Judging The Risk of Banks: **What Makes Banks Opaque?**

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Abstract

We argue that the risk of banks is hard for outsiders to judge because the risk of their mostly financial assets is either hard to measure (opaque) or easy to change. We report evidence that bond rating agencies seem to disagree more over banks than over other types of firms. Among banks, bond raters disagree more over opaque assets, like loans, and easily substitutable assets, like cash and trading assets. Fixed assets, like premises, reduce disagreement. Capital also reduces disagreement, but only at trading banks, where the risk of asset shifting may be most severe.

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Introduction

The rationale for much of the regulation and protection of banks hinges on whether or not the risk of banks is hard for outsiders to judge, or *opaque*. If depositors could easily determine whether their bank was safe, they would not panic and deposit insurance would not be necessary to prevent bank runs. Without deposit insurance and the moral hazard it invites, many of the regulations that limit risk-taking by banks would also be unnecessary. The discount window would be also be less necessary, since banks could borrow in open debt markets at rates that fairly reflected their risk. Even the link between monetary policy and bank lending depends on how accurately the market can observe the risk of banks. When the Fed drains reserves, banks could maintain their lending by issuing *uninsured* debt that does not require reserves, such as large CDs or debentures. (Romer and Romer 1990). But if that debt is mispriced (because investors cannot observe the risk of banks), better banks will reduce their lending following a tightening in monetary policy (Stein 1995).

The arguments and evidence in this paper suggest that banks are opaque, and that the veil is inherent to the business. Banks hold few fixed assets, and the risk of their mostly financial assets are relatively hard to observe or easy to change. Their primary asset, loans, are often made to borrowers who require substantial screening and monitoring (Diamond 1984). Holding these claims on hard-to-monitor borrowers may make banks themselves (and similar intermediaries, such as insurance companies) opaque. The big trading banks, who have shifted from lending into trading more liquid securities and derivatives, may actually be more opaque. Myers and Rajan (1995) call this the *paradox* of liquidity; increased liquidity and trading can actually shrink a bank's debt capacity because the risk of trading banks is hard to track. Trading also creates

agency problems between traders and their managers, who may have little idea of the risks traders are taking, derivatives traders in particular (Hentschel and Smith 1996). Lastly, the high leverage at banks may tempt banks to take excessive risk since the risk is born more by the creditors or their insurers.

Flannery (1997) surveys the recent research that investigates the ability of outsiders to evaluate the risk of banks and other financial intermediaries.[1] The evidence to date is relatively limited and is often contradictory. For example, the pair of studies that tested for contagion among insurance firms after Hurricane Andrew (which struck in Florida and Louisiana in 1992) produced conflicting results: one found that only the insurers that had written policies in those states experienced share declines, while the other found that exposed and unexposed insurers were affected equally.[2] Flannery et. al. (1996) examined bid-ask spread on bank stocks, or more particularly, the adverse selection component of the spread; that portion of the spread that market makers demand to compensate for the risk that they are trading with better informed insiders. Their results are also mixed. The adverse selection premium is roughly two times higher for their sample of banks than for a general a sample of firms, suggesting the banks are more opaque, but the premium is unrelated to the composition of a bank's assets. They note, however, that the estimates of the adverse selection premium are noisy, making it difficult to identify the effect of specific assets.

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[1] Berger (1991) surveys the earlier literature.

[2] Another strand of the literature tests whether yields on large CDS and debentures issued by banks, which are not insured, reflect the risk of the bank or holding company. The evidence for this literature is also mixed, although most find at least some link between the risk and return on the instrument, particularly after the policy of Too-Big-To-Fail doctrine was relaxed in the early 1990s

This paper proposes a very simple, direct proxy for the degree of difficulty in judging risk: disagreement among credit raters. If the risk of banks or certain bank assets is hard to judge, the credit raters--who are in the business of judging risk--should disagree more over banks and over certain types of bank assets. I begin with some cross section evidence that the two major agencies, Moody's and Standard and Poor's (S&P), tend to split more over bank holding companies and insurance firms than over other firms of comparable size and risk. This finding reinforces Cantor and Packer (1994), who noticed that S&P as well as a number of smaller agencies split more often (from Moody's) over banks than over other types of firms.

To investigate *why* the raters disagree over banks, I add data on each bank's assets. For a panel of bank holding companies (banks) between 1983-93, I find that splits between Moody's and S&P increase as banks substitute loans for securities, suggesting that lending makes banks opaque. Splits are also increasing in trading assets, while premises and other fixed assets decrease the probability of a split. This result has a nice symmetry since on the continuum of agency problems, trading and premises are the endpoints; traders can change their positions instantly, but the bank's vault is hard to move. Increased capital also reduces the probability of a split, but the effect is significant only through its interaction with trading; capital seems to mitigate agency problems where the problems may be most severe, at trading banks.

The next section of the paper draws on recent theories of financial intermediation that suggest reasons why banks might be opaque. The second section proposes split credit ratings as a proxy for opaqueness and runs through a simple, statistical model of risk and ratings to guide the regression analysis. The results are in the third section.

1. What's Different About Banks?

Loans. Banks may be opaque because of the loans they hold. Diamond (1983) and others argue that the role of banks is to screen and monitor borrowers so that savers--depositors and other lenders--do not have to. If banks are doing their jobs as delegated monitors, they should know more about the risk of their loans than depositors or other outside investors. The fact that investors bid up a firm's share price after its bank loan commitment is renewed suggests that banks are better informed about their borrowers than market participants (James 1987).

Whether banks are better informed about the *aggregate* risk in their loan portfolio of loans, however, depends on whether banks fully diversify their loan portfolios. In Diamond's model, banks are supposed to get large and diversify the idiosyncratic risk of their loans, in which case outsiders only have to agree on the aggregate risk that banks cannot shed. But if banks deliberately retain some of the idiosyncratic risk in the loan portfolios, and if that risk is increasing in the size of their portfolio, we would expect more raters to disagree more often over banks with large loan portfolios.[3]

Trading. Increased trading may also make banks more opaque. Much of the trading banks now do involve complex derivative instruments whose risk may be hard to measure.

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[3] Banks may fail to fully diversify because of regulatory distortions. The restriction on interstate branching, which were only recently limited, may have limited their ability to diversify geographically. Deposit insurance, which is based only loosely on risk, may also lead banks to take inefficient risks, as might risk-based capital requirements. Because loans are riskier, regulators now require banks to hold more capital against loans than against cash and securities. To increase their risk without raising more capital, banks substitute one type of loan for another, even if doing so reduces their diversification. Banks may also fail to eliminate all idiosyncratic risks because the cannot observe it themselves. In that case, however, they are no better informed than outsiders so there is no information asymmetry. Krasa and Villamil (1992) present a model in which limited diversification is optimal because of monitoring costs associated with diversified portfolios.

Trading in general, even in plain vanilla securities, also leads to the classic agency problem of asset substitution since traders can change their position unbeknownst even to their own managers, much less outsiders like creditors and regulators.

Trading has become big business for some commercial banks. As a share of gross total assets, trading assets increased eight-fold between 1979 and 1994: from .6 percent to 4.8 percent (Berger, Kashyap, and Scalise 1995). The lion's share of trading is by 15 "trading" banks, defined for recent regulatory purposes as those with trading assets equal to ten percent of total assets or equal to $1 billion (Seiberg 1996). One bank in particular counted nearly half of its assets as trading assets in 1993. These banks often trade and make markets in derivative instruments, either futures, options, or swaps, or complex compounds of those instruments.

A series of spectacular losses has highlighted the risk associated with trading by banks. Barings Bank, a venerable British institution, was brought down by losses resulting from trading in currency derivatives by a single trader. At Daiwa Bank, a senior bond trader managed to lose over $1 billion while maintaining secret accounts for eleven years.

Hentshel and Smith (1996) use these episodes to illustrate the agency risks of trading: the risk that traders will act in their own interests rather than the interests of managers and shareholders (Hentschel and Smith 1996). They note that senior management and owners seemed as surprised by these events as outsiders, suggesting that even these principals were unaware of the risk the traders were taking. These "rogue" traders, they note, are responding rationally to the typical bonus scheme at trading firms; traders share the upside risk but their downside risk is limited because they do not hold capital positions. While principals can monitor to curb those incentives, derivative positions are hard to monitor because they are highly leveraged; leverage

reduces the cash flow needed to assume the position, which makes the position harder for auditors to track. The incentive of principals to monitor, it should also be noted, depends on their own capital position; the more leveraged the owners and managers, the more their interests are aligned with the traders.

While Hentschel and Smith stress the agency problems between owners/management and traders, Myers and Rajan (1995) focus on agency problems between owners/management and *creditor*s. They develop a model to illustrate how increased liquidity, and the trading it allows, can actually reduce a bank's debt capacity. They give the example of a bank with a portfolio of liquid securities. If the bank could commit to hold the securities to maturity, its risks would be easy for creditors to judge and the bank could be completely leveraged. Absent such a commitment, the risk of the bank becomes less certain to outsiders and that uncertainty reduces its ability to leverage. They note that this problem is most severe at trading banks, who are in the business of making markets or trading for their own accounts.

Fixed assets. If more liquid trading assets increase uncertainty about risk, it follows that fixed assets like premises should reduce it. While trader can quickly and privately change their positions, the position of fixed assets are harder to change; a bank's vault is hard to move. Their value of fixed assets fluctuate of course, but the fluctuations are more likely due to market changes and less likely due to the actions of the owners and managers.

Leverage. The opaque or easily substitutable nature of banks' assets gives them opportunities for risk shifting and their high leverage gives them incentive to do so. Banks are among the most highly leveraged firms in the U.S. economy. The typical bank has a capital to asset ratio on the order of 10 percent. The average capital-to-asset ratio at nonfinancial firms was

55 percent at the end of 1990 (Flannery 1994).

All else equal, leverage increases risk because such firms have a smaller capital cushions against the risks that are inherent to the firm, or against market risk. But leverage also invites risk-taking, since creditors bear more of the down-side risk. Once debt has been sold, the owners of the leveraged firm have the incentive to take on more risk than creditors expected when they bought the debt (Jensen and Meckling 1976). Risk-shifting not only increases risk, it will also make the banks' risk harder to judge to the extent banks have incentive to conceal their risk-taking.[4]

2. Split Ratings As a Proxy for Opaqueness.

Disagreement between rating agencies seems like a natural proxy whether the risk of banks is hard to judge. Bond ratings agencies are in the business of measuring risk and the two agencies used in this study, Moody's and Standard and Poor's, are the largest and oldest (Cantor and Packer 1994). If these agencies disagree over the risk of a firm, it seems reasonable to infer that there is something about the firm, or bank, that makes its risk hard to judge.

Disagreement among raters will feed through into the markets, since bond investors rely heavily on the judgment of the agencies. Cantor et.al. (1997) investigate the pricing of bonds with split ratings. Investors evidently price off the average of the two ratings, since the average predicts yields better than either the individual ratings, the highest rating, or the lowest rating. The

[4] While arguing that leverage invites agency problems, we recognize that leverage is endogenous: high leverage at banks could indicate that investors are not overly concerned about mismanagement at banks. Dewatripont and Tirole (1994) take that line. They argue that bank assets require relatively little monitoring and so investors are satisfied by a relatively low capital ratio. However, the high leverage at banks is misleading in some ways since the majority of banks debt are actually insured deposits.

predictive power of the average falls as the size of the split increases from one grade to two, suggesting that investors cannot rely as much on the raters when there is more disagreement between the raters. The borrowers pay for this greater uncertainty, since investors demand a premium, albeit a small one, when the raters split over a bond. Yields on investment grade bonds with split ratings are 3.3 basis points higher than predicted by the average rating of the bond. This uncertainty premium is 6 basis point for the full sample, including below investment grade bonds, but is not statistically significant.

A. A Statistical Model of Risk and Ratings

Before turning to the data, its helpful to run through a simple model of risk and ratings. The model fixes ideas about the source of disagreement between raters and guides the empirical specification to follow.

Let σ_j denote the risk of bank *j*. Bank *j* knows σ_j but rater *i* must estimate it. Imagine that rater *i* estimates the risk of bank *j* with the following linear equation:

$$\sigma_{ij} = \alpha_i + \beta'_i x_j + \epsilon_{ij} \qquad (1)$$

where x_j is an n-1 vector of asset shares and other variables. The difference between the first and second raters estimate of risk at bank *j* is:

$$\sigma_{1j} - \sigma_{2j} = \alpha_1 - \alpha_2 + (\beta'_1 - \beta'_2)x_j + \epsilon_{1j} - \epsilon_{2j}. \qquad (2)$$

Equation (2) two reveals three possible sources of disagreement between raters. If the constant terms differ ($\alpha_1 \neq \alpha_2$), the raters will disagree on average. This constant difference may be meaningful but it is hard to interpret since we cannot associate it with a bank's assets. The raters' estimates will also differ if $\beta'_1 \neq \beta'_2$. Assuming a true β' exists, $\beta'_1 \neq \beta'_2$ implies one or both raters estimate of β' is biased. Note that this bias implies a systematic difference between the

raters' estimates; if asset k was judged riskier by rater one than by rater two ($\beta_{1k} > \beta_{2k}$), rater one would consistently produce higher estimates of risk at banks with high $x_{k.}$ Bias over an asset seems like a strong from of opaqueness; if the risk of the asset were readily apparent, raters might at least agree on average. Lastly, the estimates of risk may also differ because of differences in the errors in each rater's estimate: $\epsilon_{1j} \neq \epsilon_{2j}$. This noise in the estimates will cause random differences in the estimates, in contrast to the systematic differences due to bias.[5]

Ratings. Let r_{ij} denote the letter rating assigned by rater *i* to bank *j*. Suppose there are only two ratings, *A* and *B*, and that raters convert their numerical risk estimates into letter ratings using a cutoff value of *c:* $r_{ij} = A$ if $\sigma_{ij} \preceq c$; $r_{ij} = B$ if $\sigma_{ij} > c$. Since the risk estimates have a random error, the ratings will also be random. The probability $(r_{ij} = A) = prob\ (\sigma_{ij} \preceq c)$. Substituting (1) for σ_{ij} and rearranging implies $prob\ (r_{ij} = A) = prob\ (\epsilon_{ij} \preceq c - \alpha_{ij} - \beta'_i x_j)$. Suppose ϵ_{ij} is distributed *F;* $F(k) = prob\ (e_{ij} \preceq k)$. Then $prob\ (r_{ij} = A) = F(c - \beta'_i x_j)$, where the constant term has been incorporated into the coefficient vector.

Split ratings. If the ϵ_j are independent and identically distributed across raters 1 and 2, the probability the raters split is

$$prob\ (r_{1j} \neq r_{2j}) = prob(r_{1j} = A)prob(r_{2j} = B) + prob(r_{1j} = B)prob(r_{2j} = A)$$

$$= F(c - \beta'_1 x_j)[1 - F(c - \beta'_2 x_j)] + [1 - F(c - \beta'_1 x_j)]\, F(c - \beta'_2 x_j).$$

Note that if $\beta'_1 = \beta'_2$, the $prob(r_{1j} \neq r_{2j}) = 2F(c - \beta' x_j)[1 - F(c - \beta' x_j)]$, implying the probability of

[5] Note that a constant difference and bias can offset one another. If $\alpha_1 > \alpha_2$ and $\beta_{1k} < \beta_{2k}$, for example, $\sigma_{1j} - \sigma_{2j}$ will increase in x_{jk} up to a point, even though the raters disagree about the risk of that asset.

a split due to noise is quadratic in F.[6] Intuitively, raters are more likely to agree on the very risky firms and on the very safe firms, while there is more room for disagreement on middle-rated firms.[7] We control for the nonlinear effect of risk on the probability of a split by including the average rating and its square in the estimation equation. We specify the probability of a split assuming F is a probit function. Since a split of more than one grade is possible, we estimate an ordered probit.

3. Results: Whether and Why Raters Split Over Banks

A. Do Raters Disagree More Over Banks?

In a study of the credit rating industry, Cantor and Packer (1994) compared the ratings of eight different bond rating agencies to Moody's. The relevant results are pieced together in table 1. Moody's and S&P split over only 37 percent of the general sample of firms, but over 63 percent of the banks. All together, six of the eight agencies split more often over banks than over other types of firms, usually by a substantial margin. Only two agencies split *less* often over banks, and in those cases the proportion of splits were nearly the same. A casual study by Crabbe (1996) found that Moody's and S&P disagreed more over banks *and* insurance firms than over other types of firms.

Neither of these studies tested whether the differences they noted were significant, so this section provides some reinforcing evidence. The data used here are a cross-section of 1128 firms

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[6] $F(c - \beta' x_j) \Rightarrow 1$ as $\beta' x_j \Rightarrow 0$ so $prob(r_{1j} \neq r_{2j}) \Rightarrow 0$. $F(c - \beta' x_j) \Rightarrow 0$ as $\beta' x_j \Rightarrow \infty$ so $prob(r_{1j} \neq r_{2j}) \Rightarrow 0$.

[7] This point loses force, the more ratings are possible since there will be fewer firms near the tails of the distribution.

in 1993, including 74 bank holding companies ("banks").[8] The date include the rating assigned by Moody's and Standard & Poor (S&P) to the firms' senior (or senior implied) bonds. Each agencies alphabetic rating was converted to a numeric value as follows:

S&P		Moody's		Numeric
AAA	=	Aaa	=	1
AA+	=	Aa1	=	2
.		.		.
.		.		.
B-	=	B3	=	16
lower rating			=	17

Note that lower numeric ratings correspond to higher letter grades, and thus *lower* risk.

A few statistics for the cross-section are reported in table 2. Both insurance companies and banks are broken out since the delegated monitor theories apply to both intermediaries. Overall, raters disagreed over 60 percent of the sample of firms. They split over 62 percent of the banks and 79 percent of insurance companies, compared to only 58 percent for other firms. While the difference between insurance companies and other firms in the probability of a split is significant, the difference between banks and other firms is *not* significant. Note, however, that banks are better rated on average and control substantially more assets than other firms. Since the probability of a split may depend on both risk and assets, we should control for those differences in testing whether raters split more over banks.

Multi-variate probit estimates of the probability of a split rating are reported in table 3. The dependent variable equals one if a firm had a split rating (zero if not), and the variables *Bank*

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[8] The ratings were collected from *Credit Ratings International* by Cantor and Packer (1994), who checked the accuracy of the ratings against other sources. They also excluded firms with incomplete *Compustat* data that they needed for their study.

and *insurance company* equal one if the firm is such. The first column confirms the fact just noted; raters split significantly more over insurance companies, but not over banks. Column two indicates that the probability of a split depend on risk, as measured by the average rating assigned by Moody's and S&P. The average rating and its square are both significant, and the signs are consistent with the earlier arguments: splits increase with risk up to some point, and then turn down as risk increases further. The pattern of coefficients on assets and assets squared tell the same story, although those coefficients are insignificant. Controlling for risk and assets (column 3) substantially increases the coefficient on *Bank*; given risk and assets, raters are about 12 percent more likely to split over banks than over other (non-insurance) firms. The difference is significant at about the seven percent level.

B. Why do Raters Split Over Banks?

To determine which bank assets cause raters to disagree, we narrow the focus to banks, and expand the data set. The additional data on ratings come from a panel of ratings assigned by Moody's and S&P to nearly all straight bonds issued between January 1983 and July 1993. The ratings were collected from various sources by the Federal Reserve Board. Cantor, Packer, and Cole (1996) trimmed the sample, excluding issues of less than $10 million, and issues rated below B3 by Moody's or below B1 by S&P. They also excluded equipment trust certificates, lease certificates, collateralized trust certificates, structured transactions (e.g. CMOs), variable coupon bonds, guaranteed bonds, deep discount issues, ESOP bonds, and bonds with significant equity features.

The panel included ratings on debt issued by 82 bank holding companies ("banks"). These

banks often issued debt more than once a year, but because the precise date of the issue was not known, I converted to annual observations by calculating the average absolute difference between the ratings assigned by Moody's and by S&P to all debt issued by a bank in a given year. This yielded a panel of 223 bank-year observations between 1983-93. To these were added 50 observations from the 1993:3 cross-section used in the results above. Only the *non-overlapping* observations from the cross-section were added to the panel, lest the ratings in the cross-section and the panel were not strictly comparable. Thus, the final panel of data used below included 273 bank-year observations between 1983-93.

The distribution of the average absolute difference between the ratings is shown in table 4. Although the absolute difference is discrete, the distribution of the average tends toward a continuous variable, bounded below at zero. Given the size of this sample, however, the mass of the distribution was still highly concentrated at 0,1, and 2 so I rounded the distribution as shown in the lower panel. The rounded value of the average absolute difference between the ratings will be the dependent variable in the regressions that follow.

Data on banks' assets were collected from the call reports banks are required to file with federal regulators (form Y-9C). Summary statistics on the banks' assets are shown in table 5. Loans and leases represent the largest share of banks' assets, followed by securities. Cash and deposits comprise almost 11 percent of assets, and range nearly as high as 40 percent. Assets held in trading accounts, or trading assets, represent only two percent of bank assets on average but go as high as 41 percent. These assets are defined not by their type, but their purpose:

trading.[9] The trading account is defined to include

> ...the assets held for resale by a bank holding company that regularly engages in trading activities. Assets held in trading accounts are generally held for a short period of time. Trading accounts ...contain only instrument purchased with the intent to resell. (Instructions for preparing form Y-9C)

Financial assets such as loans, cash, securities, and the like comprise more than 90 percent of banks' assets. Fixed assets, in contrast, comprise only about 2 percent of banks' assets. Banks report two types of fixed assets; their premises (the building and branches, vault, computers, etc.) which constitute about 1.5 percent of assets, and other real estate (the property collected on defaulted credits), which make up another half percent. The last point to take from table 4 is that banks are highly leveraged; the average capital-to-asset ratio in the sample was 6.3 percent, and was as low 3.5 percent.

Table 6 reports ordered probit estimates for the sample of 273 bank holding company-years. The dependent variable is the absolute magnitude of the split: 0,1, or 2. First consider the other control variables included in the regression: the year dummies, the average rating, and assets. Splits increased in the early 1990s, significantly so in 1990 and 1992. This result support the use of split ratings as a proxy for uncertainty about risk at banks, since the early 1990s were widely regarded as uncertain times for the banking industry.[10]

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[9] The assets in trading accounts include government securities, commercial paper, and bankers acceptances. The gains from trading derivatives of theses, such as forwards, options, and swaps are also counted in trading accounts. The notional value of derivatives are counted off-balance sheet.

[10] Banks suffered large losses on real estate loans, the economy contracted in 1990-91, and bank regulators imposed new capital requirements.

Neither the average rating or its square is significant and the signs are the opposite of what was expected. If we exclude the squared term, the average rating is positive and significant, implying that raters disagree more over riskier banks. The linear specification did not alter any of the other results, however, so we maintain this specification. Both assets and assets squared are highly significant. The pattern of signs indicates that probability of a split decreases up to some level of assets, and then increases.[11]

The sign of the coefficients on the various assets in table 6 indicate how the probability of a split changes as banks substitute a particular asset for cash and deposits, holding the share of other assets constant. Cash and deposits is the benchmark because that asset was excluded from the regression.

The negative on securities indicates that the probability of a split decreases as banks substitute securities for cash and deposits. We did not expect this result, but it makes some sense with hindsight.[12] Cash is the most liquid of assets, so it invites the agency problems that lead to the liquidity paradox. Creditors may prefer securities holdings to cash, since securities are part of a banks' core business but cash can be disposed of in any number of ways. This result is also consistent with a version of Jensen's (1986) free cash-flow hypotheses: creditors may prefer that borrowers use excess cash to repay debt, for fear they will squander it on risky investment projects.

The result above suggests that securities, rather than cash, is the right benchmark for

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[11]This result is consistent with other evidence that uncertainty about the risk of smaller banks may limit their access to uninsured deposits (Kashyap and Stein 1995, Jayaratne and Morgan 1997).

[12]This result holds even if the banks with very high cash holdings are excluded.

judging whether loans and other bank assets are opaque; substituting loans for cash will not necessarily increase splits if there also agency problems associated with cash. The impact of substituting loans and leases for securities is simply the sum of coefficients on those assets. The sum is positive and is significantly different from zero at below 1 percent, indicating that substitution from securities into loans and leases significantly increases disagreement between the raters.

The probability of a split also increases as banks substitute into trading assets, whether from cash *or* securities. The impact of substitutions between cash and trading is significant at below 5 percent. Moving securities into the trading account increases the probability of a split even more (the sum of the coefficients on securities and trading) and is significant at better than 1 percent.

The split over trading assets is largely systematic, with Moody's tending to downgrade trading banks relative to S&P. Moody's ratings tend to be lower in general, but that tendency was more pronounced over trading banks. Of the bank-years with more than two percent trading assets (the median), Moody's rating was lower for 68.65 percent and S&P was lower for 7.46 percent. Recall from equation two that this systematic difference is exactly what we should expect if the raters disagree about how much risk increases as banks shift into a particular asset class.

In a special comment, Moody's was very explicit about the agency risks of trading and the difficulty of monitoring traders:

> The complexity of derivatives also makes it more challenging for managers to understand and to keep track of what traders are doing. Not only are derivatives' market and credit risks difficult to manage from a purely conceptual viewpoint, but monitoring traders can be cumbersome... (The) manager or *auditor* may be potentially at a lost about what is going on (Moody's Special Comment 1991, p. 4, emphasis added)

We emphasize "auditor" since the role of the credit rating agencies is very much like an auditors.

In contrast to trading, which increase disagreement between the raters, premises and other fixed assets tend to decrease the probability of a split. Only premises is significant but the coefficient on premises is nearly identical to the coefficient on other real estate, and the difference is statistically insignificant. The equivalence of the coefficients premises and other real estate is notable since these two assets seem very different, at least by definition: premises are the building and facilities banks use in operations; other real estate is the property banks collected on defaulted loans. What is fundamentally the same about these two assets is that they are fixed; their value and position are relatively hard for the bank to change. If premises and other real estate are added and entered collectively, the coefficient is significant below 5 percent, implying that substitutions from cash into fixed assets reduce the probability of a split.

Capital also reduces the probability of a split, but not significantly. The standard error of the estimate on capital is large in part because the regression includes the bank's average rating, which is highly correlated with capital. If the average rating (and its square) are excluded, capital is significant at about 10 percent. Nevertheless, we want to control for ratings since the question is whether higher capital reduces *uncertainty* about risk, given the level of risk.

C. The Importance of Capital at Trading Banks.

Capital may be most useful in reducing uncertainty over the risks of trading. A strong capital position reduces agency problems between creditors and owners. Higher capital should also reduce agency problems between owners and traders, since better capitalized owners have incentive to monitor and control traders. To test that argument, we add an interactive variable to

the regression: *capital* x *trading*. If capital offsets the agency problems associated with trading, this variable should carry a negative coefficient. Suppose the probability of a split is approximately $P \approx a \cdot trading + b \cdot capital + c \cdot capital\ x\ trading + \ldots$ The impact of a change in trading on this probability is $\delta P/\delta trading = a + c \cdot capital$. If $a > 0$, then $c < 0$ implies that an increase in trading increases the probability of a split by less, the higher is capital. The interactive term also alters the impact of a change in capital, since $\delta P/\delta capital = b + c \cdot trading$. Recall that $b \preceq 0$, so $c < 0$ implies that an reduction in capital increases the probability of a split by more, the more trading a bank does.

The results in table 7 suggest that capital does help mitigate the agency problems at trading banks. The interactive variable, *capital x trading,* is negative and significant, as predicted. *Capital* itself is still insignificant. These two results imply that increased capital reduces the probability of a split, but only at banks with substantial trading assets. *Trading* still enters negatively, indicating that increases in trading directly increase the probability of a split, but less so at better capitalized banks.

It turns out that the trading banks in this sample are relatively poorly capitalized. For banks with trading assets equal to 2 percent or more of total assets (the median share), the average capital ratio 5.83 percent of assets. For banks with less than two percent trading assets, the average capital ratio was 6.47 percent. The difference between the these averages is highly significant.[13]

4. Conclusion

[13]The results also bear on the possibility of a lending channel of monetary policy; if banks' lending makes them opaque, contractions in the supply of insured deposits will force banks to reduce their lending.

While the existence of most bank regulation and protection presumes that the risk of banks is hard for outsiders to judge, the evidence to date is relatively limited. This paper provides new evidence using disagreement between bond raters as a proxy for the degree of difficulty in judging the risk of a firm or its assets. Credit raters seem to disagree more over banks and insurance companies than over other types of firms. Among banks, disagreement between the raters increases as banks substitute loans for securities, suggesting that the risk of a bank's loan portfolio is hard for outsiders to observe. The raters also disagree more over banks with more cash and trading assets, whose risk is easy change. This finding squares with what Myers and Rajan (1995) call the "paradox of liquidity;" increased liquidity can actually reduce the debt capacity of a financial intermediary because liquidity allows more trading, and trading risks are hard to monitor. Symmetrically, substitutions from cash into premises and other fixed assets tend to *reduce* disagreement between raters; when it comes to judging risk, a bank's vault seems more informative than the cash it contains. Increased capital also tends to reduce disagreement, but only where agency problems may be most severe-- at trading banks.

Taken together, the results suggest that the business of banks makes them opaque: banks are highly leveraged firms with few fixed assets, engaged in the business of lending and trading. These results provide some basis for the regulation and protection of banks, particularly the recent initiative requiring increased capital at trading banks; the uncertainty about the risk of such banks in this sample seems to reflect the combination of their trading activity and low capital.[14] More generally, the results suggest the importance of agency problems and incentives in risk

[14]The results also bear on the possibility of a lending channel of monetary policy; if banks' lending makes them opaque, contractions in the supply of insured deposits will force banks to reduce their lending.

taking. Split ratings may be a useful proxy in the rest of the literature that investigates informational problems in financial markets.

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Table 1

Debt Ratings of Eight Rating Agencies Compared To Moody's For General Sample of Firms and For Sample of International Banks

	General sample of firms in 1990			*Sample of international banks in 1994*		
Agency	# jointly rated	% split	correlation	# jointly rated	% split	correlation
S&P	1398	37	0.97	351	63	0.77
CBRS	37	62	0.83	11	91	0.52
DBRS	51	72	0.72	17	71	0.61
Duff	524	50	0.92	139	58	0.84
Fitch	295	53	0.90	68	62	0.77
IBCA	134	72	0.83	206	89	0.88
JBRI	65	89	0.67	19	100	0.73
NIS	33	67	0.63	351	63	0.81

Note: S&P = Standard and Poor's, CBRS = Canadian Bond Rating Service, DBRS = Dominion Bond Rating Service, Duff = Duff and Phelps Credit Rating Service, Fitch = Fitch Investors Service, IBCA = IBCA, Ltd., JBRI = Japanese Bond Rating Institute, NIS = Nippon Investor Service.
Source: Cantor and Packer (1994)

Table 2

Split ratings, average ratings, and assets for a cross-section of firms: 1993:4
(standard deviation in parenthesis)

	Number of firms	Percent with split ratings[1]	Average rating[2]	Average assets (billions $)[3]
All firms	1128	60.0 (49.2)	9.92 (3.69)	8.63 (21.50)
Bank holding companies	74	62.3 (49.5)	7.98 (2.33)	32.84 (42.31)
Insurance firms	53	79.8 (41.2)	8.48 (3.41)	15.47 (22.70)
Other firms	1001	58.0 (49.2)	10.14 (3.73)	6.48 (17.69)

[1] Bond ratings assigned by Moody's and Standard & Poor's differ.
[2] Average of Moody's and Standard and Poor'rating. Higher number = higher grade = higher risk.
[3] Banks' assets from Call Reports. Assets for all other firms from Compustat.

Table 3

Do Bond Raters Disagree More Over Banks?

Probit regressions estimates for sample of 1128 firms in 1993:3. Dependent variable equals one if rating assigned by Moody's differs from Standard and Poors'. Dummy variables "Bank" and "Insurance company" equal to one if a firm is such. Reported are estimates of change in probability of split rating associated with change from 0 to 1 in dummy variable, or with infinitesimal change in other variables. Robust standard errors of estimates in parenthesis.

Bank	0.038 (0.058)	–	0.106* (0.059)
Insurance company	0.210** (0.057)	–	0.237** (0.054)
Assets[1]	–	-0.002 (0.002)	-0.004** (0.002)
Assets squared	–	3.09e-06 (9.62e-06)	1.02e-05 (1.04e-06)
Average rating [2]	–	0.043** (0.021)	0.038* (0.022)
Average rating squared	–	-0.002* (0.001)	-0.002* (0.001)
Log Likelihood	-755	-744	-748
Chi^2 (3) statistic	10.14	12.16	26.97
Prob > Chi^2	0.006	0.016	0.000

*Significant at between five and ten percent.
**Significant at five percent or lower.
[1] Assets measured in $1 billions.
[2] Average of Moody's and Standard and Poor's rating; higher rating indicates higher risk.

Table 4
The distribution of split ratings and the dependent variable

Absolute average difference between ratings	Frequency	Percent	Cumulative
0.0	91	33.33	33.33
0.2	1	0.37	33.7
0.3	1	0.37	34.07
0.4	1	0.37	34.43
0.5	5	1.83	36.26
0.7	2	0.73	37
0.8	2	0.73	37.73
0.9	1	0.37	38.1
1.0	114	41.76	79.85
1.1	1	0.37	80.22
1.3	2	0.73	80.95
1.5	3	1.1	82.05
1.7	1	0.37	82.42
1.9	2	0.73	83.15
2.0	40	14.65	97.8
3.0	6	2.2	100
	273	100	
Dependent variable	Frequency	Percent	Cumulative
0	94	34.43	34.43
1	127	46.52	80.95
2	52	19.05	100
	273	100	

Table 5

Bank assets and capital as percentage of total assets
Sample comprises 273 bank holding company-years between 1983-1993.

Asset	Mean	Std. Dev.	Min.	Max.
loans & leases	60.76	11.95	15.10	85.96
securities	16.22	8.74	2.03	45.30
cash & deposits	10.86	6.19	1.42	39.28
fed. funds & repurchase agreements	3.29	3.64	0.00	23.66
trading assets	2.01	4.57	0.00	41.28
premises	1.61	0.54	0.46	5.19
other real estate	0.40	0.47	0.00	3.66
intangible assets	0.69	0.61	0.00	3.08
other assets	4.04	3.04	1.20	15.12
total assets (billions)	38.60	41.60	0.15	217.00
capital	6.31	1.45	3.37	10.97

Table 6

Which Assets Cause Credit Raters to Disagree Over Banks?

Ordered probit regression estimates. The dependent variable is the average absolute difference (0,1, or 2) between Moody's and Standard & Poor's rating of debt issued by a bank holding company in a given year. Each asset and capital are expressed as a percentage of total assets; cash and deposits are excluded. Sample comprises 273 bank holding company-years between 1983-93.

	Coefficient	Standard error
securities	-0.038**	0.019
federal funds & repurchase agreements	0.025	0.032
loans & leases	0.002	0.017
trading assets	0.062**	0.029
premises	-0.242*	0.144
other real estate	-0.291	0.212
investment in subsidiaries	0.246	0.281
intangible assets	0.028	0.135
other assets	0.039	0.042
capital	-0.40	0.080
assets[1]	-2.04E-08***	6.79E-09
assets squared	1.17E-16***	3.63E-17
average rating[2]	-0.131	0.148
average rating squared	0.014	0.009
1984	0.260	0.475
1985	-0.025	0.450
1986	-0.015	0.401
1987	0.292	0.405
1988	0.657	0.455
1989	0.255	0.453
1990	1.130**	0.544
1991	0.616	0.511
1992	0.999**	0.470
1993	0.570	0.452

***Significant at one percent. ** Significant at five percent. * Significant at ten percent [1] $1000

[2] Average of Moody's and Standard and Poor's rating; higher rating indicates higher risk.

Table 7

Does Capital Reduce Disagreement Over Trading?

Ordered probit regression equation using a panel of 273 bank holding company-years between 1983-93. Dependent variable equals the average absolute difference (0,1, or 2) between the bond rating assigned by Moody's and Standard & Poor's to debt issued by a bank holding company in a given year. Each asset and capital are expressed a percentage of total assets; cash and deposits are excluded. Years are dummy variables; 1983 excluded.

	Coefficient	Standard error
capital	0.018	0.084
trading assets	0.359**	0.155
capital x trading assets	-0.055**	0.027
securities	-0.046**	0.019
federal funds & repurchase agreements	0.022	0.032
loans & leases	-0.004	0.018
premises & other real estate	-0.290**	0.114
investment in subsidiaries	0.160	0.284
intangibles	0.030	0.134
other assets	0.033	0.042
assets[1]	-2.04E-08***	6.86E-09
assets squared	1.17E-16***	3.69E-17
average rating	-0.145	0.147
average rating squared	0.014*	0.009
1984	0.254	0.474
1985	-0.079	0.450
1986	-0.018	0.401
1987	0.312	0.407
1988	0.647	0.455
1989	0.296	0.454
1990	1.085**	0.546
1991	0.690	0.510
1992	1.133**	0.469
1993	0.648	0.447
LogLikelihood=-244.75327		

* Significant at ten percent or lower.** Significant at five percent or lower.***Significant at one percent or lower.
[1] $1000 [2] Average of Moody's and Standard and Poor's rating; higher rating indicates higher risk.