

Bank Loan Pricing and the Cost of Equity

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The cost of equity capital is notoriously difficult to estimate on a company-by-company basis. But banks, unlike most companies, hold assets with identifiable returns and reasonably measurable risk. I propose a method to estimate a bank's cost of equity capital from the returns and risks of widely available loan assets. I show that this method yields plausible estimates for a wide range of banks, enabling us to estimate value creation and value destruction in this industry. The results cast doubt on beta-based estimates of cost of equity.

I. Introduction

The cost of equity capital is a central object of study in financial economics. It is usually defined as the rate of return passive equity investors expect, require or demand to hold investments of a certain level of risk. But it is difficult to translate this concept into reliable empirical measures.

The standard CAPM approach is fraught with difficulty. The variance of market returns is so high that betas and equity premium cannot be estimated with much confidence. As noted in Fama and French (1997), standard errors of more than 3.0% per year are typical both for the CAPM and for Fama and French's (1993) three-factor model. The equity risk premium is more than 8% if estimated by taking the mean of historical annual returns on large company stocks less the return on Treasury bills, using numbers from Ibbotson (2004). Yet it is less than 3% in estimates based on earnings forecasts in Claus and Thomas (2001), or 2.5-4.3% as estimated by Fama and French (2002) based on dividend and earnings growth rates.

Individual company estimates are even more problematic than industry or market averages. Individual company betas are noisy and unstable over time. Valuation-based estimates as in Claus and Thomas (2001) or Elton and Gruber (1994) require reliable estimates of future earnings, dividends or cash flow, about which analysts vary considerably. In such studies the terminal value of the projections is particularly difficult to estimate reliably yet tends to dominate the output.

In this paper I develop and demonstrate a novel method to estimate the cost of equity capital of banks. The fundamental insight is that bank assets have identifiable returns and reasonably measurable risks. This permits a "market bank" to be modeled, a totally passive leveraged investment in tradable bank loans. The market bank's returns can readily be derived from its asset risk and its leverage, and can be identified with its cost of equity capital. The cost of equity capital for a real bank is a function of such a bank's risk, which can be approximated with a market bank of similar asset risk and similar leverage.

The paper is organized as follows. Section II describes the market bank and explains why its return to shareholders must equal the bank's cost of equity. It estimates this cost of equity for a plausible range of risk parameters. Section III shows how the market bank model can be used to estimate the cost of equity of real banks. These are estimated for a set of U.S. bank holding companies. Section IV checks the plausibility of Section III's estimates by comparing them to price/book ratios, to beta-based estimates and to valuation-based estimates. Section V offers some concluding thoughts.

II. The market bank

Characteristics of the market bank

A market bank is one that employs no people at all. The owners invest equity capital, sell certificates of deposit at market rates, and buy syndicated loans of a selected risk level. They must pay a small administrative cost to collect the loans and make payments on the deposits, but other than this they incur no expenses.

The market bank does not grow, but with appropriate leverage earns and pays out to its owners an equity return related to its risks. It is a strictly passive, leveraged investment in bank assets, with no investments in information or customer relationships. We do not observe free-standing market banks in practice because regulators usually do not allow banks to fund

themselves entirely with market deposits.¹ However, major banks engage continuously in buying syndicated loans and selling market deposits. Such activities are a voluntary supplement to their normal customer business; we may therefore visualize market banks as embedded within real banks.

If it were traded separately, the equity in a market bank would necessarily sell at its net asset value. The reason is arbitrage: if the equity sold at more than net asset value, the owners could immediately sell more equity and buy more assets, collecting riskfree gains until the prices of equity and assets came into alignment. Conversely, if the equity sold at a discount to book value the owners would buy up equity and sell assets to do so.²

When banks buy publicly available loans, they do so at prices reflecting their beliefs about required equity returns, so that the returns on traded bank assets are informative about required equity returns. This is different from “relationship lending”, in which banks make loans in the context of an ongoing relationship. First, banks may earn *more* than the required rate of return on relationship lending if their client has few alternatives and a degree of dependency on the bank, e.g. if the bank has “informationally captured” the client as in Sharpe (1990) or Rajan (1992). Or second, banks may earn *less* than the required rate of return on relationship lending if their client has superior negotiating power and forces the bank to accept an inferior return on the loan in exchange for awarding ancillary business. Market banking, however, should produce returns in line with the required rate of return.

It is not difficult to model a market bank. The bank has equity E, assets A, and deposit liabilities D = A-E that pay interest rate L (LIBOR). The variable-rate assets earn L plus a spread S, but are subject to a random future loss rate λ in each period. The bank is subject to administrative expenses equal to a fraction V of assets and an income tax rate τ . The cash flow to equity C is:

$$C = [A(L+S-\lambda-V) - DL] (1-\tau) = [EL + A(S-\lambda-V)] (1-\tau) \quad (1)$$

This represents an expected return to equity of

$$k_E = \mathbf{E}(C)/E = [L + (A/E)(S - \mathbf{E}(\lambda) - V)] (1-\tau) \quad (2)$$

where the expectation of a random variable is represented by $\mathbf{E}()$.

I confirm that this is the correct discount rate in a valuation problem. The value of the market bank, viewed as a perpetuity, is $\mathbf{E}(C)$ divided by the market’s discount rate. But because of arbitrage considerations the value of the market bank must equal its net asset value E. So the correct discount rate is $\mathbf{E}(C)/E$, which is k_E in equation (2).

Equation (2) makes no reference to systemic versus idiosyncratic risk, i.e. the portfolio considerations that lie at the heart of CAPM. However, agents who buy and sell the underlying syndicated assets and liabilities are doing so on a portfolio basis. Diversification of the asset portfolio should mean that the asset spread S reflects only systemic risk.

¹ Collateralized loan obligations (CLOs) represent the securitization of a passive pool of bank loans. The lowest tier in this structure resembles equity in a market bank. The difference is that it is leveraged by bonds rather than by deposits, and need not conform to regulatory guidelines on capital.

² Closed end mutual funds might be thought subject to a similar logic, but precisely because they are closed end, the managers cannot sell additional equity to take advantage of the arbitrage, and such funds usually trade at modest discounts to net asset value.

Data

We want to use spread and expected loss data on syndicated loans to estimate k_E in equation (2). This section describes the data used to do this.

Spread data on syndicated term loans are drawn from the DealScan database of Loan Pricing Corporation for the years 1998-2004. This database records loan facilities worldwide; but this paper analyzes only U.S. dollar term loans and revolving credits convertible into term loans, issued by U.S. corporations. Records with no entry for all-in drawn spread or for tenor (term to maturity) are removed.

In many cases the dataset includes Moody's and/or Standard and Poor's ratings on bonds of the syndicated loan issuer outstanding at the time of the syndicated loan. Such ratings can provide a guide to default probabilities. I therefore select only loans of issuers for which a long-term bond rating by either Moody's or Standard and Poor's (S&P) at the time of closing is recorded.³ The final dataset contains ____ loans.

Syndicated term loans in the highest credit levels (1-7) are very scarce. Indeed, there are only 8 loans over 1998-2004 in levels 1-5 (Aaa through A1), only 10 in level 6 (A2) and 21 in level 7(A3). The great majority of term loans occur for issuers rated Baa1 or less. Consequently, the main focus of our analysis will be on credit levels 8-17.

5Almost all syndicated term loans and almost all default experience is in rating levels 6-17; that is, firms rated rarely default and rarely use bank term loans. Consequently, the analysis in this paper is restricted to rating levels 6-17.

Due to cross-default provisions, default on bank debt is highly correlated with default on bonds so that default is typically a firm-wide event. Expected default probabilities for loans are therefore estimated from the 1983-2001 average one-year bond rating transition rates into the default category from various bond ratings reported in Exhibit 31 of Moody's (2004). These transition probabilities are assumed to be stationary and reasonably well measured by this long-term average. A Moody's bond rating is available for ____ of the loans in the dataset. For the remainder, the S&P bond rating is converted into its Moody's equivalent, and the rating given an integer value, as in Table 1.

Table 1 displays the rating levels, the one-year default incidence implied by the rating, the associated loss rates, and the natural logarithms of the loss rates. The logarithms are significant because they show a remarkable empirical regularity: they appear to be an approximately linear function of rating. The regularity is displayed in Figure 1.

There is no *a priori* reason to expect Moody's ratings to be evenly spaced against any particular variable. The sense of Table 1 and Figure 1, however, is that the rating scale, like a well-tempered musical scale, is essentially a geometric progression: the expected loss at each level is a fixed percentage above the expected loss at the previous level. The regression line has a slope of 0.594, which implies that the expected loss rate at each rating level is about 81% higher than the next lower level ($e^{0.594} = 1.81$).

It is a short step from default probability to expected default loss. Loss in event of default is typically lower for bank loans than for bonds. This is partly because the great majority of bank loans are secured: for the 65% of the loans in the present dataset that have information about seniority and security, 92% are senior secured and 8% are senior unsecured. Exhibit 15 of Moody's (2004) shows the recovery rate on defaulted senior secured bank loans as 59.3% on

³ In addition, a few syndicated bank loans are rated. However, such ratings often differ from the bond rating in ways that reflect the various terms of the particular loan, so cannot be taken as proxies for default probability in the straightforward way bond ratings can.

value-weighted average over 1982-2003, and on defaulted senior unsecured loans as 41.3%. I therefore estimate the historical recovery rate on loans in the dataset as the weighted average of these two numbers or 57.9%. Loss in event of default for syndicated loans is therefore taken to be the complement: $100.0 - 57.9 = 42.1\%$. A loan's annual historical loss rate will be taken to be the historical incidence of default times this weighted average loss in event of default.

We can now compare historical loss rates in this sense with historical average spreads. Table 2a displays mean spreads by rating category during the years 1998-2004. The overall average spreads across all years show a fairly orderly linear progression by rating level (next to last column). Against this I place the logarithm of 42.1% times the mean annual default rate in that rating level, i.e. the log expected loss.

Term loan spreads are generally believed to be a function of expected loss, the loan's term and the size (relative bargaining power) of the issuer. In addition, it is clear from Table 2a that spreads vary over time. Table 2b reports the result of regressing loan spreads against log expected loss, the loans' term in months, the logarithm of the issuer's sales in millions, and indicator variables for each year except the last.

Figure 2 combines and summarizes the above data patterns. The regularity of the patterns is striking: loan spreads are approximately a linear function of risk, while expected loan losses are an exponential function of risk. Yet this is not what theory would predict. A risk-neutral lender would set spreads exactly equal to expected losses, so that all the lines would rise exponentially. A risk-averse lender would set spreads higher than expected losses, particularly in the riskier categories, so that the spread line would be somewhat above the exponential loss line in the lower risk categories and more above it in the higher risk categories.

From the perspective of standard finance theory, Figure 2 does not make sense: it suggests lenders are highly averse to low default risk and decreasingly averse to higher default risk. The pattern however can be readily explained by reference to equation (2), which takes bank capital into account. Bank loans do not follow the asset pricing patterns of standard finance theory primarily because banks as institutions need to earn an appropriate return on their equity capital.

Spreads and the cost of capital

Equation (2) can be used to estimate the return on equity for a market bank with standard Basel capitalization of equity / assets = 8%, a tax rate of 40% (U.S. Federal 36% rate plus a small allowance for state and local taxes), and assets consisting of syndicated loans of a selected credit rating level. For L in equation (2) I use daily averages of three-month dollar LIBOR as reported by Datastream.

We need to estimate the rate of administrative expenses V, since even the most efficient banks incur some cost to administer a portfolio of loans and related funding. For this purpose I consult the expense ratios of the most efficient bond funds, the entities which most nearly resemble market banks. It appears that the most efficient funds have expense ratios in the range of 0.15-0.25%. Based upon this, I set $V = 0.20\%$.

The result is displayed in Table 3a for the years 1998-2004 holding the bank's A/E at the Basel maximum of 12.5; and in Table 3b averaging over the years and allowing the bank's A/E to vary between 12.5 and 7.5. In both tables, something clearly goes wrong at the highest rating levels (15-17): equity return falls with increased risk into negative territory as spreads fail to cover expected default losses.

Tables 3a and 3b as well as Figure 2 tell us that banks do not charge enough spread to their highest-risk borrowers. One reason is that some of these loans may be forced rollovers of

distressed loans, not reflective of arms-length market returns. Whatever the reason, the pursuit of risky loans is a poor banking strategy: unless the bank has other forms of revenue from these borrowers, shareholders do less well at the high risk end of the spectrum than they do in the middle. Indeed, during the years 1998-2004 loans in the rating categories 8-14 represented 62-76% of the annual dollar volume of syndicated loans. In general, syndicated term loans are concentrated in the rating levels Baa1-B1.

Except for the high-risk anomaly, Tables 3a and 3b show that market bank returns fall generally in a plausible range. Comparing them with long-term average returns in Ibbotson (2004), market bank returns range generally between those of corporate bonds (6.2%) and small company stocks (17.5%). If the market bank is leveraged as high as legally possible, as in Table 3a, average returns slightly exceed expected returns on large company stocks (12.4%) in most years. If the market bank is leveraged at less than the legal maximum, as in Table 3b, its returns average a plausible 8-13%.

III. Estimating bank cost of equity

Overall approach

Any firm's cost of equity capital should be a function of its risk. The primary risk run by banks is default risk. While exposure to interest rate and foreign exchange volatility add somewhat to bank risk, these are typically well hedged⁴. Banks have certain operational risks as well, such as exposure to rogue traders and fraud, but in the great majority of cases these are modest compared to default risk.

Table 3b shows the cost of equity capital for market banks with various combinations of default risk and leverage. The central purpose of this paper is to estimate the default risk and leverage of real banks and then match them with a market bank of similar default risk and leverage, in effect locating the real banks somewhere in the matrix of Table 3b. The procedure is as follows.

1. Observe the historical level of the bank's default losses as a percentage of assets over a number of years. Find the annual average loss rate and take the logarithm of this number.
2. Invert the regression line of Table 2b to solve for the spread associated with this log loss rate. That is, find the spread that would be earned by replacing the bank's actual assets with syndicated loans of the same average risk.
3. Use equation (2) to compute k_E for a market bank with the real bank's combination of asset risk and leverage. Use this as an estimate of the bank's cost of equity capital, i.e. the return that could be earned by a passive equity investor in market assets at the bank's risk level.

Data

Bank data from the period 1998-2004 were drawn from quarterly Federal Reserve (Y-9) filings by bank holding companies (BHCs) with assets more than \$1 billion; this resulted in ___ BHCs. The data were further screened to eliminate BHCs with less than five quarters of data available and those with negative average loan loss rates over the available quarters. Several adjustments were made to the data. First, income items on the Y-9s were converted from cumulative to quarterly. Second, goodwill was subtracted from both assets and equity because

⁴ This paper does not concern itself with thrift institutions – savings banks and savings and loan associations – whose main risk is exposure to interest rates.

goodwill represents payment in acquisitions for the non-tangible values that are here separated from regular bank assets. Observations with negative tangible equity were eliminated. This resulted in ___ observations on ___ BHCs.

The loss rate λ might be measured either with loss provisions or with net chargeoffs.⁵ Provisions are forward-looking but highly subjective, opinions about future losses. Chargeoffs are harder data (actual realized losses net of realized recoveries) but are backward looking. The two measures should converge over time. I compute an annual rate of chargeoffs (4 times quarterly chargeoffs divided by average tangible assets) and an annual rate of provisions (4 times quarterly provisions divided by average tangible assets) for each quarter. If the mean value of both is positive, those two means rates are averaged. If one mean rate is negative and the other positive, the positive rate is used. If both were negative, the bank is discarded as noted above.

LIBOR data and assumptions about the rate of taxation and administrative costs are the same as in the previous section. With sufficient data it would be possible

Results

⁵ Banks carry loss allowances on their balance sheets much as industrial companies carry depreciation allowances. Loss allowances estimate the extent to which, in the bank's judgment, principal value will not be recovered on some of their assets. The loss provision on each period's income statement is a deduction from income that increases the balance sheet allowance based on new information during the period. It is inherently subjective and forward-looking. Loss chargeoffs occur when the uncertainty is over and certain troubled loans have been resolved. Chargeoffs are a balance sheet deduction to both gross assets and loss allowance.

Table 1
Log Default Incidence
as a Function of Bond Rating Level

Moody's Rating	Standard & Poor's Equivalent	Numerical Rating Level	Moody's Default Incidence	Log Default Incidence
Aaa	AAA	1	0.00	
Aa1	AA+	2	0.00	
Aa2	AA	3	0.00	
Aa3	AA-	4	0.04	
A1	A+	5	0.00	
A2	A	6	0.03	-8.11
A3	A-	7	0.04	-7.82
Baa1	BBB+	8	0.19	-6.27
Baa2	BBB	9	0.13	-6.65
Baa3	BBB-	10	0.45	-5.40
Ba1	BB+	11	0.69	-4.98
Ba2	BB	12	0.66	-5.02
Ba3	BB-	13	2.34	-3.76
B1	B+	14	3.22	-3.44
B2	B	15	6.54	-2.73
B3	B-	16	11.55	-2.16
Caa to C	CCC+ to D	17	23.49	-1.45

Table 1 displays the scale of bond ratings used by Moody's and Standard and Poor's and, in the third column, a numerical equivalent scale. The fourth and fifth columns show the mean rate of annual default by bonds rated at various levels as reported in Moody's (2004) over 1982-2003 and the natural logarithm of these annual default rates. The data and regression line are displayed in Figure 1.

Table 2a
Mean Bank Loan Spreads by Bond Rating and Year, 1998-2004
(in basis points)

Rating	1998	1999	2000	2001	2002	2003	2004	Average	Log Default Loss*
6	251	-	49	113	300	125	-	168	-9.01
7	200	113	288	57	356	65	-	180	-8.72
8	88	177	92	113	83	129	150	119	-9.58
9	233	115	184	132	174	116	93	150	-8.98
10	135	182	152	229	191	186	115	170	-8.39
11	205	262	256	230	303	260	167	240	-7.79
12	198	250	228	270	301	274	198	246	-7.20
13	253	290	299	305	293	316	262	288	-6.60
14	264	304	308	319	366	332	302	313	-6.01
15	269	302	315	350	396	430	372	348	-5.42
16	256	311	317	337	449	411	417	357	-4.82
17	296	370	396	395	465	469	402	399	-4.23
Average	220	256	255	268	302	292	248	263	-3.63

Table 2b
Regression of Average Loan Spreads
on Explanatory Variables

	Coefficient	Standard Error
Constant	496.874	11.311
Log Loss	43.968	1.997
Log Size	-15.222	2.285
Term	-0.068	0.105
1998 Dummy	-52.474	7.446
1999 Dummy	-17.308	7.419
2000 Dummy	-10.910	7.633
2001 Dummy	5.253	8.991
2002 Dummy	43.870	9.640
2003 Dummy	40.297	8.704

$R^2 = 0.291$

Table 2a displays the spread data in summary form by taking the mean spread on all loans by year and bond rating category, and also the . Syndicated term loans in rating categories 1-4 (Aaa through Aa3) are extremely rare.

*In both tables, Historical Log Loan Loss means the natural logarithm of the historical (1988-2003) average annual default incidence times the historical loss rate on senior secured bank loans. The regression excludes rating level 5 (A1), for which there were no defaults in the period 1982-2003.

Table 3a
Expected Annual Market Bank Returns at A/E = 12.5

Rating	-----Year-----							Average
	1998	1999	2000	2001	2002	2003	2004	
8	8.08	14.53	8.90	8.91	5.40	8.58	10.06	9.21
9	18.71	9.63	15.51	10.11	12.02	7.36	5.51	11.26
10	10.89	14.23	12.70	16.96	12.83	12.10	6.69	12.34
11	15.30	19.37	19.68	16.16	20.43	16.84	9.82	16.80
12	13.32	17.02	16.07	17.72	18.74	16.43	10.64	15.70
13	14.68	17.31	18.65	17.62	15.48	16.83	12.72	16.18
14	10.63	13.48	14.45	13.75	16.00	13.12	10.79	13.17
15	2.13	4.37	6.11	7.23	9.40	11.60	7.16	6.86
16	-14.98	-11.05	-9.86	-9.86	-2.71	-5.96	-5.58	-8.57
17	-41.12	-35.80	-33.09	-34.73	-30.69	-30.75	-35.85	-34.58
Average 8-14	13.09	15.08	15.14	14.46	14.42	13.04	9.46	13.53

Table 3b
Expected Annual Market Bank Returns at Various A/E

Rating	-----Assets / Equity-----						
	12.5	11.5	10.5	9.5	8.5	7.5	6.5
8	9.21	8.64	8.07	7.50	6.93	6.37	5.80
9	11.26	10.53	9.80	9.07	8.33	7.60	6.87
10	12.34	11.53	10.71	9.89	9.07	8.25	7.43
11	16.80	15.63	14.45	13.27	12.10	10.92	9.75
12	15.70	14.62	13.53	12.44	11.35	10.27	9.18
13	16.18	15.06	13.93	12.81	11.68	10.55	9.43
14	13.17	12.29	11.40	10.52	9.63	8.75	7.86
15	6.86	6.48	6.10	5.72	5.34	4.96	4.58
16	-8.57	-7.72	-6.86	-6.01	-5.15	-4.30	-3.45
17	-34.58	-31.64	-28.71	-25.77	-22.84	-19.90	-16.97
Average 8-14	13.53	12.61	11.70	10.78	9.87	8.96	8.04

Figure 1
Log Default Incidence vs. Rating

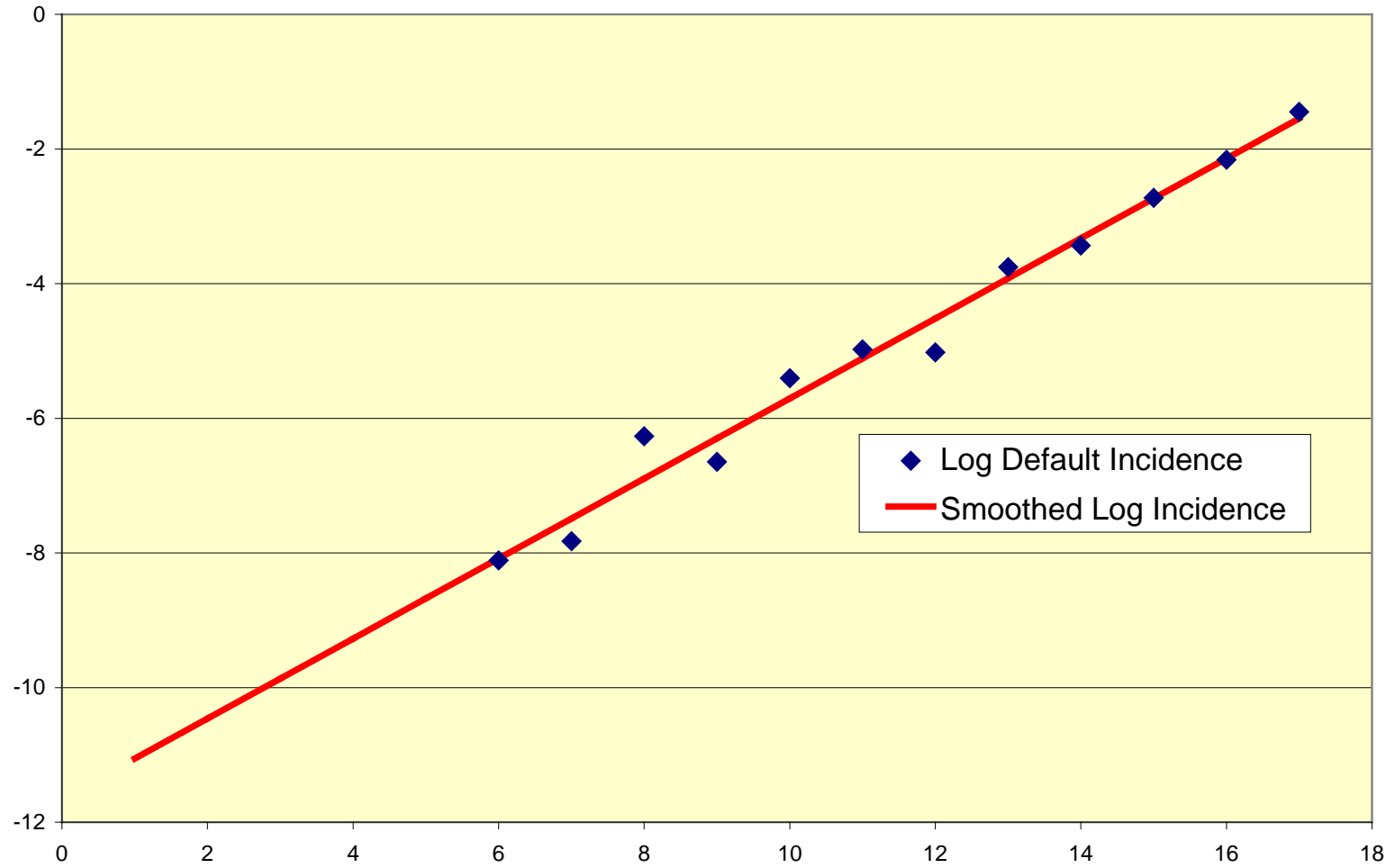
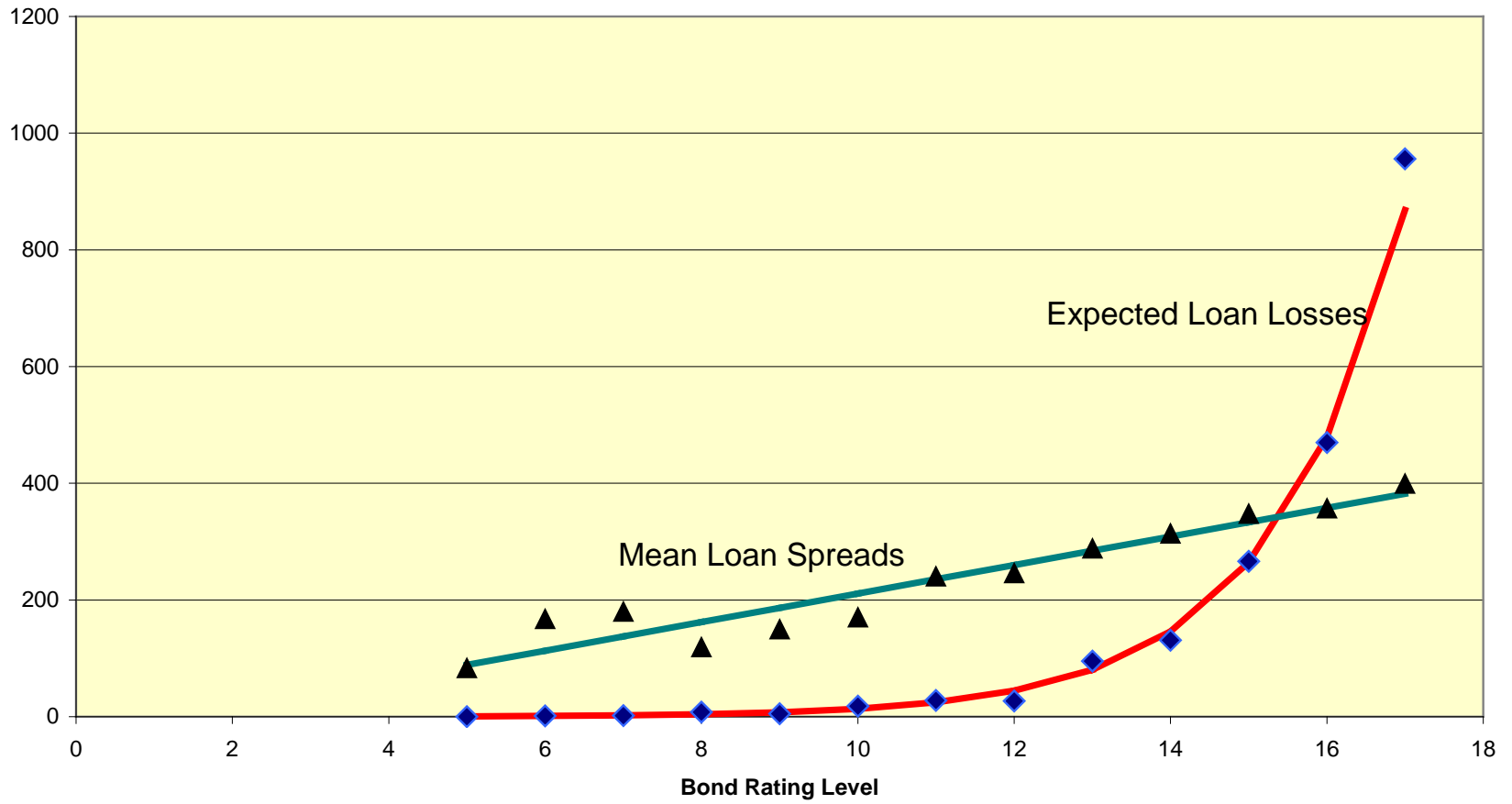


Figure 2
Mean Loan Spreads vs. Expected Loan Losses
(in basis points, by bond rating)



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