banks perspective, more favorable lending terms imply more valuable loans and more unfavorable lending terms imply less valuable loans. This new approach has the potential advantage of not requiring estimates of loan variables such as cash flows and cost of capital, but relies on terms of lending that are directly observable. This study is a test of the usefulness of this approach.

Summary of the Dissertation

To provide an orientation for the reader, each chapter is reviewed at this point. Chapter II is a review of the relevant literature pertaining to the analysis of institutional lending. A description of the categories of loans is followed by a discussion of how the customer-bank relationship affects loan policies and lending decisions. Empirical evidence supporting the relationship among lending terms provides a background for the development of specific hypotheses in Chapter IV. The review of the empirical studies include a Congressional committee report on financing small business, a research project by Jacobs, and articles by Hester and by Boltz and Campbell.

The development of contingent claims theory is covered in Chapter III. With contingent claims, options were initially used as a hedge against risk in the 1800's followed by the quantitative development of models in the 1900's. The Black-Scholes model is a widely accepted options valuation model that determines the equilibrium value of stock option. This model has subsequently been extended to allow a relaxation of assumptions and has been applied to value contingent claims other than options. Contingent claims analysis is further extended to include analyzing lending decisions.

The research hypotheses developed in Chapter IV integrate previous empirical studies covered in Chapter II with contingent claims theory developed in Chapter III. Contingent claims relationships should be consistent with previously established relationships, but if inconsistencies exist the rationale should be evident from contingent claims theory.

To test the research hypotheses, data from the Federal Reserve's Survey of Terms of Lending is used in a linear regression to test the relationship between commitment status, logarithm of loan size, maturity date, demand status, collateral, and floating interest rate and the effec-

tive interest rate using approximately 21,500 loan observations. The results of the regression analysis are presented.

The conclusions that can be drawn from the regression analysis are discussed in Chapter V. The results indicate that commercial bank loans can, in general, be analyzed in a contingent claims framework. However, it also clearly shows that bank-customer relationships are more comprehensive than can be uncovered from the data in this study.

Scope and Limitations

The purpose of this dissertation is to provide empirical tests of the contingent claims approach to loan analysis. Tests of hypotheses based on contingent claims theory relating to commercial loan interest rates to other specific loan characteristics are used to determine if lending terms are established as would be predicted with contingent claims analysis.

CHAPTER II

REVIEW OF THE RELEVANT LITERATURE

The purpose of this chapter is to review the relevant literature pertaining to institutional lending, the terms of lending, and the associated problems of analyzing loan applicants. After discussing loan analysis and previous research on the terms of lending, the problems associated with traditional loan analysis are presented.

Analysis of Commercial Bank Lending Decisions

Commercial banks, as financial institutions, serve the role of providing funds to private and public sectors to influence economic growth and development. While essentially a service industry, the three major aspects of commercial banking activity, providing for deposits, loans, and other services, are integrated into a bank-customer relationship that both serves the customer's needs and maximizes the commercial bank's long run profit.

Since the primary function of commercial banking is providing funds to customers as loans, all other banking activities are subordinated to the lending activity and serve the goals of the lending policy. The deposit and investment policies are designed to provide lendable funds when needed and other services offered to customers must be designed to attract depositors and borrowers.

Commercial banks are the major suppliers of funds to commercial and industrial firms. During the period February 4-9, 1980, the Federal Reserve reported that 21,597 commercial and industrial loans totaling $1,865,265,000 were extended. The relative importance of this supply of funds varies according to firm size with 19,890 of the above loans being less than $100,000 in size and 256 of the above loans being more than $1,000,000 in size.[1] Commercial bank lending is the largest source of funds, most important source of financial advice, and in some instances, the only source of debt financing available for small businesses. Although large businesses have more debt financing flexibility, commercial banks still provide them with a major source of debt financing and financial advice.

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[1]Federal Reserve Bulletin 66 (April, 1980): A-26.

Commercial Loans

Commercial loans may be secured or unsecured depending on whether collateral is required. Commercial banks and borrowers establish relationships involving loan packages that contain both price and non-price lending terms.

Secured Loans

Secured business loans are extended contingent upon collateral; such as accounts receivables, inventories, real estate, stock, or bonds; being pledged to guarantee loan payment. The collateral acts to reduce risk since in the event of default, the bank may take possession of the collateral.

Collateral on loans may be used to transfer credit risk from the bank to either the borrower or a third party, such as a cosigner, since the risk of default on the principal payment and the interest payment decrease. Other reasons to require collateral are because collateral is readily available, traditionally required, and complete and accurate credit information is unavailable.[2]

Unsecured Loans

Unsecured loans, noncollateralized short term loans, are extended to firms having the highest creditworthiness,

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[2]Oliver G. Wood, Jr., Commercial Banking: Practice and Policy (New York: D. Van Nostrand, 1978), p. 203.

typically as lines of credit and revolving credit agreements. Unsecured commercial loans are extended primarily to insure businesses of having adequate financial resources during peak seasonal demand. As business activity increases to satisfy seasonal demand, increases in working capital requirements may be financed by unsecured loans that are repaid by the resulting cash flow.[3]

Loan Pricing

Tight money and historically high and volatile interest rates experienced during the 1970's caused commercial banks to re-evaluate pricing policies. The terms of loan packages are affected by the relationship between the bank and the customer.

Loan Pricing Policies

Commercial bank loans are priced according to the riskiness of the loan, time to maturity, and market competition. An increase in risk and time to maturity and a decrease in competition exert an upward pressure on prices, ceteris paribus, while a decrease in risk and time to maturity and an increase in competition exert a downward pressure on prices.

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[3]John M. Mason, Financial Management of Commercial Banks (Boston: Warren, Gorham and Lamont, 1979), pp. 258-260.

Commercial banks offer customers a variety of services ranging from the traditional aspects of lending and deposits to other services such as the management of and/or advice concerning a customer's investment portfolio and providing for lines of credit. The pricing policy of a commercial bank depends on the bank-customer relationship and which aspects of the relationship, deposit, loans, or other services, the customer uses.[5] Often the collection of services which comprises a specific customer relationship is sold together with some services being a prerequisite for other services in a tie-in sale. For example, a deposit balance may be a prerequisite for a line of credit.[6]

Money market conditions during the 1970's led to a realization that loan prices should be measured according

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[4]Ibid., pp. 261-62.

[5]Donald R. Hodgman, Commercial Bank Loan and Investment Policy (Champaigh: Bureau of Economic and Business Research, University of Illinois, 1963), pp. 99-101.

[6]Neil B. Murphy, A Study of Wholesale Banking Behavior (Boston: Federal Reserve Bank of Boston, 1969), pp. 49-52.

to the total yield on the loan. The use of total yield recognized that banks should be compensated for maintaining sufficient liquidity to service short term agreements and for providing funds as loans. Actual measurement of the total yield is a function of the loan size, interest rate, compensating balance, and fees, which are all interchangeable in the pricing structure.[7]

Empirical Evidence

Empirical studies confirm that loan pricing is a function of interest rates, compensating balances, and fees. The trade-off between the variables along with a bank's pricing policy is affected by the customer's long term relationship with the bank.

Financing Small Business

The relationship between the size of a loan and the interest rate charged was extensively researched in 1958 in a report, Financing Small Business, prepared by the Federal Reserve System. Although the focus of the study was on the extent to which loan size is related to default risk, the conclusions are enlightening as to how the size of loans

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[7]William H. Baughn and Charles E. Walker, eds., The Bankers' Handbook (Homewood, Illinois: Dow Jones-Irwin, 1978), p. 619.

affects interest rates.

The study compared loans extended to small firms with loans extended to larger firms under the presumption that loans to small firms will on the average be smaller than loans to large firms. Comparison of default rates between small and large loans showed that small firms have more financial difficulty, worse financial ratios, even during periods of economic expansion, and higher default rates. Credit agencies recognize this trend and generally give small firms worse credit ratings than large firms.

The available evidence indicated that the credit risk on loans to small firms was higher than the credit risk for larger firms. However higher interest rates were charged on small loans than on large loans to compensate for more credit risk and to pay for a higher cost per dollar of loan on small loans.[8]

Jacobs' Study

Using linear regression analysis to test the relationship between bank market structure and prices charged to customers, two models were developed to determine the impact

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[8]U.S. Congress, Report to the Committees on Banking and Currency and the Select Committees on Small Business, Financing and Small Business by the Federal Reserve System, 85th Congress, 2a sess., April 11, 1958.

of the services provided to customers and market structure on interest rates and deposit balances. While recognizing that banks are also compensated through fees, a regression on fees was not included since fees are relatively unimportant as a source of bank income.

The regression analysis was performed on all business loans in this sample, noncollateralized business loans, and business loans 100 percent or more collateralized. Using the interest rate as the dependent variable, the regression on all customers indicated that loan size, bank size, branching restrictions, business size, population increase, total bank deposits in SMSA, concentration of deposits, mean deposit size, deposit fluctuations, length of lending arrangement, time to maturity, and account activity significantly affects the interest rate on loans. This result supports interest rates as being determined through package arrangements that are described by the customer relationship with the bank and the bank market structure.[9]

The differences between noncollateralized and collateralized loans indicated that credit risk is independent

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[9]Donald P. Jacobs, Business Loan Costs and Bank Market Structure: An Empirical Estimate of Their Relations (New York: National Bureau of Economic Research, 1971), p. 59.

of loan size for collateralized loans, but important for establishing interest rates for uncollateralized loans. Additionally, the long term relationship between banks and customers receiving collateralized loans is less likely to be profitable than with customers receiving noncollateralized loans.[10]

Using mean deposit size as the dependent variable, loan size, business size, bank size, account activity, time to maturity, and interest rates were found to be important determinates of the mean deposit size when testing all business loans. Differences between the noncollateralized and 100 percent or more collateralized loans indicated that business size, time to maturity, and interest rate were important determinants of deposit size for noncollateralized loans. These results imply that the relationship between banks and customers receiving noncollateralized loans is more comprehensive and the pricing structure encompasses greater interdependence of the loan terms.[11]

Hester Studies

The results of (1) a survey on a small number of large banks conducted in 1955 by the Board of Governors of the Federal Reserve System, and (2) a survey in 1972 by

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[10]Ibid., p. 32.

[11]Ibid., pp. 44-55.

the Federal Reserve System were analyzed to determine how the relationship between the bank and customer affects the terms of lending.

Bank and Federal Reserve System Survey of 1955. Regression analysis and subsequent canonical correlation analysis was performed on the data to develop statistical support for a loan offer function. The regression analysis on the commercial bank data indicated that the interest rate will increase, maturity will decrease, loan amount will decrease, and the likelihood of loan collateral will increase if:

(1) Average losses have increased over the period three to five years prior to the loan or average net profits have increased over the period three to five years prior to the loan, ceteris paribus.

(2) The firm's average deposit balance declined during the year prior to loan extension, ceteris paribus.

(3) The firm's current ratio declined at the end of the fiscal year immediately prior to loan extension, ceterus paribus.

(4) The length of time that the firm continuously had maintained deposits at the lending bank declined, ceteris paribus.

(5) The prime interest rate had declined.

(6) The ratio of average losses over the period three to five years prior to the loan to total assets at the end of the fiscal year immediately prior to the loan increased, or the ratio of

> average net profits over the period three to five years prior to the loan to total assets at the end of the fiscal year immediately prior to the loan decreased.[12]

The regression analysis on the Federal Reserve System survey investigated the effects of specific borrower and bank characteristics on lending terms and showed that

> (1) An increase in total assets of a firm will tend to decrease the interest rate, increase the maturity, increase the loan size, and decrease the likelihood of the loan being collateralized, ceteris paribus. Banks tend to associate business size with default risk.
>
> (2) An increase in the bank size will tend to increase the interest rate and the likelihood of the loan being collateralized, ceteris paribus.
>
> (3) Borrowers located in the same city as lenders tend to have lower interest rates, longer maturities, and a smaller likelihood of the loan being collateralized.[13]

Results from the canonical correlation analysis, which was performed on both the bank and Federal Reserve System data, provided insight into the substituability between interest rates, loan sizes, and maturity dates. The trade-off between these lending terms evident from the analysis is that increases in maturity tend to be off-set

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[12]Donald D. Hester, "Customer Relationships and Terms of Loans: Evidence From a Pilot Survey," Journal of Money, Banking, and Credit 2 (August, 1979), pp. 352-55.

[13]Ibid., pp. 290-10.

by decreases in the loan sizes and increases in interest rates. Increases in the loan size tend to be off-set by increases in the interest rates, and decreases in the maturity tend to be off-set by increases in loan sizes and decreases in interest rates.[14]

Federal Reserve System Survey of 1972. In 1972 the Federal Reserve Board collected data on the terms of bank lending for 1,072 loans made by 62 banks. Regression analysis was used to investigate the relationship between the bank and the customer's financial and banking relationship characteristics. The regression analysis showed that:

(1) Lower interest rates and larger loans can be expected with larger borrower deposits.

(2) Loans made under commitments can be expected to have lower interest rates.

(3) Customers previously receiving loans can be expected to receive lower interest rates.

(4) Customers previously receiving loans can be expected to be given shorter maturities.

(5) New loans to previously highly profitable customers can be expected to have higher interest rates, longer maturities, and larger amounts.

(6) Firms having higher current asset to total asset ratios can be expected to receive lower interest rates.

(7) Firms receiving collateralized loans are less

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[14]Ibid., pp. 211-13.

likely to have a large amount of working capital.

(8) Larger firms can be expected to receive lower interest rates, larger loans, and fewer collateralized loans.

(9) Firms with high depreciation costs can be expected to receive higher interest rates and longer maturities.

In general business loans tend to be part of an overall long term relationship between banks and their customers. The lending and loan size decisions are independent of interest rates and collateral requirements, which are used to compensate for credit risk. Finally, the larger and/or more financially secure firms are able to obtain more favorable credit terms in the form of lower interest rates, larger loans, and a lower frequency of collateral due to the reduced credit risk.[15]

Survey of Terms of Bank Lending

In a report on the 1977 Quarterly Survey of Terms of Bank Lending conducted by the Federal Reserve System, Boltz and Campbell examined the relationship between nominal interest rates and (1) fixed versus floating interest rates, (2) loan commitments and fees, (3) collateral, and (4) loan size.

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[15]Donald D. Hester, "Customer Relationships and Terms of Loans: Evidence From a Pilot Survey," Journal of Money, Banking and Credit 2 (August, 1979), pp. 352-55.

Fixed Versus Floating Interest Rates. An interest rate that is fixed remains constant throughout the life of the loan, and an interest rate that floats is allowed to vary throughout the life of the loan in accordance with a predetermined economic indicator such as the prime rate.

The pricing difference between fixed and floating interest rates is a function of the yield curve. If short term rates are expected to increase, a premium should be paid by borrowers for fixed rate contracts, ceteris paribus, to obtain an interest rate that is expected to be below the market yield in the future. If short term rates are expected to decrease, a premium should be paid by the borrower for floating rate contracts, ceteris paribus, to avoid having an interest rate that is expected to be above the market yield in the future.[16]

In the survey of terms of lending, major regional banks charged premiums for fixed rate contracts. This coincides with what would have been predicted since the yield curve during 1977 was upward sloping. However, no clear relationship between fixed rate loan contracts and premiums could be identified for the large money center banks. The

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[16]Board of Governors of Federal Reserve System, Innovations in Bank Loan Contracting: Recent Evidence, by Paul Boltz and Tim S. Campbell, 1979, p. 7.

ambiguity in the results may be attributable to risk differences between borrowers and other unknown differences in the loan contracts.[17]

Loan Commitments and Commitment Fees. A loan commitment is an agreement by a bank to lend money to a borrower in the future and the commitment fee is the explicit cost to the customer of the bank's service. Loan commitments may be fixed rate, where the interest rate is predetermined, or variable rate, where the interest rate varies with the prime rate. Commitments are used by banks to establish long-term relationships with customers and by borrowers to secure future financing.

The Survey of Bank Lending Terms' Results indicated that customers receiving loans at interest rates below or high above the prime rate are less likely to have a loan commitment in the contractual agreement than customers receiving loans at or moderately above the prime rate. Although the reason for this occurrence is unclear, suggested possibilities are that customers receiving below the prime rate loans are high quality, low risk and do not need a commitment covenant. Customers receiving loans at interest rates high above the prime rate possibly cannot afford the cost of the commitment.

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[17] Ibid., p. 27-28.

Commitment fees were found to be seldom used for short-term loans, but more frequently used for long-term loans. Since fees may be used in lieu of compensating balances, requiring fees on long-term loans may reflect an effort to avoid reducing a firm's long-term liquidity while obtaining revenue for the bank.[18]

Collateral. Collateral is an asset the debtor agrees to forfeit in the event of loan default. Used to make debt obligations self-enforcing through the threat of repossession upon default, collateral has implicit costs, which include the requirement of additional contractual stipulations and the debtor's loss of ownership rights or loss of title and possession of collateral while the debt is outstanding.[19] The logic and conditions for the use of collateral may be stated as

> "...if collateral is to be used, default risk must be positive. Since default is relevant to the creditor only if it is costly, the use of collateral implies the existence of collection costs: it must be costly for the creditor to gain ownership of the debtor's assets and these costs must be lower if a security agreement is in force at

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[18]Ibid., pp. 29-30.

[19]Daniel K. Benjamin, "The Use of Collateral to Enforce Debt Contracts," Economic Inquiry 16 (July, 1973), p. 334.

> the time of default. The existence of a security agreement, however, implies some attenuation of the debtor's rights to the collateral during the debt contract. An alternative to the use of an asset as collateral is its sale to obtain the requisite funds. Thus, if an asset is to be used as collateral, its sale must be costly and these costs must be greater than the foregone value of the rights attenuated by the security agreement.[20]

In this sense two types of collateral that can be identified may be referred to as tangible and intangible. Tangible collateral is an asset that can be physically repossessed and sold in a secondary market. Ceteris paribus, loan amounts greater than the net selling price of the collateral in the secondary market can be unprofitable since borrowers in effect can sell the collateral to the creditor by defaulting on the loans. Ceteris paribus, loan amounts less than the net selling price will be repaid. In general, when the loan balance is less than the net selling price of the collateral the choice of whether to repay the loan will have a value and the default rate will be zero. Loan boundaries will be $P_n/(1 + r)$, where r is the opportunity rate, and P_n, which is the value of the collateral to the borrower. The interest rate of loans less than $P_n/(1 + r)$ will be r and will increase as the loan size approaches P_n due to the increase default risk.

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[20] Ibid., p. 335.

Intangible collateral may also be a service, such as electrical service, that has value to the debtor, but no realizeable or market value to the creditor. Credit ratings, for example, are not tradeable and have no potential monetary gain to the creditor in the event of default, but serve as an incentive for a debtor to repay loans. The loan boundaries will be $P_n/(1 + r)$ and P' where P_n now is the value of the intangible collateral to the borrower. As the loan size increases above P'n/(1 + r), interest rate will increase since the risk of default is positive and creditors will require a default premium as compensation for the increased risk.[21]

The results of the Survey of Terms of Bank Lending may be interpreted with respect to both tangible and intangible collateral. In the survey, the majority of short term loans were unsecured, implying that creditors perceived that the loss by firms of something intangible was great enough to insure repayment on short-term debts. Collateral occurred more frequently with term loans, implying that loss by firms of intangible assets was not great enough to sufficiently reduce credit risk. In general, collateralization was used less frequently by more creditworthy customers, but was accompanied by higher interest rates.[22]

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[21]Ibid., pp. 336-37.

[22]Board of Governors of Federal Reserve System, pp. 36-37.

Loan Size. An inverse relationship was evident between loan size and interest rates with larger loans being priced at prime or below prime and small loans being priced above prime. These results imply that larger loans are extended to more creditworthy customers and that the high cost of servicing small loans is passed on to the borrower.[23]

Loan Profitability Model

As part of the study to identify the relationship between loan costs and bank market structure, Jacobs developed a multiperiod customer profitability model. Using the net present value method of analyzing loan requests, wealth maximization through maximization of discounted long-run profits remained the goal of the bank.

The multiperiod model for a single customer was expressed as:

$$NPV = \sum_{j=1}^{T} \frac{L_t(R_{tL} - R_{tA} - R_{tR}) - C_{tL} + D_t\ (1-rr)\ R_A - Y_tA + \sum_{j=1}^{N} S_{tj}}{(1 + K)^t}$$

where:

NPV = Net present value of stream of expected profits

L_t = Loan balance during period t

R_{tL} = Loan interest rate during period t

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[23] Ibid., p 32.

R_{tA} = Banks cost of acquiring a dollar of lendable funds during period t

R_{tR} = Probability of default during period t

C_{tL} = Cost of extending loan, including credit search and handling costs

D_t = Customers mean deposit balance during period t

rr = Reserve requirement on demand deposits during period t

R_t = Value of a dollar of demand deposit during period t

Y_t = Change in assets average yield during period t

A = Total bank assets during period t

$\sum_{j=1}^{N} S_{tj}$ = Net fees from services to customer j during period t

K = Discount factor

$L_i(R_{tL}-R_A-R_{tR})$ = Net revenue expected from loan

$D_t(1-rr)R_A$ = Value received from customers deposit balance

Y_tA = Change in revenue from banks assets

As was previously discussed, banks receive compensation from interest income, deposit balances, and fees. Each of these pricing mechanisms is represented in the model along with the off-setting costs of providing the loan. Net income interest income, $L_t(R_{tL}-R_A-R_{tR})$, is off-set by loan extension costs, C_{tL}; the value of deposit balances, $D_t(1-rr)R_{tA}$ is off-set by the change in revenue from the

bank's assets, $Y_t A$, which includes the bank's cost of liquidity necessary to satisfy loan commitments; and net fee revenue, $\sum_{j=1}^{N} S_{tj}$, for non-loan services.[24]

As with other NPV analyses, the decision rule is to extend credit to the customer if the NPV > 0 and reject the credit request if the NPV < 0. The model incorporates a comprehensive bank-customer relationship including multiple facets of bank compensation and customer services. The model implies that customers do not have to be profitable in each period, but must be profitable over the long term for a bank to service their needs.

Problems with Conventional Models

Problems inherent in traditional loan analysis are identifying the applicant's payment pattern, identifying the relevant cash flows, and determining the lending institution's cost of capital.

Identifying Payment Pattern

The applicant's payment pattern is a relevant factor in loan analysis since the earlier a payment is received the sooner the lending institution can reinvest the funds. Applicants who make payments on time may be rewarded with

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[24] Jacobs, pp. 10-14.

more favorable lending terms while poorer quality applicants may be given more restrictive lending terms to compensate the lending institution the increased credit risk exposure.

Loan valuation typically does not address the problem of quantitatively assigning accurate patterns of payment to account for each applicant's characteristics although these characteristics may be useful for estimating the promptness of loan payments.[25] Although probabilities of bad debts and general risk categories are used, a further useful refinement that adjusts for the probabilities of payments has not been developed.

Identifying Relevant Cash Flows

The amount of investment in loans by a lending institutions is heavily influenced by the lending terms, with lenient lending terms resulting in a higher investment in loans and restrictive lending terms resulting in a smaller investment in loans. Altering policy toward any of the lending terms will change the level of investment and the pattern of cash flows from the loan portfolio. Although the

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[25] Credit scoring has successfully been used to determine the quality of consumer loan applicants, but has rarely been used to analyze business loan applications due to the more complex terms of lending.

incremental profitability of a policy change is dependent on the incremental cash flow pattern resulting from the change, identifying the relevant cash flows and estimating a reliable pattern is imprecise.[26]

The conventional approach is to compare the incremental revenues resulting from the policy change with the incremental expenses to determine the marginal profitability of the change. The marginal profitability is formulated as

$$\text{Marginal Profitability} = \text{Incremental Contribution} - \text{Carrying Cost of Incremental Investment in Loans} - \text{Incremental Bad Debt Expense}$$

Other costs are not included since they are considered insignificant.[27]

This approach has not, however, been received without criticism. Changes in policy variables that lengthen the maturity date may cause an increase in explicit and im-

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[26]Harlan R. Patterson, "New Life in the Management of Corporate Receivables," Credit and Financial Management, 72 (February 1970): 17.

[27]Joseph Atkins and Yong H. Kim, "Comment and Correction: Opportunity Cost in the Evaluation of Investment in Accounts Receivables," Financial Management, 6 (Winter 1977): 72.

plicit costs. The explicit cost is the cost of the incremental investment in the loans. While the conventional method includes the calculation for the explicit cost of a policy change, the implicit cost calculation is omitted.[28]

Cost of Capital

An accurate estimation of the cost of capital is an important variable affecting the lending institution's optimal mix of assets and investments. An inaccurate specification of the cost of capital may lead to incorrect financial decisions resulting in a decrease in shareholder wealth. Traditional methods of measuring the cost of capital, however, have relied on the measurement of nebulous concepts and have used crude estimation methods. In the banking literature the cost of capital has received only cursory attention.

The cost of capital is the hurdle rate, or minimum rate, that new investments must earn for the lending institution to be profitable and keep shareholder wealth constant. In financial literature both the weighted average cost of capital and the risk adjusted cost of capital have been

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[28]Tirlochan S. Walia, "Explicit and Implicit Cost of Changes in the Level of Accounts Receivable and the Credit Policy Decision of the Firm," Financial Management (Winter 1977): 77.

suggested as acceptable methods for determining an appropriate hurdle rate. In some cases both approaches yield the same result.[29]

Two commonly used methods for estimating the cost of a lending institution's funds are the average cost and the marginal cost approaches. Using the average cost of funds approach, all interest charges on liabilities are summed and the total divided by the total funds raised. The appeal of this approach lies in its simplicity, but the average cost of funds approach has been criticized since historical costs are not reflective of current costs during periods of volatile interest rates. When the average cost understates current funds acquisition costs and when interest rates are decreasing the average cost overstates funds acquisition costs.[30]

A type of weighted average cost of capital, the marginal cost of capital is the weighted cost of borrowed and equity funds. The cost of borrowed funds is the current annual borrowing rate adjusted for reserve requirements and

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[29]Glenn V. Henderson, Jr., "In Defense of the Weighted Average Cost of Capital," Financial Management, VIII (Autumn, 1979): 58.

[30]Ronald D. Watson, "The Marginal Cost of Funds Concept in Banking," Journal of Banking Research 8 (Autumn, 1977), 138-39.

float and the cost of equity is the current required return on shareholder investment. Since all costs are market determined, this method reflects current rates in the short term market, but has been criticized for not including all relevant costs, not considering alternative sources of funds, and not recognizing the difficulty of estimating the cost of equity.[31]

An alternative marginal cost calculation, the real marginal cost recognizes the importance of including all relevant costs, leverage risk adjustments, market determined equity costs for both new and old equity holders, and value maximization criterion in decision making. The real marginal cost calculation is a summation of the explicit and the implicit costs of each source of funds. The explicit cost of funds is the dollar cost of acquiring and servicing acquired funds and includes applicable cash interest and dividend payments, servicing costs, acquisition costs, reserve requirements and float, and deposit insurance. The implicit cost of funds is the change in capital costs caused by changes in leverage risk.[32]

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[31]Ibid., p. 139.

[32]Ibid., pp. 140-141.

The marginal cost of funds has been shown to be equal to the real marginal cost of funds plus a risk adjustment which compensates for the difference between the risk of the investment and the average risk of the bank's assets. The marginal cost of capital approach has been shown to be a superior method since determining the risk adjustment in the real marginal cost of capital is imprecise and the adjustment for leverage risk may be conceptually incorrect.[33]

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[33]Edward A. Dyl, "The Marginal Cost of Funds Controversy," Journal of Banking Research 9 (Autumn, 1978), 192.

CHAPTER III

CONTINGENT CLAIMS APPLICATIONS TO COMMERCIAL BANK LOANS

The purposes of this chapter are (1) to review the development of contingent claims theory and (2) to provide a link between contingent claims theory and commercial bank loan analysis that enables the research hypotheses to be developed. The research hypotheses are based on previous empirical commercial bank loan studies and contingent claims theory.

Development of Contingent Claims Theory

Contingent claims theory is an extension of put and call options analysis and views the value of an asset as being dependent on the characteristics of another asset.[1] The succession of proposed models to value options, given

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[1]A call option is an option to purchase shares of stock at a specified price within a specified time period. A put option is an option to sell shares of stock at a specified price within a specified time period. European options can only be exercised at maturity while American options can be exercised anytime during the life of the option.

in Smith,[2] preceded the pathbreaking Black-Scholes model published in 1973, which was subsequently clarified and extended by Merton. Since the development of the Black-Scholes model, significant theoretical advances have been made, but only a few empirical studies have been completed to support contingent claims analysis. Application of contingent claims analysis to loans has been recognized by Black-Scholes,[3] Galai and Masulis,[4] Smith,[5] and Copeland and Weston.[6]

Merton's Option Price Restrictions

Equilibrium price restrictions have been defined by Merton that limit the range of call option prices and have been shown to be consistent with option models. The restrictions, which depend on portfolio dominance, are:

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[2]Clifford W. Smith, "Option Pricing: A Review," Journal of Financial Economics, 3 (January-March, 1976): 15-70.

[3]Fisher Black and Myron Scholes, "The Pricing of Options and Corporate Liabilities," Journal of Political Economy, 81 (May-June, 1973): 649.

[4]Dan Galai and Ronald W. Masulis, "The Option Pricing Model and the Risk Factor of Stock," Journal of Political Economics, 3 (January-February, 1976), 61-70.

[5]Smith, p. 5.

[6]Thomas E. Copeland and J. Fred Weston, Financial Theory and Corporate Policy (Reading, Mass.: Addison-Wesley, 1979), p. 418.

1. "Call prices are non-negative.

2. "At the expiration date, t, the call will be priced at the maximum of either the difference between the stock price and the exercise price, S*-X, or zero.

3. "At any date before the maturity date an American call option must sell for at least the difference between the stock price and the exercise price.

4. "If two American calls differ only as to expiration date, then the one with the longer term to maturity, T_1, must sell for no less than that of the shorter term to maturity, T_2.

5. "An American call must be priced no lower than an identical European call.

6. "If two options differ only in exercise price, then the option with the lower exercise price must sell for a price which is no less than the option with the higher exercise price to avoid dominance.

7. "The common stock is at least equivalent to a perpetual call (i.e., T =) with a zero exercise price.

8. "An American call on a non-dividend paying stock will not be exercised before the expiration date.

9. "A perpetual option on a non-dividend paying stock must sell for the same price as the stock.

10. "The call price is a convex function of the exercise price.

11. "If the call price can be expressed as a differential function of the exercise price, the derivative must be negative and be no larger in absolute value than the price of a pure discount bond of the same maturity.

12. "With dividend payments on the stock premature exer-

cise of an American call may occur."[7]

In developing these option price restrictions, Merton compared the return on two portfolios using the dominance principle. Portfolio 1 is dominant over portfolio 2 if the return on portfolio 1 is not less than the return on portfolio 2 for all possible outcomes, and if the return on portfolio 1 is greater than the return for portfolio 2 in at least one possible outcome. In equilibrium no portfolios would be dominant since investors would bid up the price of dominant portfolios until the dominance was eliminated. Correspondingly, the demand for dominated portfolios would fall, as would price, until they are no longer dominated.[8]

Black-Scholes Model

In a seminal article in 1973, Black and Scholes presented an option valuation model that has become widely accepted. The model has been shown to be consistent with existing finance theory and has been modified and applied to other situations.

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[7]Smith, 7-14. This is only a partial list of the restrictions. For the complete list see Robert C. Merton, "Theory of Rational Option Pricing," Bell Journal of Economics and Management, IV (Spring 1973): 141-83.

[8]Ibid., p. 7.

Model Development

Under the assumptions of the Black-Scholes model, investors can create a riskless portfolio by combining a stock with European call options. The appropriate combination of stock and options to create a riskless hedged portfolio relies on adjusting the number of options to changes in the stock price, time to expiration of the option, variance rate of return on the stock, exercise price of the option, and risk free rate of return. Assuming that:

1. "The short term interest rate is known and constant through time.

2. "The stock price follows a random walk in continuous time with a variance rate proportional to the square of the stock price. Thus the distribution of possible stock prices at the end of any finite interval is log-normal. The variance rate of the return on the stock is constant.

3. "The stock pays no dividends or other distributions.

4. "The option is European, that is, it can only be exercised at maturity.

5. "There are no transaction costs in buying or selling the stock or the option.

6. "It is possible to borrow any fraction of the price of the security to buy it or to hold it, at the short term interest rate.

7. "There are no penalties to short selling. A seller who does not own a security will simply accept the price of the security from a buyer, and will agree to settle him an amount equal to

the price of the security on that date."[9]

The model is

$$C = S \cdot N\left[\frac{\ln(S/X + \{r+(\sigma^2/2)\}T}{\sigma\sqrt{T}}\right] - Xe^{-rt} \cdot N\left[\frac{\ln(S/X) + \{r-(\sigma^2/2)\}T}{\sigma\sqrt{T}}\right]$$

where:

S = Stock price at time t

X = Exercise price of option

σ^2 = Variance rate of return on stock

T = Time to expiration of option

r = Risk free rate of return

$N[]$ = Cumulative normal probability distribution

All variables in the model are directly observable, except the variance of the rate of return on the stock, which can be approximated through historical analysis of the expected return of the stock. The appropriate hedge ratio, or the appropriate number of options to be held with a share of stock to return the risk free rate of return, is C', where C' is the partial derivative of the option value, C. This model is superior to previous models since unobservable variables, such as the expected return on the stock, expected return on the option and market risk aversion,

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[9]Black and Scholes, 640-41.

do not appear.[10]

Analysis of Variables

Changes in the variables comprising the model can be investigated to determine the subsequent change in the value of the option by taking the partial derivative of the Black-Scholes model with respect to each variable in the model.

1. The value of the option, C, increases if the stock price increases.

$$\frac{\partial C}{\partial S} = N\left[\frac{\ln(S/X)+(\sigma^2/2)\ T}{\sigma\sqrt{T}}\right] > 0$$

2. The value of the option, C, increases if the exercise, X, decreases.

$$\frac{\partial C}{\partial X} = -e^{-rt}\ N\left[\frac{\ln(S/X)+\{r-(\sigma^2/2)\}T}{\sigma\sqrt{T}}\right] < 0$$

3. The value of the option, C, increases if the time until expiration, T, lengthens.

$$\frac{\partial C}{\partial T} = Xe^{-rt}\ \frac{\sigma}{\sigma\sqrt{r}}\ N'\left[\frac{\ln(S/X)+\{r-(\sigma^2/2)\}T}{\sigma\sqrt{T}}\right] + rN\left[\frac{\ln(S/X)+\{r-(\sigma^2/2)\}T}{\sigma\sqrt{T}}\right] > 0$$

4. The value of the option, C, increases if the risk-less rate of interest, r, increases.

$$\frac{\partial C}{\partial r} = T\cdot Xe^{-rt}\ N\left[\frac{\ln(S/x)+\{r-(\sigma^2/2)\}\ T}{\sigma\sqrt{T}}\right]\frac{T}{2\sigma} > 0$$

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[10]Galai and Masulis, p. 75.

5. The value of the option, C, increases if the variance rate, σ^2, increases.

$$\frac{\partial C}{\partial \sigma^2} = Xe^{-rt_N} \cdot N' \left[\frac{\ln(S/X) + \{r - \sigma^2/2\}T}{\sigma\sqrt{T}} \right] \frac{T}{2\sigma} > 0$$

Where N' = standard normal density function at d_1 and d_2

These relationships are consistent with the restrictions imposed on the range of option values by Merton and with the capital asset pricing model variable relationships.[11]

Extensions of Black-Scholes Model

The Black-Scholes model has been expanded to allow wider applicability by relaxing the assumptions of the model. Black and Scholes assumed that dividends were not paid on the stock during the life of the option. By relaxing the restriction on dividend payments during the life of the option, the proportional dividend model allows dividends to be paid continuously, but is only applicable to European call options.[12] Another modification of the Black-Scholes model, the differential tax model, allows differential tax rates between capital gains and ordinary income in addition to continuous dividend payments.[13] The variable interest rate model allows interest rates to vary over the life of the option and can be applied to both

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[11] Galai and Masulis, p. 75.

[12] Smith, p. 26.

[13] Ibid., p. 27-28.

European and American options since dividends are assumed not to be paid on the stock during the option's life.[14] Roll has developed a model to value American call options when the underlying stock makes dividend payments during the option's life.[15]

Holding the assumptions made by Black and Scholes intact, a pricing model for European put options was developed. The put option pricing model can, however, be modified to allow continuous dividend payments, tax differential between capital and gains and ordinary income, and variable interest rates.[16]

Applications of Black-Scholes Model

The Black-Scholes equation has been used to value contingent claims other than stock options. The debt and equity components of a firm having only common stock and pure discount bonds having a restrictive covenant prohibiting dividend payments until bond maturity have been valued using the Black-Scholes equation. In this situation, stockholders sell the firm's assets to the bondholders with the option to repurchase the assets by paying the bond

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[14]Ibid., p. 28.

[15]R. Roll, "An Analytical Valuation Formula for Unprotected American Call Options on Stocks with Known Dividends," Journal of Financial Economics, 5 (November 1977), pp. 251-58.

[16]Robert C. Merton, "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," Journal of Finance 24 (May 1974): pp. 449-70.

obligation.[17]

Changes in any of the functional variables comprising the model may change the ownership division between debt and equity. The effect of changes in corporate policies such as the impact of investment decision on nondiversible risk, expected return, and distribution of ownership between debt and equity has been analyzed using the Black-Scholes model.[18]

The Black-Scholes model has been used to examine the relationship between the firm's debt, the variables comprising the model, and how changes in the variables affect debt value. The yield to maturity and risk premium on bonds can also be determined.[19]

Dual closed-end funds, which are created by issuing income shares and capital shares have been valued using the Black-Scholes model. The capital shareholders receive very little until expiration, at which time they are paid residual funds after income shareholders are paid, and have similar characteristics to European options of

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[17]Black and Scholes, pp. 649-50.

[18]Smith, pp. 43-45.

[19]Merton, "On the Pricing of Corporate Debt," pp. 449-70.

dividend paying stock.[20]

Fixed rate loan commitments have been analyzed as contingent claims. By providing customers with the right to borrow funds at a fixed rate within a specified time period, banks are selling put options giving borrowers the right to sell the bank debt at a fixed price. Fixed rate loan commitments have been modeled as options in a manner analogous to the Black-Scholes model, except that interest rates are assumed to be lognormally distributed.[21]

Loan Agreements as Contingent Claims

Granting a loan can be viewed as establishing a contingent claim and anlayzed in an options framework. Loan agreements generally may be analyzed as call options, and in some cases as combinations of puts and calls depending on the terms of the loan.

Call Option Analysis

Loan agreements are contingent claims that provide funds to borrowers under a specified interest rate contract for a specific time period. A loan agreement may be ana-

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[20]Smith, pp. 45-46.

[21]Brit. J. Bartter and Richard J. Rendleman, Jr., "Fee Based Pricing of Fixed Rate Bank Loan Commitments," Financial Management 8 (Spring, 1979): p. 13.

lyzed from a call option perspective if, when the loan is granted, the borrower uses as collateral a tangible or intangible asset and agrees to pay off the loan at a specific maturity date.

Loan Analysis

When a loan is extended, the borrower has the option of either repaying or not repaying the loan at maturity. Since call options give the owner the right to purchase an asset at a specified price within a specific time period, when a loan is granted, the lending institution has sold to the borrower a call option to buy the collateral at maturity. If the loan is paid, the borrower exercises the call option and retains the ownership of a tangible asset or the full value of an intangible asset used as collateral by paying the exercise price. If the loan is not paid, the lending institution may take possession of the tangible collateral or the borrower may lose the full value of the intangible collateral.

The option to retain collateral ownership will be exercised if the borrower places higher value on the collateral than on the loan payoff, and the borrower will sell the collateral to the lending institution by allowing the option to expire and not repaying the loan when the

collateral value becomes less than the loan value.

Payoff Analysis

Assuming costless repossession and no transaction costs, the pay-off value of the loan is dependent on the market value of the collateral. Contingent claims analysis of a loan agreement can be analyzed with a pay-off graph as in Figure 1.

FIGURE 1

Payoff Graph for Loan

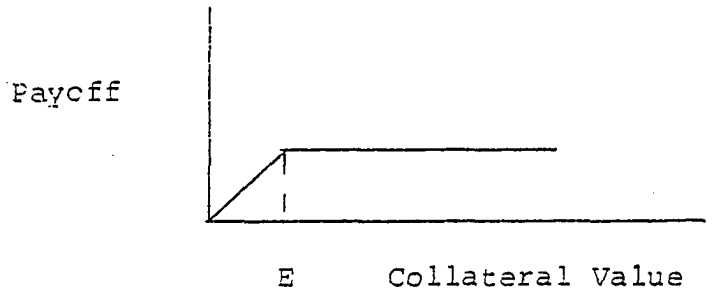


Figure 1 shows that if the market value of the collateral is greater than the maturity value of the loan, E, the borrower will repay and the lending institution will earn a profit equal to the interest earned on the loan, or the difference between the loan payoff and the loan size. If the market value of the collateral is less than the market value of the loan, the lending institution may repossess the collateral and, assuming a costless repossession and no put option available, have a pay-off decreasing steadily with the market value of the collateral.

Call and Put Option Combinations

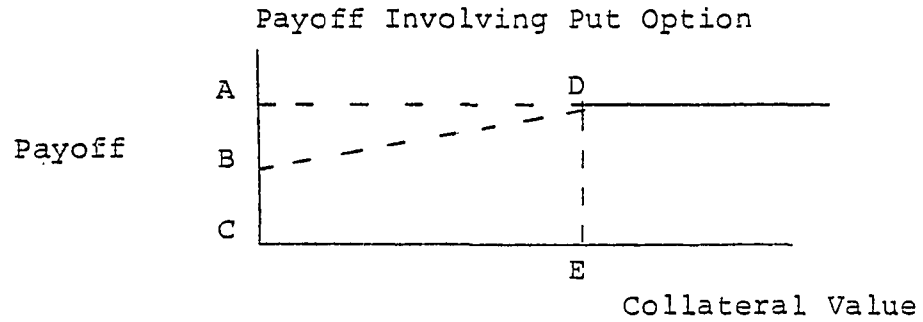
In this section it is shown that the lender has the equivalent of a put option on a loan if loan repayments are guaranteed. If the loan is guaranteed for 100% repayment upon default of the borrower, the lender has one put. If the lending institution is guaranteed a 50% repayment of the amount lost upon default, the lender has one-half put. Other fractional puts may be determined in an analogous manner.

Fully Guaranteed Loan

Loans that are fully guaranteed insure that the lender will receive full payment on the loan if the borrower defaults. This arrangement is shown in Figure II.

Since the lender is guaranteed full payment, the pay-off is the straight line AD. Since the firm will receive 100% payment, the payoff CA, is equal to the premium earned on the loan, ED.

FIGURE 2



Partially Guaranteed Loan

Loans that are partially guaranteed insure that the lender will receive partial payment on a defaulted loan. In this example, the lender has insurance against 50% of the loss of a defaulted loan.

The expected pay-off for loans insured for 50% of the value of the loss is line BD in Figure II. The pay-off decreases less than proportionately with collateral value and when the collateral value is zero, the pay-off is B, where CB = ½ CA.

Research Hypotheses of Commercial Bank Loans as Contingent Claims

The empirical analysis entails a statistical comparison between bank loan effective interest rates and other loan characteristics to investigate the contingent claims approach to analyzing commercial bank loans. Merton's theorems on option prices and the effects of specific variables on option prices in the Black-Scholes model are used to generate research hypotheses.

Interest Rate

The relationship between interest rates and other loan characteristics has been the focus of empirical studies by Jacobs and Hester. Both studies used regression

analysis to identify significant factors affecting the level of interest rates.

The link between previous empirical studies and contingent claims theory of commercial bank loans lies in the interest rate charged on loans. In a contingent claims framework, an interest rate is determined through Merton's formulation as

$$i = \frac{1}{t} \ln \left[\frac{X}{V-C} \right] \quad \text{where:}$$

t = time until loan maturity

V = collateral value

C = value of option on underlying asset

X = loan payoff

V-C = interest earned on the loan if the obligation is paid in full

If commercial loans can be analyzed in a contingent claims framework, then loan analysis should be consistent with observed loan interest rates and previously established empirical relationships. Since interest rates should be equivalent, loan characteristics affecting theoretical interest rate levels should in a contingent claims framework affect observed commercial bank loan interest rates in the same manner. Research hypotheses relating interest rates to other loan characteristics are used to determine

if contingent claims relationships are consistent with interest rate movements.

Loan Size

Previous empirical studies by Jacobs, Hester, and in the Congressional Committee report on financing small business showed an inverse relationship between the logarithm of the loan size and interest rates. Smaller loans are often extended to smaller firms that have a higher probability of encountering financial difficulty. Small loans also have a higher per dollar loaned cost than large loans. The higher relative administrative costs cause higher interest rates for smaller loans.

In contingent claims analysis of lending decisions, an inverse relationship between the logarithm of loan sizes and interest rates can be justified in two ways. The committee report on financing small business reported a direct relationship between the percent of total loans extended to small firms and loan losses. Banks whose loans to small firms comprised more than 25 percent of total loans had greater loan losses than banks whose loans to small firms were 12.5 percent to 25 percent of total loans and even greater loan losses than banks whose loans to small firms were less than 12.5 percent of total loans.[22]

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[22]U.S. Congress, p. 45.

Implied in the comparison of loan losses to firms size is that loans to small firms on the average are more risky. Since, as reported by Hester, small firms obtain small loans and large firms large loans, then on the average small loans can be expected to be riskier than large loans.

In a contingent claims framework, increased risk leads to higher option values and higher interest rates in the equation $i = \frac{1}{t} \ln \left[\frac{X}{V-C}\right]$. Anything increasing/decreasing the option's value, c, will increase/decrease the interest rate. Accordingly, small loans, which expose lending institutions to more risk relative to large loans, increase option value and interest rates charged on the small loans.

Another argument supporting the inverse relationship between loan size and interest rates revolves around the administrative costs of extending the loan. The administrative costs of loan analysis and extension are relatively fixed and account for the empirical observation that costs per dollar loaned decrease as the loan size increases. An altered formulation of the interest rate equation that accounts for administrative lending costs is $i = \frac{1}{t} \ln \left[\frac{X}{V-C-F}\right]$ where F represents the administrative lending costs.

Using the reformulated interest rate equation, increases in the size of a loan V-C, and payoff, X, cause the fixed administrative costs to become a less significant factor. By including the fixed administrative lending cost in the equation, interest rates will be inversely related to

loan sizes, and the research hypothesis is:

Interest rates are inversely related to the logarithm of loan size.

Loan Risk

The interest rates charged to borrowers reflect, in part, the lending institution's concern for the time value of money and the credit risk of the applicant. Holding constant the time value of money, factors decreasing/increasing credit risk exert downward/upward pressure on interest rates charged to borrowers.

In Hester's analysis of the Federal Reserve System survey data, the decisions to extend a loan and the size of a loan were found to be independent of collateral requirements, which protect against default, and interest rates, which compensates for risk exposure. The use of collateral decreased credit risk by shifting the risk of default from the lending institution to the borrower. Loans that are collateralized are less risky and should have lower interest rates than loans with no collateral.[23]

Theorem 7 and the subsequent corollary by Merton specify that the more risky the underlying asset the more valuable the option. The more valuable the option the higher the implied interest rate.[24] In support of this

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[23]Hester, "Customers Relationship and Terms of Loans," p. 355.

[24]Merton, "Theory of Rational Options Pricing," p. 148.

relationship, Galai and Masulis have shown that option values increase with the risk of the underlying security.[25]

In terms of commercial loans, the value of a call option on a loan should be higher with uncollateralized loans than with collateralized loans since uncollateralized loans expose the lending institution to greater risk. Because lending institutions are compensated for greater risk through higher interest rates, the research hypothesis is:

Uncollateralized loans have higher interest rates.

Floating Interest Rates

Few empirical studies have examined the effect that a floating rate loan has on the interest rate charged to the borrower. The only major contribution was a descriptive analysis of the 1977 quarterly Survey of Terms of Bank Lending by Boltz and Campbell. In their study, Boltz and Campbell reported that the interest rate on floating rate loans was higher than interest rates on fixed rate loans. This result was unexpected since floating rate contracts shift the risk of interest rate changes from the lender to the borrower and should lower the interest rate charged to the borrower. Boltz and Campbell, however, suggested that the floating rate loans may have been extended to more risky borrowers than fixed rate loans and that the risk differential between borrowers was large enough to offset the

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[25]Smith, 24.

decreased risk exposure to the lender. Also suggested was that banks competed for customers by offering fixed rate loans that were lower than floating rate loans when interest rates were expected to rise.

The effect of a variable rate loan on the bank is to hedge against interest rate risk since the interest rate on the loan may be renegotiated while the loan is outstanding. This greater flexibility by the bank increases the value of the loan to the bank and would be expected to decrease the interest rate on the loan, ceteris parabus. In the interest rate equation, V-C becomes V-C+P' where P' is the value of the option to renegotiate the interest rate.

The above argument for floating interest rate contracts being lower than fixed interest rate contracts assumes, however, that the fixed and floating rate contracts are offered to customers with identical characteristics. If as Boltz and Campbell suggest, floating rate contracts are offered to more risky customers and if the increased customer risk is great enough to offset the value of the floating rate contract to the bank, then floating rate contracts would have higher interest rates than fixed rate contracts. In this case the increased risk of lending has a stronger effect on the loan interest rate than the decreased interest rate risk.

In allowing elements of reality to enter the study and to be consistent with the Boltz and Campbell study, the research hypothesis is: Floating rate loans have higher interest rates than fixed rate loans.

Loan Commitments

Loan commitments, also known as lines of credit, allow borrowers to obtain loans at fixed prices within specified time periods and have been described by Bartter and Rendlemen as put options. When a borrower decides to exercise the put option on the loan, debt is sold to the lending institution under the prearranged conditions.[26]

Recent volatility in market conditions have caused loan commitments to be more risky to lenders than when market conditions are more stable. The profitability of loans made under commitment agreements may be significantly impaired if, for example, interest rate and/or federal reserve requirements substantially increase above levels existing when the loan commitment was negotiated.

The greater potential for loans being either less profitable or unprofitable due to loan commitments, and due to the ability of the borrower to exercise a put option on the lender, increases the risk of lending to the lending institution. The interest rate equation, $i = \frac{1}{t} \ln \left[\frac{X}{V-C}\right]$, may be altered to encompass the added dimension of a loan commitment being sold to the borrower by the lending institution. The new formulation would be $i = \frac{1}{t} \ln \left[\frac{X}{V-C-P}\right]$

[26]Bartter and Rendleman, p. 13.

where P represents the decreased value to the lending institution that results from selling the put option to the borrower and would cause the interest rate on the loan to increase. In this case, the put is not the simple putting of the asset, but putting a bundle of the asset and a call option.

Although Hester found commitment loans to have lower interest rates,[27] the increased risk exposure by lending institution extending loans under loan commitments should cause compensation to the lending institution from fees, compensating balances, and interest rates to increase. Since data on fees and compensating balances is not available, the only aspect of the lending institution that can be empirically tested is interest rates. Accordingly the research hypothesis is:

Interest rates are higher for loans extended under loan commitments.

Demand Loans

Demand loans give the lending institution the right to demand loan repayment from the borrower at any time during the life of the loan. Lending institutions

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[27]Hester, "Customers Relationships and Terms of Loans," p. 352.

may be justified in recalling a loan due to changes in market conditions, such as an unexpected increase in the prime rate and/or borrower characteristics, such as breaking a loan covenant.

Demand loans may be viewed as a put option that is sold by the borrower to the lending institution since the lending institution has the option to put immediate repayment on the borrower. Ownership of this put option, which may be exercised at the lending institution's discretion, reduces the risk exposure of the lending institution and should cause interest rates to decrease.

The interest rate equation may be altered incorporate the demand loan status by including the put option, $i = \frac{1}{t} \ln \left[\frac{X}{V-C+P} \right]$ where P represents the put option the lending institution receives from the borrower. The put option is added in this equation, in contrast to be subtracted in the loan commitment equation, because the lending institution is purchasing a put option with demand loans and selling a put option with loan commitments. Adding the put option will cause interest rates to decrease as the put option becomes more valuable.

The conditions under which the bank would exercise their put option is if the collateral value decreased below,

and was expected to remain below, the payoff value of the loan, ceteris paribus, or if the bank's required return increased above, and was expected to remain above, the interest rate on the loan, ceteris paribus. The conditions under which the bank's put option would be exercised becomes more complex if the ceteris paribus constraint is relaxed. If the constraint is relaxed, the decision to exercise the put option would not depend only on the collateral value-payoff value and loan rate-required return relationships, but would depend on the borrower-lender relationship. The bank, for example, would be more likely to exercise the put option by requesting immediate loan payment if the borrower is expected to be unprofitable or marginally profitable than if the borrower is expected to be a long term profitable customer. The decision rule used by the bank in determining whether to exercise their put option would be established in a manner that was consistent with their wealth maximization criteria.

Although Hester found that demand notes had higher interest rates, ownership of the put option on the loan gives the lending institution increased flexibility and decreased risk. Accordingly, the research hypothesis is:

Interest rates are lower if the loan is a demand note.

Time to Maturity

Securities with different maturity dates have different yields and are thus priced differently in the market. The relationship between maturity date and yield, known as the term structure of interest rates, may be shown graphically with a yield curve either having a positive, negative, or flat slope depending on characteristics of the market and the security.

By imposing a ceteris paribus constraint, the relationship between yield and maturity is simple and straightforward. However, many complex interdependent factors affecting the shape of the yield curve, such as the maturity date, coupon interest rate, call provisions, tax status, and risk, must be considered in any empirical analysis concerning the relationship between yield and maturity. The complexity of the real-world relationship between yield and maturity has led to the development of contingent claims and arbitrage term structure models. Rendleman and Bartter[28] and Brennan and Schwartz[29] have developed contingent

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[28]Richard J. Rendleman, Jr. and Brit. J. Bartter, "The Pricing of Options on Debt Securities," Journal of Financial and Quantitative Analysis, 15 (March, 1980), pp. 11-24.

[29]Michael J. Brennan and Edwardo S. Schwartz, "Savings Bonds, Retractable Bonds and Callable Bonds," Journal of Financial Economics, 5 (August, 1977), pp. 67-68.

claims models that value riskless bonds. A contingent claims model that is different from the Black-Scholes model is needed for pricing bonds since the price of bonds is not likely to follow any well-defined probability distribution due to the effects of the bond-specific coupon and maturity characteristics. Richard[30] and Dothan[31] have developed arbitrage models that consider investor's tastes and preferences, the real interest rate, the expected inflation rate, and the equilibrium prices of interest rates and inflation risks as important characteristics affecting the yield-maturity relationship.

In an effort to better understand the term structure of the loan payments for the loans in this study, duration, which is defined as the average time until receipt of payment on an obligation, is a useful measure. Duration could provide insight into the relationship between interest rates and maturity since debt obligations that have similar duration but different maturities are more likely to react similarly to changes in interest rates than debt obligations that have similar maturity but different duration.

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[30]Scott F. Richard, "An Arbitrage Model of the Term Structure of Interest Rates," Journal of Financial Economics, 6 (March, 1978), pp. 33-57.

[31]L. Uri Dothan, "On the Term Structure of Interest Rates," Journal of Financial Economic, 6 (March, 1978), pp. 59-69.

Duration measures the time and pattern over which payments on debt obligations occur and, thus, captures more characteristics of the interest rate-maturity relationship.[32]

The necessary data to accurately determine the functional relationship between interest rates and maturities and to determine the duration on loans was unavailable for use in this study. Because of the data limitations no research hypothesis was formulated for a predicted contingent claims relationship between interest rates and maturity dates. Time to maturity was, however, included in the model as a moderating variable that has a statistically significant impact on the model. The resulting coefficient on the time to maturity cannot be predicted, only reported.

The research hypotheses were developed from combining the previous empirical studies on commercial bank loan analysis and contingent claims theory. The resulting functional form of the regression model that is used to test the hypotheses is consistent with models used in previous studies. The form of the variables used in the regression analysis is consistent with previous empirical studies and

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[32]William F. Sharpe, Investments, (Englewood Cliffs: Prentice-Hall, 1978), pp. 39-40. Also see F. R. Macauley, Some Theoretical Problems Suggested By the Movements of Interest Rates, Bond Yields, and Stock Prices in the U.S. Since 1865 (New York, 1938) for a discussion of duration.

were put in a framework consistent with contingent claims analysis.

CHAPTER IV

EMPIRICAL TESTS AND RESULTS

The purpose of this chapter is to report the results of the regression analysis used to test the research hypotheses. After a description of the data and regression equation, the implications of the regression coefficients and statistical tests of the coefficients are reported and related to previous empirical studies.

Description of the Data

The Federal Reserve System and the Federal Deposit Insurance Corporation conduct the Survey of Terms of Bank Lending during the first full business week of the middle month each quarter. Participants in the survey include approximately 340 Federal Reserve member and nonmember banks that are randomly selected to represent insured commercial banks in all size categories of United States banks. The survey collects information on both price and nonprice terms of lending on commercial, industrial, and construction

loans. Specific information collected in the survey, shown in Appendix I, includes effective interest rates, loan sizes, maturity dates, floating or fixed rates, commitment status and fees, insurance status, and collateral requirements.[1]

Description of Results

The regression analysis in this study was conducted on 21,667 commercial and industrial loans collected during August, 1979, in the Survey of Terms of Bank Lending. With 21,660 degrees of freedom, the specific form of the regression equation is

$$I = \alpha + B_1 LogSz + B_2\ Mat + B_3\ Dem + B_4\ Com + B_5\ Fl + B_6\ Col$$

The variables are described in Table I and the results in Table II.

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[1]See Paul W. Boltz, "Survey of Terms of Bank Lending: New Series," Federal Reserve Bulletin 63 (May, 1977), 442-45 for a description of the survey.

TABLE 1

Variables, Symbols, and Description of Variables

Used in Regression Analysis

Variable	Symbol	Description
Interest rate	I	Effective rate of interest on loan
Logarithm of loan size	Log Sz	Logarithm (Base 10) of face amount of loan
Maturity	Mat	Number of months until final payment due
Collateral	Col	Col = 1 if collateral used Col = 0 if collateral not used
Floating interest rate	Fl	Fl = 1 if floating rate Fl = 0 if fixed rate
Commitment status	Com	Com = 1 if commitment loan Com = 0 if not commitment loan
Demand Status	Dem	Dem = 1 if demand loan Dem = 0 if not demand loan

The effective rate of interest, the dependent variable, is adjusted for discount and add-on interest calculations and is consistent in functional form with the empirical studies by Jacobs and Hester. Loan size was scaled by taking the logarithm of the original amount, which is consistent with Jacobs' study. The maturity is the number of months until final payment is due.

Collateral, floating interest rate, commitment status, and demand status are each used as dummy variables

that assumed a value of one if incorporated in the loan agreement or zero if not incorporated in the loan agreement.

TABLE 2

Results of Regression Analysis Using Interest Rate as the Dependent Variable

Coefficient	B	σ_B	t-statistic
Log Sz	-.2057	.0140	14.914
Mat	-.008	.001	8.114
Col	-.1614	.0207	7.814
Fl	.7185	.0225	31.914
Com	-.0378	.0224	1.69
Dem	-.9829	.0218	36.161

Constant = 13.880

R^2 = .08873

Standard Error = 1.433

Although not an issue of central importance in this study, the explained variance (R^2) is .08873 (or 8.873% of the variation in interest rates can be explained by the model). The regression equation constant is 13.88, which

represents the average interest rate charged to customers during the survey period. The standard error of the estimate, which indicates the amount of dispersion around the regression line, is 1.433.

The correlation matrix, shown in Table III, shows the degree of multicollinearity between the dependent variables. The effect of multicollinearity is to obscure the reduction in total variation in the dependent variable which can be ascribed to an independent variable. The tests of significance in the regression coefficients may lead to the incorrect conclusion that the coefficients are not significantly different from zero.

As can be seen from Table III, multicollinearity is not a significant problem since the correlation between most independent variable pairs is very low. The largest correlation between independent variables occurs between floating rate and commitment status, log loan size, and demand status variables, but the correlation is not high enough to cause a problem.

TABLE 3

Correlation Matrix for Regression Using

Interest Rate as the Dependent Variable

	Commitment Status	Log Loan Size	Demand Status	Collateral	Floating Rate
Commitment Status	1.0				
Log Loan Size	.26679	1.0			
Demand Loan	.11867	.09294	1.0		
Collateral	.20484	-.03484	.13037	1.0	
Floating Rate	.331167	-.29385	.26861	.13947	1.0
Time To Maturity	.04173	.09294	-.20398	.16251	.01286

Logarithm of Loan Size

The coefficient for the logarithm of loan size is -.2057, which indicates that a one unit increase/decrease in the logarithm of the size of a loan, or an increase/decrease by the power of 10, can be expected to decrease/increase the interest rate charged on the loan by 0.2057 of a percent. With a standard error .0140, the t-statistic is 14.914, causing the coefficient to be statistically different from zero at the 99 percent level. The research hypothesis is accepted in support of the contingent claims approach. Large loans can be expected to have lower interest rates than smaller loans, ceteris parabis.

In Jacob's study a statistically significant inverse relationship between interest rates and the logarithm of loan size was attributed to economies of scale in lending. Since substantial fixed costs are associated with lending, the cost per dollar decreases as the loan size increases. Boltz and Campbell, although not applying statistical analysis, reported an inverse relationship between interest rates and loan size with loans in the largest categories receiving prime or below prime rates. Boltz and Campbell attributed the relationship to increased credit worthiness and smaller cost per dollar loaned as the loan size increases.

In the committee report on financing small business, large firms were reported to receive lower interest rates than small firms. If larger firms can be assumed to receive larger loans than small firms, an inverse relationship between interest rates and the size of loans is implied. The higher cost per dollar loaned accounted for the higher interest rates on small loans.[2]

Loan Risk

The coefficient for the collateral variable is -0.1614, which indicates that collateralized loans can be expected to have an interest rate .1614 of a percent lower than uncollateralized loan. With a standard error of .0207 the t-statistic is 7.814, causing the coefficient to be statistically different from zero at the 99 percent level. The research hypothesis is

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[2]Neil B. Murphy is currently conducting a Small Business Administration study to disentangle the loan size and risk effects on interest rates.

accepted in that the interest rate charged on a loan is dependent upon collateral being used to reduce the credit risk.

The results coincide with both contingent claims theory and the implications of the empirical research by Hester. Uncollateralized loans expose the lending institution to more credit risk and to compensate for the increased risk a higher interest rate is charged on loans that are uncollateralized.

The theoretical work by Merton and by Galai and Masulis predicted that the more risky the underlying asset, the more valuable the option. The more risky the asset against which the option is written, the higher the interest rate charged on a loan. Uncollateralized loans are more risky since the lending institution has no physical asset to improve the repayment probability. The value of the option to repay the loan and the interest rate increase correspondingly.

Floating Interest Rates

The coefficient for the floating versus predetermined interest rate variable is 0.7185, which indicates that loans which have floating rates can be expected to be .7185 of a percent higher than fixed rate loans. With a standard error of .0225 the t-statistic is 31.914, causing the coefficient to be statistically different from zero at the 99 percent level. The research hypothesis is accepted in support of the contingent claims approach. The option to repay a loan becomes more valuable if the interest rate charged on the loan is allowed to

float and leads to a correspondingly higher interest rate charged on the loan.

The discussion by Boltz and Campbell illustrated how a positively or negatively shaped yield curve may explain the premiums that are paid for fixed or floating rate loans. During the survey period the yield curve was relatively flat and provides no insight into the results of this study.

The results of this study are consistent with the theoretical predictions of Merton's variable interest rate option valuation model. Merton's model predicts higher option values, and thus higher interest rates, when the interest rate is allowed to vary over the life of the option.

Demand Status

The coefficient for demand status is -0.9829, which indicates that interest rates can be expected to be 0.9829 of a percent lower if the loan is a demand note. With a standard error of .0219 the t-statistic is 36.161, causing the coefficient to be statistically different from zero at the 99 percent level. The research hypothesis is accepted in support of the contingent claims approach. Loans that are demand notes can be expected to have lower interest rates since the lending institution's put option reduces loan risk.

The empirical study in 1972 by Hester, which showed that demand notes had higher interest rates, is not consistent with the results of this study. Viewing the demand status as

a put option sold by the borrower to the lending institution provides a broader perspective between the nature of the put option mechanism and the lending institution's flexibility and risk. The analysis of demand status as being a combination of puts and calls is supported by this study.

Commitment Status

The coefficient for commitment status is -0.0378, which indicates that interest rates can be expected to be 0.0378 of a percent lower if obtained under commitments than if not obtained under commitments. With a standard error of 0.0224 the t-statistic is 1.69, causing the coefficient to be statistically different from zero at the 90 percent level. The research hypothesis must, however, be rejected. With a sample size of 21,669, an hypothesis that could be only marginally acceptable should be rejected with explanations for the rejection.

Rejection of the hypothesis is consistent with previous empirical studies by Hester and by Boltz and Campbell. Hester found that loans made under commitment agreements had lower interest rates. Boltz and Campbell reported that commitments were not used for loans with interest rates below the prime rate, were used for loans with interest rates at or above the prime interest rate, and were not used on loans with interest rates high above the prime rate. Loan commitments were not used at rates high above the prime rate because banks did not

want to be committed to lending to high risk customers and because borrowers in the high risk categories cannot afford the commitment fees, which is consistent with Jacob's conclusion that the lending and loan size decisions are independent of the interest rate.

Time To Maturity

The coefficient for time to maturity is -0.008, which indicates that interest rates can be expected to be 0.008 of a percent smaller as the months until maturity increases by one month. Loans with shorter maturities can be expected to have higher interest rates and loans with longer maturities can be expected to have lower interest rates, ceteris parabis. With a standard error of .001 the t-statistic is 8.114, causing the coefficient to be statistically different from zero at the 99 percent level.

The time to maturity was not used as in a research hypothesis, but as a moderating variable that would improve the regression results. Since no previous empirical studies have used time to maturity as an independent variable to explain interest rates, the consistency of results in this study with past results cannot provide insight to the reasons for the inverse relationship.

A possible explanation for the results may have been the shape of the yield curve. If the yield curve were negatively sloped, lending institutions may have extended loans with lower interest rates for longer maturities. Extending

low interest on long term loans is a reasonable strategy if future interest rates are expected to decrease, especially if the lending institution can charge a rate higher than the eventual rate occurring in the future.

At the time of the survey, August, 1979, from which data was used for this study, maturity spreds were historically narrow. The credit cycle was at a point where there was little compensation to borrowers for length of maturity. A flat yield curve does not provide adequate explanation for the inverse relationship between the interest rate and the maturity date.

Another rational for the inverse interest rate-maturity relationship may be attributed to the fixed costs of lending. The fixed costs of lending, which are relatively high compared to the variable costs of lending, may be spread over a longer time period on long term loans than on short term loans. The longer time period enables the bank to spread the costs over more payment and charge lower interest rates on the long term loans. On short term loans the fixed costs must be recovered over fewer payments resulting in higher interest rates.

CHAPTER V

CONCLUSIONS

Analyzing commercial loans in a contingent claims framework requires a precise specification of how loan characteristics can be considered combinations of puts and calls and apply to contingent claims theory. If commercial loans may be analyzed as contingent claims, then variables analyzed in a contingent claims framework must affect interest rates analogous to the way the same variables affect interest rates in previous studies. The variable relating contingent claims theory and traditional analysis of loans is the interest rate charged on a loan. Since interest rates and loan characteristics are observable and since an interest rate equation has been developed in contingent claims theory, the interest rate is used as a focal point to develop the research hypotheses.

Analysis of the specific variables used in the study generally supported the contingent claims approach to analyzing commercial bank loans. Empirical analysis of the relationship between interest rates and the logarithm of

loan size has produced results that are consistent with the results in this study. The inverse relationship found in all studies has been attributed to economies of scale in lending. The fixed costs of lending may be spread over more dollars on large loans than on small loans and, thus, large loans can be charged lower interest rates than small loans.

Variables decreasing loan risk decrease option value and interest rates in contingent claims framework. This relationship is consistent with the risk-return framework where interest rates also decrease with decreasing risk. Loan collateral acts to decrease loan risk by shifting credit risk from the lending institution to the borrower. Any variable acting to reduce loan risk, such as the length of relationship between the lending institution and the borrower, should also decrease loan risk and interest rates. Intangible assets can also act as collateral to reduce credit risk by making loan repayment self-enforcing. The potential loss of goodwill and/or credit rating can have the same effect as physical collateral. The loss of either of these factors may significantly impair the viability of the borrower.

Lending institutions extending demand loans have a put option since the obligation can be put onto the borrower at any time during the life of the loan. In a risk-return framework, the lending institution is exposed to

less risk with demand loans and should subsequently charge a lower interest rate. The results coincide with the risk-return analysis by indicating an inverse relationship between interest rates and demand loans. The put option held by the lending institution reduces risk and the required compensation for risk exposure.

The rejection of commitment status as being statistically significant may be a result of commitment fees and/or compensating balances that were paid by the borrower, but not included in the data analysis. Commitment loans that require fees or compensating balances increase the effective interest rate and would cause a stronger empirical relationship between commitment status and the required rate.

The weak empirical relationship may be a result of commitment fees and compensating balances that lending institutions require on commitment loans. Instead of directly increasing the interest rate to commitment borrowers, some lending institutions may increase the effective interest rate through the commitment fees and compensating balances. An effective interest rate including commitment fees and compensating balances may cause a stronger empirical relationship and be consistent with previous empirical studies.

Rejection of the hypothesis cannot be used as an argument to invalidate the analysis of commitment loans as

put options by Bartter and Rendleman since data on other types of compensation to the lending institution by borrowers was not available.

Due to the complex factors affecting the interest rate-maturity relationship, the empirical results could not be hypothesized, but interest rate was used as an independent moderating variable.

Based on the results of this study, a general conclusion is that commercial loans can be analyzed in a contingent claims context. The value of a commercial loan is dependent on the loan characteristics, which refer to the aspects of the borrower, the lending institution, and the negotiated loan covenants.

While contingent claims theory is a viable method for commercial loan analysis, developing a complete model encompassing all factors affecting an interest rate would be difficult since intangible as well as tangible factors would have to be measured. Some relevant factors may be difficult to measure, such as friendship between the borrower and lending institution and third party influence on the decision.

A model including measurable loan characteristics would require complex interaction of put and call options and would include variables not used in this study. Variables that may increase the explanatory power of a contingent claims model are fees, compensating balances, length

of banking relationship between the borrower and lending institution, and the prime rate.

Future research on the applicability of contingent claims theory to lending decisions can focus on expanding the explanatory power of the model by including additional variables such as were suggested above. Increasing the explanatory power of the model makes the contingent claims approach a more viable alternative or complementary analytical method for loan analysis.

This study was completed during only one time segment. The results or the relationships between the interest rate and independent variables may change over time. An interesting continuation of this study in both the contingent claims field and the bank lending field would be to conduct the regression analysis over the business cycle. In commerical bank lending, many empirical studies have tested the relationship bewteen banks and borrowers, but have been static in nature since only one time segment has been observed. Completing this study over the business cycle may provide insight into the relationship between interest rates and the other variables in this study in diverse market conditions. The results may be found to be an anomoly of the market conditions, stable over the entire cycle, or change with changing market conditions, and may be used to infer discriminatory lending patterns toward types of borrowers. The most obvious discriminatory possibility is

whether the difference in interest rates between small loans and large loans is constant or changes over the business cycle.

Completing the study over the entire business cycle can also provide insight into whether contingent claims analysis is valid in diverse market conditions or whether the results of this study were an anomoly. Since no contingent claims analysis of commercial loans has been done prior to this study, the results of a study of the relationship between interest rates and other variables over the entire bysiness cycle can provide evidence into whether the results of this study are stable or change with market conditions. Information on the relationships over time can be used to confirm the contingent claims approach to commerical bank analysis and can be used as a base for further developing the approach.

TERMS OF BANK LENDING TO BUSINESS

COMMERCIAL, INDUSTRIAL, AND CONSTRUCTION AND LAND DEVELOPMENT LOANS MADE ON _____

FR 2028A
Approved by Federal Reserve Board -- July 1976
Approval Expires Feb 1979

Page ___ of ___

This report is authorized by law [12 U.S.C. 248(a) and 12 U.S.C. 248(i)]. Your voluntary cooperation in submitting this report is needed to make the results comprehensive, accurate, and timely.

The Federal Reserve System regards the individual bank information provided by each respondent as confidential. If it should be determined subsequently that any information collected on this form must be released, respondents will be notified.

(Please read instructions before completing form)

	DATE MADE		FACE AMOUNT OF LOAN			RATE OF INTEREST						MATURITY STATUS		COMMITMENT STATUS				FEDERAL INSURANCE STATUS			COLLATERAL AND PURPOSE							
							Method of calculation			Rate over life of loan								Check one					Complete columns 12 and 13 only for construction and land development loans				
							Check one			Check one								(a) Insured or guaranteed by S.B.A.	(b) Insured or guaranteed by other U.S. agencies or depts.	(c) Not insured by U.S. agencies or depts.			Check one				
	Mo.	Day	Mil.	Thou.	Dol.	Stated rate of interest	(a) Discount	(b) Add-on	(c) On remaining balance	(a) Floating	(b) Predetermined	Date of maturity (If none, enter zero) Yr.	Mo	If maturity stated, enter number of scheduled payments over life of loan	Loan made under a commitment		Fees paid on commitment					Loan secured		(a) 1-4 Family	(b) Multi-family	(c) Non-residential	Primarily secured by real estate	
						Per cent									Yes	No	Yes	No				Yes	No				Yes	No
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Bank name, branch number

Office address

Person to be contacted concerning this report

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