

Bank Risk Ratings and the Pricing of Agricultural Loans

Nick Walraven
Federal Reserve Board
Washington DC 20551
Nick.A.Walraven@frb.gov

and

Peter Barry
University of Illinois
p-barry1@uiuc.edu

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Abstract

In this paper, we review the prevalence of the use of risk ratings by commercial banks that participated in the Federal Reserve's Survey of Terms of Bank Lending to Farmers between 1997 and 2002. We find that adoption of risk rating procedures held about steady over the period, with a little less than half the banks on the panel either not using a risk rating system, or reporting the same rating for all their loans in the survey. However, most of these banks were small, and roughly four-fifths of all sample loans carried an informative risk rating. We found that after controlling for the size and performance of the bank and as many nonprice terms of the loan as possible, banks consistently charged higher rates of interest for the farm loans that they characterized as riskier, with an average difference in rates between the most risky and least risky loans of about 1-1/2 percentage points.

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The management of risk by commercial banks in the U.S. and other developed countries has advanced significantly to now address the frequency and severity of loss and an enterprise-wide perspective on credit, market, and operational risks. The goals of risk management are to refine the measures of risk, better match economic capital to the overall risk profile, allocate capital efficiently among the respective bank enterprises, and to price loans and other products and services consistent with their marginal contributions to economic capital and risk-adjusted returns on capital (Matten (2000); Beisses (2002); Smithson (2003); Saunders(1999)). The proposed New Basel Accord emphasizes these refinements, while offering a menu of choices for institutions of different size, operating environments, complexities, and market characteristics. The menu ranges from an expanded set of risk weights compared with those in the 1988 Accord to internal-ratings-based approaches in which institutions estimate probabilities of default and the resulting loss by rating classes of borrowers and loans.

The use of risk-rating systems to summarize multiple features of a bank's customers or loans has been spreading through the banking system for at least a decade, first among larger banks, and gradually to medium and smaller banks (Brady, English, and Nelson, 1998; Treacy and Carey, 1998). According to Brady, English, and Nelson, virtually all large banks rated loans in the August 1998 Survey of Terms of Bank Lending by the Federal Reserve System; in contrast, most medium to small banks either did not rate loans or assigned all the loans in the survey to a single rating category. Assessing the adoption of these risk, capital, and pricing practices by banks with different attributes is important to understanding the scope and depth of their management resources, their likely adoption of more sophisticated technology in the future, and the design of risk-based capital regulations for safety and soundness in a diverse banking system.

Little contemporary evidence is available about the use of such practices on agricultural loans (for past studies of credit risk management by agricultural banks, see Barry and Calvert (1983); Moss, Barry and Ellinger (1997); Miller et al (1993); Swackhamer and Doll (1969)). In 2003, about half of U.S. commercial banks lending to farmers occurred through smaller

community banks that had less than \$500 million of assets (ERS,USDA), half came from larger, regional or national banks. The diversity in size and management of banks that lend to farmers suggests the need for a range of capital management and risk assessment guidelines and continued monitoring of structural change in agricultural lending.

This paper reviews the use of risk ratings, risk-adjusted pricing, and other responses to credit risk by commercial banks when making new agricultural loans. Quarterly data from the Federal Reserve's Survey of the Terms of Bank Lending to Farmers (STBLF) from August 1997 through August 2002 are utilized following the methods employed for business lending by English and Nelson (1998) (hereafter referred to as EN). Bank characteristics, loan pricing, and other risk management tools are summarized, compared to the August 1998 findings of EN, and then evaluated using regression procedures to determine the effects of risk ratings and other risk control practices on interest rates for new farm loans.

Surveying Banks About Agricultural Lending

The data for our analysis of risk pricing on agricultural loans comes mainly from the Federal Reserve's Survey of the Terms of Bank Lending to Farmers. This section provides a brief history of that survey and reviews its current scope and the selection of its panel (a more detailed description of the evolution of the survey may be found in Walraven and Slowinski (1993)).

In 1977, the Federal Reserve Board requested a quarterly survey of banks to gauge the cost, volume, terms, and purpose of credit extended to both commercial businesses and to farmers. A single longitudinal survey panel of banks was selected to gather information about both types of lending. The survey has been modified since that time, most notably in 1989, when a separate panel of banks was selected to report information on farm loans (some banks remained on both the business loan panel and the farm loan panel), and in 1998 when questions about the riskiness of loans were added to both surveys.

Since the panel redesign in 1989, a stratified, random sample of 250 insured commercial banks reports information on each agricultural loan completed during the first week of the second

month of each quarter ¹. Because the volume of agricultural loans is highly skewed across the universe of commercial banks, the first stratum of the survey panel includes ten agricultural lenders that are among the largest holders of agricultural loans. The remaining commercial banks holding at least \$1 million in agricultural loans are divided into four strata, with the members of each stratum holding successively smaller amounts of farm loans. Sixty banks are chosen randomly from each of these strata.

During the sampling week in each quarter, banks in the survey report the amount, the rate of interest, the maturity, and some non-price terms of each loan that they complete. In recent years, around 200 sample banks report roughly 4000 loans in each survey.

The prevalence of risk rating in the STBLF panel

About 1/4 of the banks in the panel (48 of 186) for the August 1998 STBLF did not rate the farm loans that they closed, and almost as many (36 of 186 banks) assigned the same risk rating to all of the survey loans that were reported. Similar to the EN findings, almost all of the banks in the 1998 survey that either did not assign risk ratings or gave all loans the same risk rating were small banks (less than \$1 billion in assets). As a group, these banks accounted for about 18 percent (739 of 4072) of the total number of farm loans in the August 1998 survey.

Although anecdotes suggest that the use of risk-rating systems has been spreading for all types of loans, according to the STBLF panel, the proportion of banks that assigned risk ratings was little changed during the five years following the EN business loan survey. In the August 2002 survey, about 1/5 of the panel (38 of 172 banks) did not rate farm loans, and about 1/4 (42 of 172 banks) reported no variation in risk ratings; although in total, these 80 banks closed a little fewer than 9 percent of the loans reported in the August 2002 survey (440 of 5105 survey loans), a proportion well below the 1998 reading, which gives some support to the assertion that the proportion of farm loans having a risk rating has been growing.

¹ “Agricultural loan” refers to either of the farm loan definitions employed in the quarterly Report of Condition (Call report). Included are both “loans to finance agricultural production or other loans to farmers” and “loans secured by farm real estate”.

Most of the banks remain on the survey from one quarter to the next; indeed, 120 of the banks that reported closing at least one loan in the August 1998 survey also reported a loan in August 2002. Among this group of banks, about 50 assigned loans to multiple risk categories in both 1998 and 2002. This set of banks reported about 2/3 of the number of sample loans (3231 of 5105) in the most recent survey. Another 10 banks that reported in both periods did not rate farm loans in 1998, but had begun to report ratings by 2002. A set of 22 banks that did not rate farm loans in 1998 still did not rate farm loans in 2002, and another 10 banks had discontinued rating farm loans by 2002. These 32 banks reported 245 loans in the August 2002 survey. The remaining 29 banks that reported loans in both 1998 and 2002 assigned all the loans the same risk rating. Although this singularity is a little unfortunate from an econometric point of view, to some degree it was inevitable—most banks in this last group reported closing fewer than 5 loans during the August 2002 sample week, and given that the risk descriptions were designed so that most loans fell in the middle of the risk scale, it seems plausible that among only a handful of loans at a particular bank that they all could be ranked similarly.

Description of risk rating categories

Banks participating in the survey are asked to map their internal risk ratings into a set of five rating categories that are described in detail in the reporting instructions. The loans are characterized in terms of the probability of a loss to the bank, rather than the probability of a default by the borrower. As a result, requirements for compensating balances or collateral can lower the risk rating of an otherwise more risky loan. Loans placed in Category 1, the “minimal” risk category, should bear virtually no chance of loss to the bank. Loans in Category 2, are described as “very unlikely” to result in a loss to the bank. Category 3 loans were termed “moderate risk” and were intended to be an average loan to a typical borrower under average economic conditions. The survey was designed so that most loans would fall in Category 3. Loans placed in Category 4, although still bearing an “acceptable” degree of risk, were in some sense substandard. Category 5 loans were described as “Special mention” loans, such as work-out loans--new loans typically would not fall in this category. Two additional rating categories

were provided, the first for banks that rated some loans, but not a particular one that was reported, while the final designation was for banks that did not rate loans.

Farm loan characteristics by risk rating

August 1998 Survey

In order to compare the EN averages for business loans to the STBLF data, we computed averages by bank size and risk category that were weighted by the size of the loan and by a stratum blowup factor reflecting the ratio of the volume of farm loans outstanding at the panel bank to the volume outstanding at banks not in the survey. As shown in Table 1, panel banks in 1998 tended to adjust rates of interest on their loans according to the reported riskiness of the loans in the sense that loans rated the least risky generally had lower rates and those rated most risky tended to carry higher rates. However, there was a large degree of variability about this broad assertion. Large banks, which are defined as having more than \$1 billion in assets, closed transactions on loans with a risk rating of 3 tended that, on average, carried lower rates of interest than those with less risky ratings. For medium-sized banks (assets between \$1 billion and \$100 million) and small banks (assets less than \$100 million) loans in Category 4 tended to carry lower rates than loans in Category 3. EN found closer correspondence between reported riskiness of C&I loans and the average interest rate than these averages suggest for farm loans.

Table 1
Average Loan Rate by Risk Rating
(Weighted by Loan Volume)
August 1998 Survey of Terms of Bank Lending to Farmers

	Risk Rating					
	1	2	3	4	5	All
All	9.32%	9.45%	8.68%	8.93%	9.49%	9.06%
Large Bank	7.98%	8.83%	7.96%	8.77%	9.10%	8.44%
Medium Bank	9.39%	9.68%	10.22%	9.92%	10.16%	10.00%
Small Bank	9.33%	9.42%	10.14%	9.86%	10.95%	9.62%

To the extent that reported rates of interest fail to increase with the reported risk rating, other characteristics of the loan likely compensate the lender for bearing the risk. To examine this possibility for the August 1998 survey, other reported features of the loans, can be broken out by risk ratings (Table 2). On average, farm loans in the survey were small; the overall weighted average amount for each loan was \$27.3 thousand, with the weighted-average amount increasing uniformly with the size of the loan from \$15.6 thousand for the least risky loans to \$79.3 thousand for the most risky loans. In general, loans rated as less risky were more likely to have collateral associated with them, consistent with the Berger and Udell (1990) hypothesis that collateral requirements often offset some of the risk of the loan. Furthermore, less risky loans tended to carry provisions allowing the bank to call the note before maturity, likely affording the bank some protection from post-closing changes in the pattern of interest rates in the general economy. In addition, riskier loans were more likely to have been made under a prior commitment, which is consistent with Morgan's (1998) hypothesis that, as economic conditions worsen (i.e. the general riskiness in the economy increases), lenders make relatively more loans under preexisting commitments and relatively fewer new loans. Prepayment penalties, although rare overall, tended to be more prevalent for loans with risk ratings of 3 or above. Finally, the

average maturity of the loans fell with reported riskiness, perhaps suggesting some concerns about interest rate risk or repayment capability that were not sufficiently assuaged by call provisions, collateral requirements, and other terms of the loan.

Table 2
 Loan Characteristics by Risk Rating
 Weighted by Loan Volume
 August 1998 Survey of Terms of Bank Lending to Farmers

	Risk Rating					
	1	2	3	4	5	All
Amount (thousand \$)	15.6	16.7	31.2	53.7	79.3	27.3
Percent With Collateral	94.9	94.8	61.0	36.9	48.0	66.8
Percent Under Commitment	57.0	70.0	85.1	92.1	94.7	80.0
Percent Callable	18.4	24.3	14.5	5.9	9.8	14.0
Percent with Prepayment Penalty	0.1	0.1	3.5	0.8	0.5	1.6
Average Maturity (months)	21.3	18.6	12.4	5.8	9.4	12.8

August 2002 Survey

Despite a multitude of changes between 1998 and 2002 among agricultural lenders, the agricultural sector, and the economy as a whole, we examined the August 2002 survey data within the same framework as the August 1998 survey. Summary statistics are shown in Table 3. In August of 2002, rates of interest at all sizes of banks showed a more consistent tendency to increase with the reported riskiness of loans, perhaps reflecting a better use of nonprice terms to adjust the riskiness of the loans than in 1998. For instance, the proportion of loans that were

secured rose to more than 90 percent in the August 2002 survey, well above the 67 percent that were secured in the survey four years earlier. In addition, loans in the riskier categories were much more likely to be secured in the more recent survey. The proportion of survey loans that the bank can call prior to the maturity date rose substantially for loans that were of average or lower risk (risk ratings 1 to 3).

Table 3
August 2002 Survey of Terms of Bank Lending to Farmers
(weighted by loan volume)

	Risk Rating					
Rates by bank size	1	2	3	4	5	All
Large Bank	4.30%	4.40%	4.72%	5.11%	6.09%	4.99%
Medium Bank	5.91%	6.89%	7.19 %	7.48%	7.63%	7.11%
Small Bank	7.04%	7.01%	7.78 %	8.19%	9.46%	7.36%
All banks	6.75%	6.86%	6.00%	5.39%	6.54%	6.05%
Loan Characteristics						
Amount (thousand \$)	15.5	19.0	24.0	37.6	34.0	24.9
Percent with Collateral	95.0	96.2	88.6	95.1	98.8	92.7
Percent With Commitment	76.4	73.3	74.7	93.1	92.2	80.3
Percent Callable	27.0	28.2	30.3	3.9	3.3	20.6
Percent with Prepayment Penalty	1.8	0.4	1.1	3.5	0.5	1.8
Average Maturity	21.5	11.8	15.9	10.0	5.5	13.2

Controlling for variations in terms

In this section we use regression analysis to examine the effect of various terms on the rate of interest charged by the bank. We include data from all the quarterly surveys from August 1998 through May 2002, which provided 84,265 loans. Roughly following EN, we include either quantitative or qualitative measures of all the nonprice terms of the loan as explanatory variables

for the rate of interest.

The STBLF includes some nonprice indicators that are not included in the STBL survey. First, respondents to the STBLF survey indicate whether the loan is secured by farm real estate, some other type of security, or is unsecured—STBL respondents indicate only whether the loan is secured. Over the entire sample used in this paper, about 8-1/2 percent of loans were secured by farm real estate, although many of these loans have a maturity that is much shorter than one might expect for a farm mortgage. The farm survey also asks whether the loan is insured by a federal agency, an important consideration given the various programs available to bankers through the Farm Services Agency (formerly the Farmers Home Administration). Finally, the farm survey asks whether the loan was made in participation with other banks, a traditional means that rural banks use to limit exposure to individual loans.

Our regression specification also differs from EN in that we add bank-specific factors that might influence the rate of interest offered on the loan. Banks that maintain a substantial portfolio of agricultural loans differ markedly across various size and performance measures. For example, in the March 2003 Call report², almost half of farm loans were held by “nonagricultural” banks.³ These institutions typically can diversify risks that they perceive in their farm loans against those in other parts of their portfolio, perhaps reducing the compensation they require for more risky loans. We include the ratio of the volume of the bank’s farm loans to its total loans as a right-hand-side variable to control for this type of difference.

In addition, the March Call report also indicates that almost 60 percent of the outstanding volume of agricultural loans was held by banks with assets of less than \$500 million. These small banks typically depend more heavily than larger banks on depository sources of loanable funds, and their cost of funding loans likely differs substantially from larger competitors.

² The Call reports are quarterly statements of financial information that are submitted to banking regulators. The information reported typically could be found on a bank’s balance sheet or income statement.

³ In this paper, a nonagricultural bank is one that holds a proportion of agricultural loans in its loan portfolio that is smaller than the unweighted average of the ratios of agricultural loans to total loans at all commercial banks. In recent years, that average has held around 15 percent of total loans.

Smaller banks also tend to be less diversified geographically, so that they may be more vulnerable than larger banks to adverse local events; for example, drought conditions in only a couple of counties could cause a significant proportion of a small bank's loan customers to have trouble meeting scheduled payments, while a larger bank might be less vulnerable to this sort of shock. To account for these potential differences in our regressions, we add the natural logarithm of the bank's assets as an explanatory variable.

We include several other ratios that are related to bank performance: 1) return on assets, 2) interest expense/ total assets, 3) delinquent loans / total loans, and 4) net charge-offs / total loans. We also include the ratio of loans to deposits, a traditional indicator of bank liquidity.

Table 4 lists the all of the variables used in the regressions, along with the mean and standard deviation for each; contrary to the previous tables, these statistics are calculated from raw, unweighted data. For instance, the mean of the 0-1 indicators shows that 5.4 percent of the sample loans fell in the first (least risky) category, while 41.7 percent were rated in the third (typical risk) category. The average interval until the loan could be repriced was about 3 months, while the average maturity was a little less than one year. Roughly 1/5 of the loans in the sample could be called by the bank, and very few (about 2 percent) carried a prepayment penalty. Most of the loans (more than 85 percent) were made under some sort of prior commitment, and more than 9 out of every 10 loans were secured (although relatively few were secured by farm real estate). The loans tended to come from banks that were more profitable—the average ROA for banks making the loans was 1.4 percent, a good bit above the 1.1 percent average rate of return for all small agricultural banks between 1997 and 2002 (Agricultural Finance Databook). The delinquency rate at banks making the loans was about 5-3/4 percent, considerably greater than the delinquency rate that prevailed at most agricultural banks.

Table 4
Summary of Regression Variables

Variable	Mean	Std Dev.
Risk Rating 1 (least risk) (1=yes, else 0)	.054	.227
Risk Rating 2 (1=yes, else 0)	.135	.341
Risk Rating 3 (average risk) (1=yes, else 0)	.417	.493
Risk Rating 4 (1=yes, else 0)	.224	.417
Risk Rating 5 (most risk) (1=yes, else 0)	.059	.235
Risk Rating 7 (bank does not rate farm loans) (1=yes, else 0)	.080	.271
Nonprice: Days until loan may be repriced	92.6	327.
Nonprice: Days until loan matures (0 if no stated maturity)	307.	515.
Nonprice: Call provision (1=yes)	.190	.392
Nonprice: Prepayment penalty (1=yes)	.020	.141
Nonprice: Loan made under commitment (1=yes)	.854	.353
Nonprice: Loan secured (1=yes)	.907	.290
Nonprice: Loan secured by farm real estate (1=yes)	.085	.278
Nonprice: Loan made in partnership with another bank (1=yes)	.019	.136
Nonprice: Loan insured by federal agency (1=yes)	.040	.195
Nonprice: Ln (loan amount)	2.44	1.55
Bank: Ln (bank assets)	14.8	3.18
Bank: ROA (percent)	1.40	.730
Bank: farm loans/total loans (percent)	23.4	24.7
Bank: interest expense/assets (percent)	2.99	.784
Bank: all loans/all deposits (percent)	85.4	21.8
Bank: all delinquencies/total loans (percent)	5.77	6.67
Bank: all net charge-offs/total loans (percent)	0.35	0.45

The regression results for the entire sample are shown in Table 5. The adjusted R-squared is 31 percent, indicating that a substantial proportion of the variability in rates of interest reflects differences in the terms of the loans and in bank performance. The T-statistics for most variables were significant at the 1 percent level, and the F-statistic of 1616 for the inclusion of the full set of explanatory variables also was highly significant.

After controlling for both the nonprice terms of the loan and the bank-specific differences, the coefficients for the risk rating indicators suggest a plausible and consistent pricing of loans according to their reported riskiness. For instance, a loan with the least risky rating, other factors equal, carried a rate of interest that was 1.3 percentage points less than a loan rated the most risky (coefficient on Risk 1 minus coefficient on Risk 5).

Coefficients on most other loan level variables were of a plausible magnitude. Loans with a prepayment penalty, issued under a prior commitment, issued in participation by more than one bank, or with federal insurance were priced lower than other loans, consistent with their risk-reducing properties. The coefficients on these nonprice terms indicated a reduction of 17 to 50 basis points for each characteristic, and all were highly significant.

Secured loans tended to carry a significantly higher rate of interest, which is consistent with results from Berger and Udell's (1990) finding that banks tend to extend unsecured loans mainly to their least risky customers. However, the subset of secured loans that were secured by farm real estate carried substantially lower rates of interest. The reduction in rates associated with real estate collateral was highly significant, which likely reflects the perception of bankers that farm real estate collateral affords considerable insurance against losses on loans.

Among the bank level variables, higher returns on assets were associated with lower rates on farm loans—in other words, more profitable banks in the survey tended to offer lower rates to their farm borrowers. In addition, banks that specialized in farm lending (as indicated by its farm loan ratio), tended to offer lower rates on their farm loans. While the parameter associated with the farm loan ratio was highly significant and suggests some economies of scale in making farm loans, the effect was small quantitatively. In contrast, the parameter on the ratio of interest expense to bank assets, our proxy for the bank's cost of funds, was large and highly significant.

Indeed, the coefficient of about unity suggests that banks tended to pass higher funding costs directly to their borrowers. In addition, greater bank liquidity, as measured by the ratio of loans to deposits, was associated with lower rates on new loans.

Among our indicators of portfolio quality, the higher the rate of delinquencies in the bank's portfolio (total delinquencies, both agricultural loans and other loans), the lower the rate charged on new loans. Similarly, banks with a higher rate of net charge-offs closed new farm loans with significantly lower rates of interest than other banks in the sample. However, both of these indicators are somewhat difficult to interpret because they are backward-looking, while new loans necessarily reflect the bank's assessment of the borrowers prospects in the future.

Table 5
Summary of Regression Estimates

Dependent Variable: Effective Rate of Interest

Observations: 84265

Adjusted R²: .306

F-statistic: 1616.

Variable	Parameter	t-value
Intercept	7.55	88.54
Loan-Level Variables		
Risk Rating 1 (least risk)	.03	.75
Risk Rating 2	.22	6.68
Risk Rating 3 (average risk)	.72	23.69
Risk Rating 4	.70	22.35
Risk Rating 5 (most risk)	1.34	37.08
Risk Rating 7 (not rated by bank)	.78	22.15
Days until loan may be repriced	-.00025	-12.62
Days until loan matures	.00004	3.13
Call provision	.25	17.10
Prepayment penalty	-.33	-9.0
Under commitment	-.30	-18.44
Secured	.13	7.02
Secured by farm real estate	-.44	-22.63
In partnership with another bank	-.50	-13.32
Insured by federal agency	-.17	-6.22
Ln (loan amount)	-.11	-31.04
Bank-Level Variables		
Ln (bank assets)	.004	1.01
ROA (percent)	-.21	-27.11
Farm loans/total loans (percent)	-.007	-18.48
Interest expense/assets (percent)	1.05	111.14
All loans/all deposits (percent)	-.02	-49.34
All delinquencies/total loans (percent)	-.02	-24.13
All net charge-offs/total loans (percent)	-.38	-29.95

Of course, economic conditions in the farm sector, as well as those in the broader economy, change considerably over time, and it seems reasonable to expect that these changes might affect the price and terms offered by banks to their farm customers. To explore changes in the terms of agricultural lending over time, we fit the regression described above separately to data for each quarter. The resulting lengthy list of parameter estimates is given in Table 6. As in the previous regression, we controlled for as many terms of the loan as possible and for variation in bank characteristics and performance in the sample. As a result, one can examine the changes over time in the spreads for loans of different riskiness. For example, the estimated coefficient for loans that were rated least risky (risk rating 1) ranged from -0.95 (i.e. 95 basis points) in the May 1998 survey to 0.04 (and statistically insignificant) in the August 2001 survey. Note that these spreads were calculated relative to loans in risk category "6", i.e. those loans that were not rated by the bank, although the bank did have a risk-rating program for loans in place (this was the risk rating category that was omitted as an explanatory variable in the regressions in order to avoid multicollinearity among the parameter estimates).

Table 6
Quarterly Parameter Estimates

Parameter Estimates for the Intercept and Risk Variables

Survey Date	Intercept	Risk 1	Risk 2	Risk 3	Risk 4	Risk 5	Risk 7
Aug-97	11.9647	-0.49308	-0.17222	0.12757	0.23793	0.72752	0.20502
t-stat	47.8258	-6.53293	-2.7425	2.27731	3.81161	8.5017	2.71945
Nov-97	11.783	-0.48701	-0.23025	0.03079	0.22264	0.69459	0.08046
t-stat	47.8241	-4.72214	-2.41406	0.33359	2.26701	6.2936	0.77199
Feb-98	12.0506	-0.65729	-0.47664	-0.1387	0.07627	0.43728	-0.18362
t-stat	45.1798	-4.73164	-3.72419	-1.12244	0.59348	3.1867	-1.44289
May-98	12.5247	-0.94904	-0.59727	-0.21326	-0.14523	0.32685	-0.37056
t-stat	44.3514	-6.40269	-4.21542	-1.55301	-1.04325	2.1904	-2.64859
Aug-98	12.8159	-0.65101	-0.3974	0.10831	0.29588	0.65371	0.04215
t-stat	46.4878	-5.20316	-3.52679	1.01864	2.70581	5.4272	0.37421
Nov-98	11.9541	-0.49646	-0.22382	0.12527	0.33193	0.65775	0.10106
t-stat	41.8561	-4.98943	-2.60931	1.60523	4.01168	6.5366	1.14664
Feb-99	11.4844	-0.24409	0.10169	0.34907	0.39019	0.82985	0.34103
t-stat	42.2632	-2.08628	0.97251	3.51377	3.83583	7.2128	3.06162
May-99	11.2163	-0.36181	-0.1442	0.31624	0.40295	0.68707	0.34323
t-stat	41.6286	-3.30496	-1.472	3.39456	4.17867	6.5817	3.28667
Aug-99	12.2804	-0.64136	-0.22602	0.21224	0.32965	0.95055	0.18731
t-stat	39.8524	-4.8204	-1.8774	1.84157	2.81412	7.6584	1.48955
Nov-99	12.3397	-0.79417	-0.35186	0.02702	0.20688	0.56362	0.10382
t-stat	34.8448	-5.92675	-2.86514	0.23316	1.74272	4.3818	0.80211
Feb-00	13.4864	-0.91174	-0.72512	-0.24191	-0.15846	0.27749	-0.38769
t-stat	39.421	-6.66962	-5.80215	-2.0575	-1.32042	2.0843	-2.91743
May-00	11.106	-0.51437	-0.20767	0.23163	0.33525	0.56311	-0.00855
t-stat	42.3539	-4.44223	-1.94983	2.31963	3.30438	4.9214	-0.07642
Aug-00	12.3781	-0.49469	-0.37895	0.09318	0.26268	0.59771	0.05745
t-stat	39.2529	-3.66872	-3.14693	0.84679	2.41396	4.6866	0.45831
Nov-00	11.7332	-0.40541	-0.06895	0.35768	0.48608	0.88851	0.11482
t-stat	36.2461	-3.42432	-0.67792	3.8946	5.21756	8.2568	0.95446
Feb-01	12.226	-0.53378	-0.06201	0.29856	0.43191	0.86318	0.06447
t-stat	41.4432	-4.7511	-0.6427	3.48386	4.96408	8.4615	0.58647
May-01	12.0182	-0.28291	-0.16668	0.35007	0.63659	0.71294	0.17941
t-stat	44.8908	-2.98594	-2.10903	5.04267	8.90223	8.1582	2.1347
Aug-01	11.9802	0.04119	0.13999	0.43473	0.68384	1.08439	0.32605
t-stat	36.5286	0.35906	1.44084	4.93891	7.74276	10.684	2.8177
Nov-01	10.2524	-0.56839	-0.23212	0.19406	0.38829	0.91346	0.37447
t-stat	29.1971	-4.10386	-1.96274	1.76625	3.53123	7.4353	2.87293
Feb-02	12.0048	-1.11079	-0.73761	-0.17772	0.18329	0.66915	-0.55219
t-stat	37.2174	-8.55097	-6.70699	-1.82777	1.88478	5.8708	-4.41506
May-02	13.0292	-0.52882	-0.55637	-0.19007	0.1028	0.69144	-0.24112
t-stat	46.2952	-4.67556	-5.84302	-2.24158	1.20269	6.863	-2.25384

Table 6 (continued) Parameter Estimates for the Nonprice Terms of the Loan

Survey Date	Reprice	Maturity	Callable	Prepay Pen.	Commit	Security	RE Secure	Participat	Fed Insur.	Amount
Aug-97	-0.00019	4.75E-06	0.27629	-0.75149	-0.09062	0.05885	-0.10314	-0.11674	0.22815	-0.14028
t-	-2.76407	0.10397	7.0784	-7.8939	-2.2137	1.36276	-1.67555	-1.03815	3.41081	-13.6192
Nov-97	-0.00032	-1.3E-05	0.26782	0.51477	-0.32017	0.06446	-0.15162	-0.28636	0.02151	-0.14256
t-	-5.58977	-0.37031	6.8464	5.2765	-7.5196	1.39694	-2.33092	-2.93409	0.25447	-14.8321
Feb-98	-0.0003	-4E-05	0.23995	-0.42409	-0.35908	0.01945	-0.18019	-0.44985	0.29851	-0.12166
t-	-5.76745	-1.21176	5.7167	-1.9762	-8.6236	0.38693	-3.09432	-4.31259	3.46239	-12.5196
May-98	-0.00023	1.52E-05	0.34895	-0.40166	-0.09822	0.04622	-0.0418	-0.56794	0.19577	-0.13082
t-	-4.71837	0.41645	9.3999	-2.5647	-2.3183	1.00048	-0.7631	-5.46906	2.66363	-13.3474
Aug-98	-0.00027	-0.00012	0.34521	0.58627	-0.15088	0.00401	0.04228	-0.15998	0.14138	-0.15889
t-	-4.48298	-2.95723	8.5602	4.4534	-3.3392	0.08788	0.65885	-1.64457	1.77816	-15.3195
Nov-98	-0.0002	-2.2E-05	0.31081	-0.10903	-0.1621	0.0609	0.03771	-0.59216	-0.14008	-0.16425
t-	-3.17592	-0.56891	6.957	-0.59	-3.4051	1.26022	0.53115	-5.17509	-1.54665	-16.2145
Feb-99	-0.00013	-5.7E-05	0.1744	-0.35993	-0.28489	0.11349	-0.15161	-0.65634	0.15384	-0.14168
t-	-2.65477	-1.51624	3.9498	-2.46	-6.8438	2.26891	-2.38337	-6.93978	1.71461	-14.7595
May-99	-0.00013	-1.3E-05	0.11989	-0.05146	-0.22964	0.19214	-0.24325	-0.4327	0.06825	-0.12775
t-	-2.51471	-0.43605	3.3406	-0.2896	-5.4573	3.72004	-4.2119	-4.47789	1.04202	-13.0856
Aug-99	-0.00028	1.36E-05	0.16898	0.03648	-0.3568	0.04921	-0.14953	-0.49377	0.03082	-0.13045
t-	-4.91228	0.33006	4.5075	0.199	-8.748	0.90245	-2.56279	-4.49874	0.4273	-13.0029
Nov-99	-0.00026	-1.6E-05	0.08725	-0.40761	-0.199	0.1336	0.07481	-0.44283	0.31457	-0.15908
t-	-4.00303	-0.38099	1.8748	-1.8032	-3.9471	2.12539	1.22758	-3.78015	3.5399	-13.8542
Feb-00	-0.00039	1.15E-06	0.41934	-0.57311	-0.37955	-0.0337	-0.08152	-0.3555	0.22091	-0.11125
t-	-6.47755	0.03222	9.2466	-2.8126	-7.6642	-0.49673	-1.52395	-2.90837	2.44144	-9.8858
May-00	-0.00036	0.000153	0.47257	-0.57029	-0.34004	0.05839	-0.20064	-0.19319	0.17802	-0.11399
t-	-6.99077	4.04056	12.5475	-2.8878	-7.4303	1.05269	-4.43548	-1.78079	2.48221	-11.0963
Aug-00	-0.00027	2.66E-05	0.54012	-0.17368	-0.33151	0.06203	-0.12887	-0.1707	0.15098	-0.12048
t-	-4.2351	0.6751	11.4835	-0.974	-6.2314	0.96419	-2.40827	-1.47133	1.75042	-10.3344
Nov-00	-0.00026	-5.3E-05	0.3997	-1.00168	-0.35539	0.06623	-0.19657	-0.3162	0.29249	-0.15958
t-	-4.5922	-1.41837	7.9204	-13.6575	-6.3474	1.06715	-3.45377	-3.10796	3.2011	-15.8445
Feb-01	-0.00015	-8E-05	0.16658	-0.26712	-0.36045	-0.06803	-0.08393	-0.67956	0.17289	-0.18256
t-	-2.75647	-2.7106	3.6348	-3.3755	-7.2201	-1.12731	-1.62159	-6.19707	1.88845	-18.8259
May-01	2.07E-05	-6.8E-05	0.05429	0.24669	-0.1866	-0.18957	0.06327	-0.23384	0.01675	-0.19468
t-	0.35862	-2.12492	1.3039	3.3792	-3.776	-3.98914	1.31036	-2.66617	0.2347	-21.9038
Aug-01	0.000114	-4E-05	-0.10189	0.57022	-0.37818	-0.03912	-0.14094	-0.47429	-0.0431	-0.20218
t-	1.97825	-1.01662	-2.2109	6.1852	-6.8908	-0.78093	-2.64246	-4.36047	-0.598	-20.6828
Nov-01	0.000393	-6.5E-05	-0.34335	1.36634	-0.37509	-0.00087	-0.18095	-0.60181	0.27328	-0.24985
t-	5.93557	-1.56449	-6.6449	13.618	-6.6978	-0.01388	-3.06528	-5.28968	3.06253	-23.8826
Feb-02	0.000329	-5.1E-05	-0.16862	1.10463	-0.35336	-0.12091	-0.0618	-0.78589	-0.30933	-0.20527
t-	5.38693	-1.42508	-3.2232	10.4736	-6.3012	-1.90251	-0.86609	-5.83903	-3.84503	-19.1277
May-02	0.000412	4.17E-05	-0.01275	0.02823	-0.61688	-0.09768	-0.0678	-0.69453	-0.29496	-0.20425
t-	6.70226	1.28604	-0.2889	0.4013	-12.5623	-1.81107	-1.10169	-4.92199	-4.09403	-21.1152

Table 6 (continued) Parameter Estimates for the Bank-level Variables

Survey Date	ln(Bank Assets)	ROA	Farm Ratio	Int.Exp./Loans	Loan/Dep.	Delin. Rate	Nchoff Rate
Aug-97	-0.145	0.07469	-0.0068071	-0.05145	0.005542	0.0064	0.17668
t-stat	-11.9613	1.95324	-6.35391	-1.4534	4.82557	1.24193	6.03537
Nov-97	-0.13008	0.0559	-0.0033028	-0.05355	0.007162	0.019063	0.08082
t-stat	-10.5573	1.25628	-2.95617	-1.4346	6.05146	2.14212	2.03024
Feb-98	-0.12414	0.05365	-0.0013468	-0.04673	0.004796	0.008311	0.05386
t-stat	-9.5209	1.21388	-1.25673	-1.2639	3.51747	0.83911	1.32545
May-98	-0.13807	-0.02102	-0.000898	-0.1297	0.005327	-0.00543	-0.02559
t-stat	-11.8415	-0.68866	-0.86343	-3.6725	4.35344	-3.74318	-0.59799
Aug-98	-0.15573	-0.04038	-0.0010973	-0.17159	0.004892	-0.020664	0.11325
t-stat	-12.1733	-1.04452	-0.95798	-4.8762	3.91853	-4.37747	2.88481
Nov-98	-0.14295	0.00808	5.9908E-	-0.03058	-0.00027	-0.013938	0.01751
t-stat	-10.1361	0.2248	0.05094	-0.8307	-0.20487	-1.60016	0.31657
Feb-99	-0.15304	0.01385	-0.0052002	0.09259	-0.00165	0.001504	0.04071
t-stat	-12.4118	0.40611	-4.63371	2.6617	-1.31538	0.16385	0.74366
May-99	-0.13772	-0.01302	-0.0054393	0.09715	-0.00128	-0.002685	-0.15936
t-stat	-10.7054	-0.42377	-5.2472	2.4993	-1.2863	-1.90533	-4.05936
Aug-99	-0.18245	0.01606	-0.0024289	-0.06916	0.003577	-0.015069	0.10073
t-stat	-12.5615	0.39936	-2.2231	-1.7746	3.143	-3.23178	1.93752
Nov-99	-0.16484	-0.06598	-0.0013442	-0.02943	0.002767	-0.045947	0.10729
t-stat	-10.0774	-1.29239	-1.0454	-0.5905	2.18074	-4.34631	1.74834
Feb-00	-0.16207	-0.14525	-0.0022265	-0.21955	0.003949	-0.03075	0.2373
t-stat	-10.3398	-2.99953	-1.84095	-4.8293	3.32803	-2.88783	3.23866
May-00	-0.08256	0.10382	-0.0032306	0.05062	0.002073	-0.002528	0.06186
t-stat	-6.7036	2.92677	-2.98949	1.6858	2.2436	-1.30539	2.07688
Aug-00	-0.11708	0.06655	-0.0039621	-0.06147	0.002977	0.000913	0.50209
t-stat	-7.9733	1.72145	-3.05511	-1.6731	2.64213	0.13198	6.52909
Nov-00	-0.06833	0.07666	-0.0003842	0.02216	-0.00081	-0.065259	0.50723
t-stat	-5.192	1.79553	-0.28297	0.5578	-0.49831	-5.74282	8.54973
Feb-01	-0.14697	0.14848	-0.0036264	0.0619	-0.00132	-0.024102	0.18105
t-stat	-11.5948	3.16721	-2.96445	1.7661	-1.31768	-1.73362	3.43665
May-01	-0.19206	0.05987	-0.0046814	0.04571	-0.00116	0.008244	-0.04869
t-stat	-14.836	2.97262	-3.91116	1.0856	-1.39113	3.91198	-1.43977
Aug-01	-0.20728	-0.08752	-0.0046762	0.0836	-0.00425	0.014903	-0.0494
t-stat	-14.186	-2.66359	-3.35782	1.7608	-4.79324	1.8406	-0.93976
Nov-01	-0.2683	0.03574	0.0014206	0.45139	-0.002	0.032241	0.05373
t-stat	-16.8928	0.9663	0.9636	10.4597	-2.67957	2.61467	0.85016
Feb-02	-0.32129	0.02705	-0.0005931	0.28175	-0.00387	0.00811	0.0378
t-stat	-20.7053	0.65255	-0.41004	7.5936	-4.32236	0.58082	0.67687
May-02	-0.32928	-0.12912	-0.0027003	-0.09769	-0.00051	-0.003463	0.04049
t-stat	-24.8321	-3.37411	-2.33912	-2.3886	-0.72799	-1.413	1.00748

It is common in describing financial markets to translate quoted rates of interest into rate spreads between instruments of varying degrees of riskiness. As shown in Exhibit 1, the markup for loans in either the third or fourth risk rating category moved closely together, and for the entire sample period averaged about 70 basis points over loans in the least risky category. As might be expected, fluctuations in the markup for the most risky loans were much wider than those on other loans, with noticeable spikes in 1999, 2001, and 2002. In general, the spreads largely exhibited similar patterns of ups and downs over the 20 quarters of the time period.

To further examine quarterly changes in the spreads on survey loans of different reported riskiness, Exhibit 2 compares movements in the estimated spread between survey loans that received the most risky rating and those with the least risky rating to movements in the spread of speculative-grade issues and those rated BAA in the corporate credit markets. The spread between the most risky and least risky loans in this bank survey generally ran a couple of percentage points less than the spread in the corporate markets; although the corporate spreads seem to show a bit of an upward trend over the sample period, while the spread on agricultural loans did not. The quarterly swings in the two spreads seemed to match up pretty well over the sample period, except for a somewhat anomalous spike in the agricultural series in 1999.

Exhibit 1

Spread over Risk Rating One

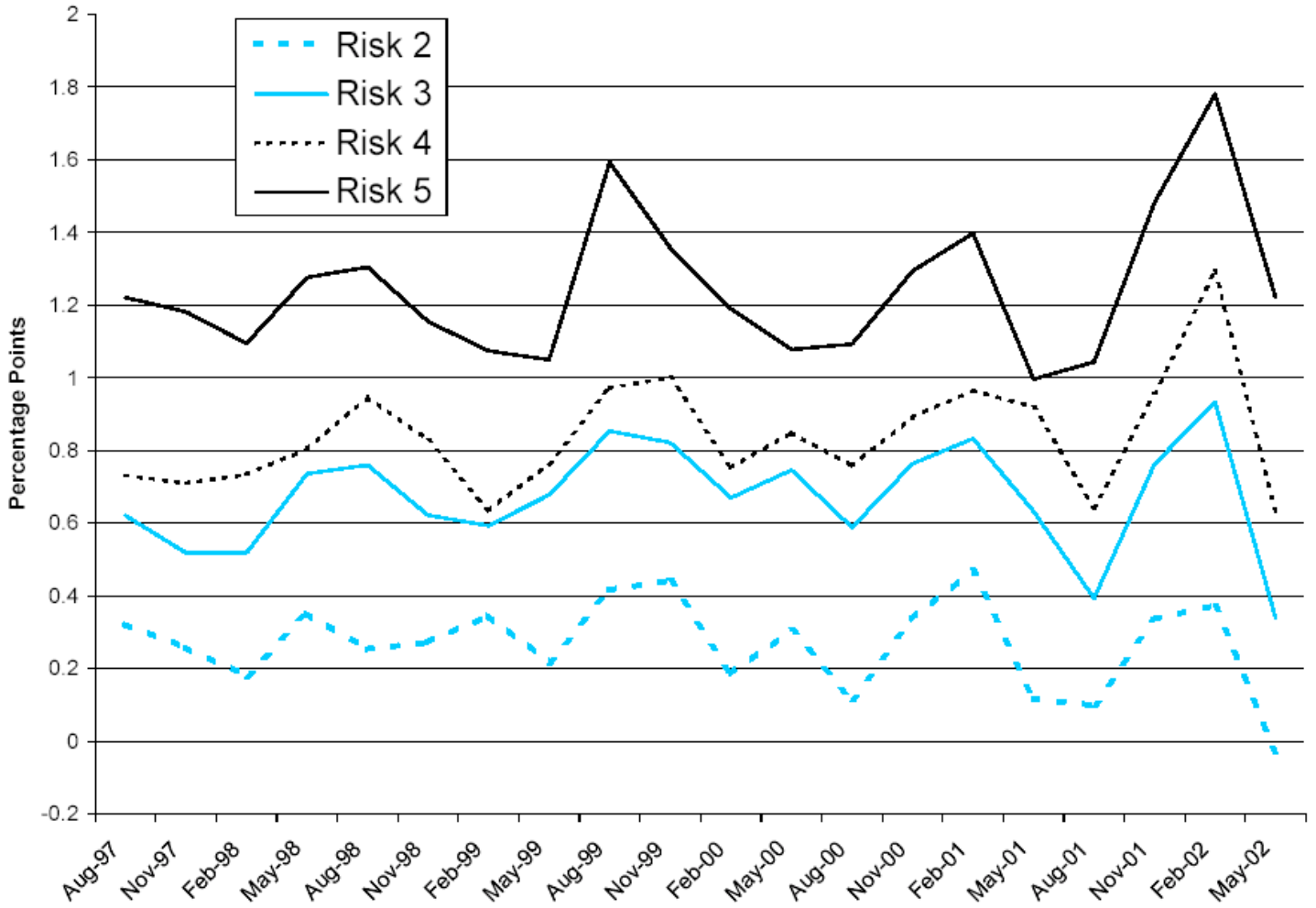
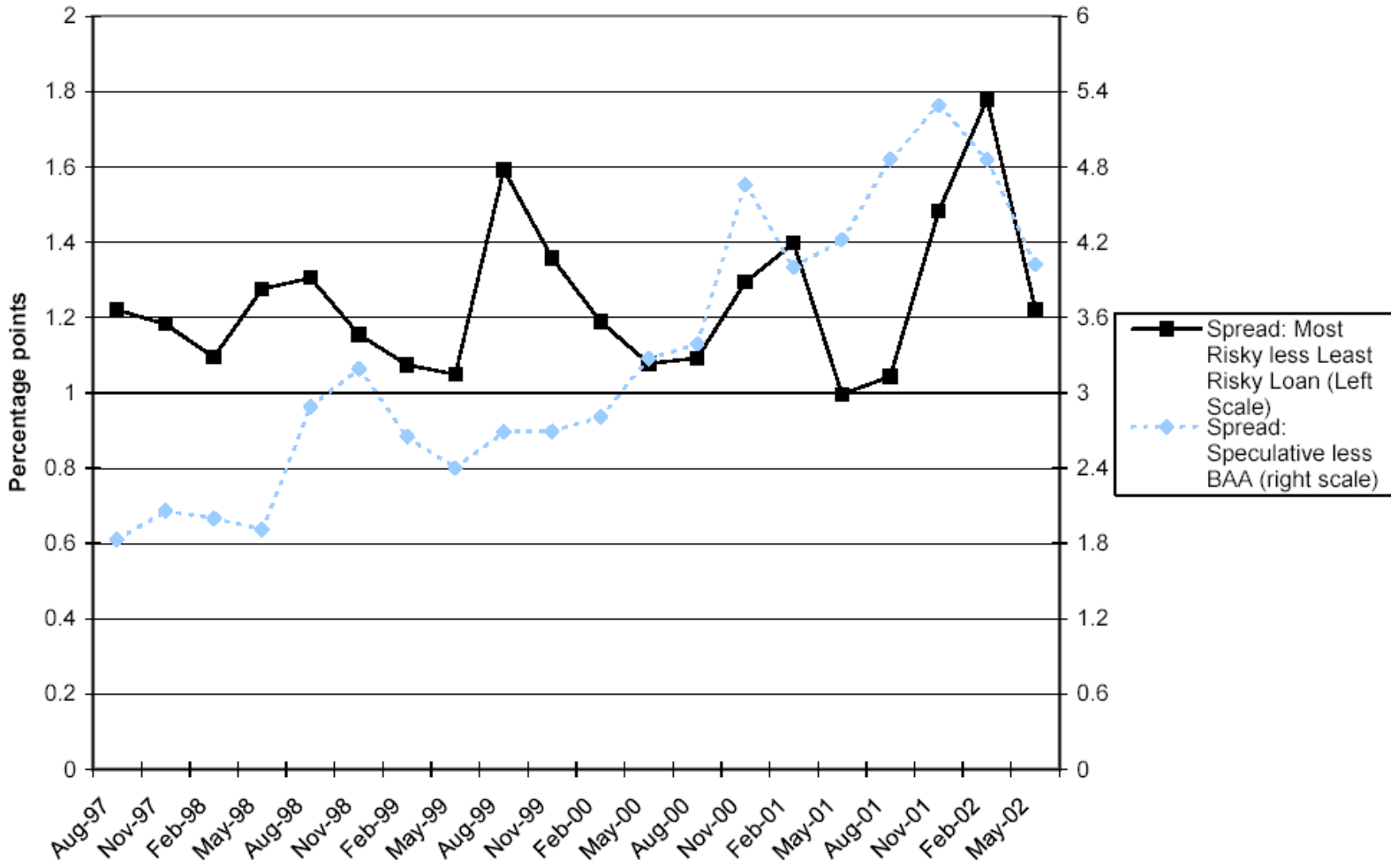


Exhibit 2

Risk Spreads



In examining the quarterly parameter estimates, it was apparent that beginning in 2001, the coefficients on the variables associated with the duration of the loan (the dummy for whether the loan could be called, the dummy for whether the loan could be prepaid, and the number of days until the loan could be repriced), each switched sign (the quarterly estimates for these variables are shown in Table 6 and Exhibits 3, 4, and 5 in the appendix). For almost the entire sample period until 2001, the inclusion of a call provision came along with an interest rate that was about 30 basis points higher (significant at the 1 percent level); during this period, about 1/4 of sample loans carried call provisions. Beginning in early 2001, the proportion of sample loans with call provisions dropped to about 15 percent or less, and the presence of a call provision, on average, reduced the rate on the loan by about 20 basis points. This switch in sign came as short-term interest rates were falling sharply in the broader economy and economic activity was sagging, perhaps suggesting that lenders may have been easing terms on their loans to bolster demand. By contrast, the sign and statistical significance of the coefficient for prepayment had not shown any particular pattern until 2001, when the inclusion of a prepayment penalty began to coincide significantly with loan rates that were upwards of a full percentage point higher.

In the summer of 2000, the average number of days until the loan could be repriced fell sharply in the survey. In addition, before that time, a longer period until the loan could be repriced was associated with significantly lower rates. However, by the latter part of 2001, fixing the rate for an additional month tended to add about 10 basis points to the cost of the loan. This effect was highly significant.

Concluding Comments

The data presented here suggest that, among the smaller community banks that provide a substantial portion of farm loans, the prevalence of risk rating systems changed little during the 5-year (1997-2002) sample period. Nevertheless, there is a sizable volume of farm lending that comes from commercial banks

and is carried out utilizing rating systems that enable banks to price the perceived riskiness of their loans. Such risk-adjusted pricing occurs within a framework where loan rates also reflect adjustments for a host of non-price terms, including security, commitments, call provisions, prepayment penalties, repricing intervals, and maturity.

The future will likely bring wider use of dual rating systems (frequency of default by borrowers and severity of default associated with loan transactions), as well as closer linkages between loan pricing, credit risk, economic capital, and risk-adjusted returns on capital. The systematic pricing practices on farm loans found in this study thus provide a benchmark to future research on loan pricing as the structure and managing of banks' credit risks continues to evolve. The resulting spreads between loans that are rated to be of minimal risk and those of high risk change over time in a pattern that is broadly consistent with quality spreads in corporate credit markets. Thus, the risk and other pricing characteristics of farm loans largely parallel those of non-farm business loans.

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Exhibit A-1

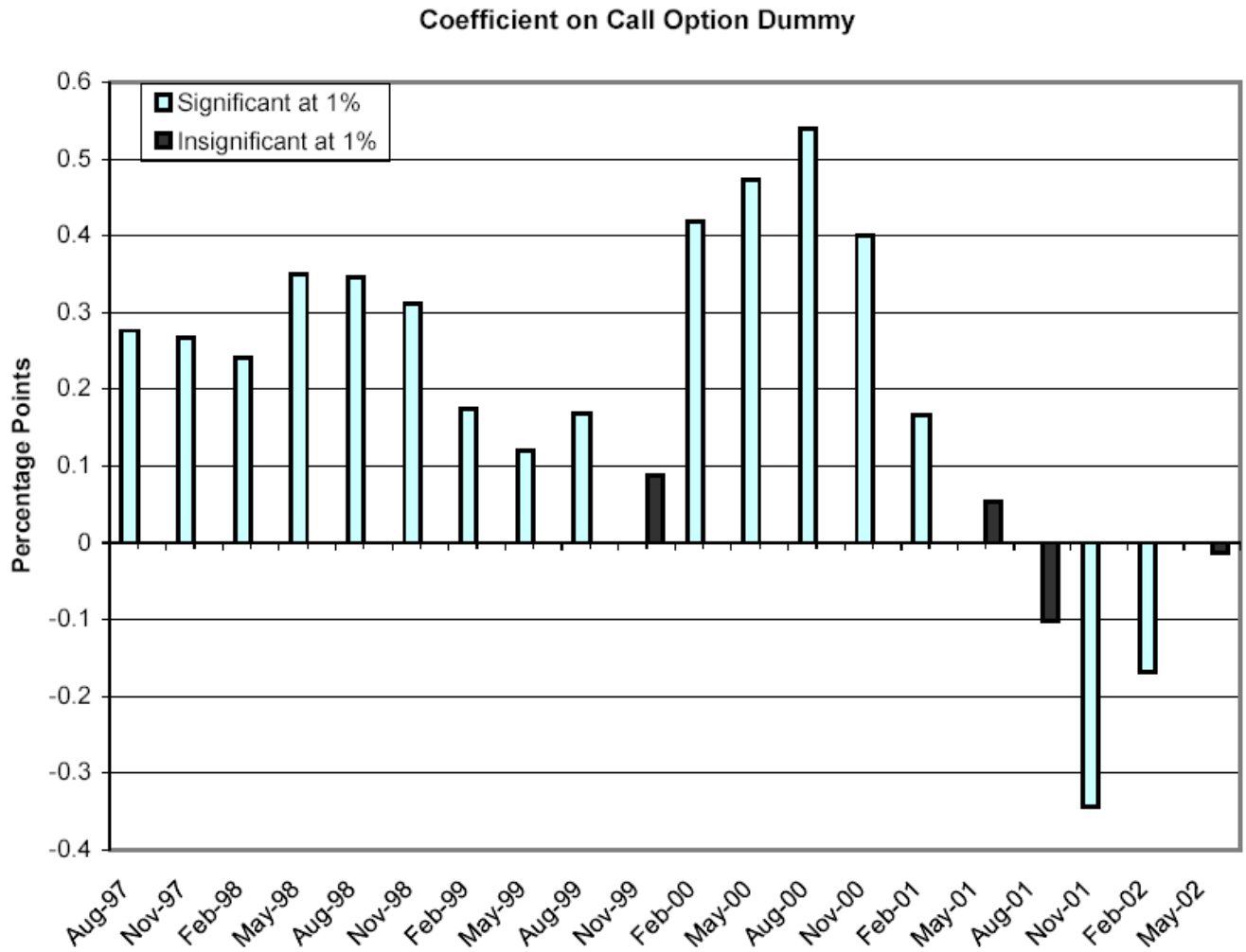


Exhibit A-2

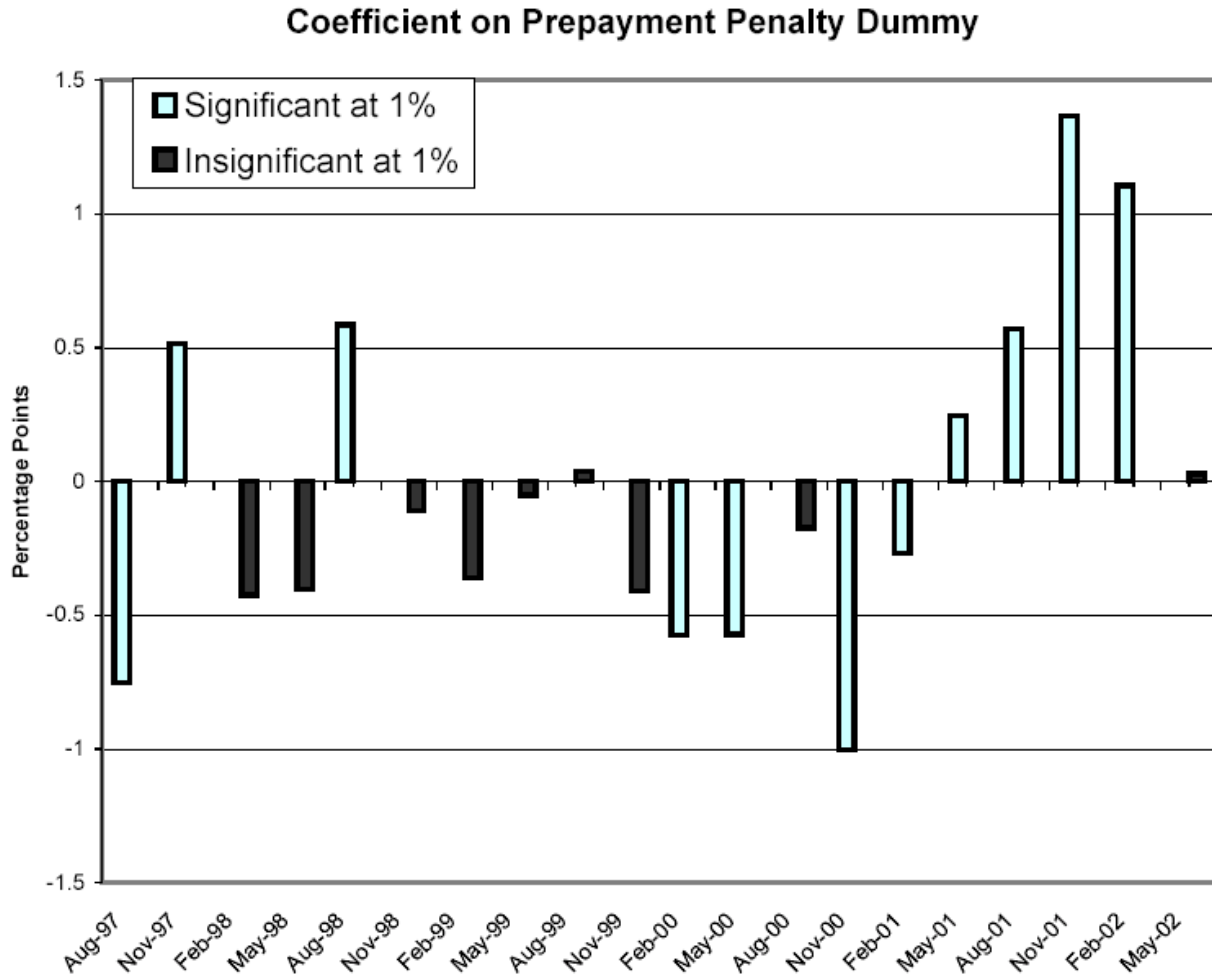


Exhibit A-3

Coefficient on Days to Repricing

