



Measuring Lending Profitability at the Loan Level: An Introduction



“How much am I making on this deal?” has been a fundamental question posed by bankers for as long as currency has been used as a medium of exchange. This has never been an easy question to answer, as doing so requires one to consider a variety of revenues and costs, many of which are anything but straightforward to quantify. Loan pricing models attempt to do this by computing the interest rate necessary to fairly compensate lenders for all of the costs of delivering money to their customers. These include not only tangible costs (e.g., their own cost of funds, salaries and other overhead) but the less tangible, indirect costs of bearing risk in many different forms. This is achieved by disaggregating the various costs of doing business in the banking industry and assigning a value to each of those costs. Having done this, a loan-level net income and return on allocated capital can be determined for various combinations of loan interest rates, fees and other sources of revenue.

Many lending institutions employ less-than-scientific methods for pricing loans. Lending rates are usually a function of the competitive environment, with rates being set at whatever the market will bear. This “seat of the pants” approach can and often does get banks in trouble. Loans that are booked (in hindsight) at less than profitable spreads can become a significant drag on a bank’s net interest margin and earnings, even if none of them default. Measuring lending profitability at the loan level provides answers to such critical questions as:

- ♦ *What is the true profit margin the bank is earning by booking loans at their proposed rates? Many banks consistently price some core products at less than break-even levels without even knowing it.*
- ♦ *Are the bank’s lending rates attracting the kind of credit exposure the bank is seeking? If customers who should be buying Chevys are instead buying Mercedes, the bank’s consumer loan products are probably mispriced.*
- ♦ *Is it rational to price the bank’s loans at levels comparable to the local competition’s? If the competition is earning yields lower than they could by simply buying “Baa” rated corporate bonds of a similar duration, the bank should probably not worry about losing this business.*
- ♦ *If the competition is making loans at irrational levels, what kinds of alternative products can the bank offer that will be attractive to customers and also ensure profitability? One of the strongest arguments for having a pricing model is to facilitate restructuring deal proposals in ways that are “win-win” for both the bank and its customers.*

While the mathematics behind each piece of the loan profitability formula can become quite complicated, the formula itself is readily understood:

$$\text{Return on Allocated Equity (ROE)} = \frac{\text{Loan Net Income (Annualized)}}{\text{Capital Allocation}}$$

To facilitate comparability between loans of different types, the annualized net income is usually based upon an average loan balance over the expected life of the loan. The capital allocation is also based on the average loan balance. A monthly amortization or pay-down schedule for the loan should be generated, based on its expected life, weighted by the monthly principal repayment.

As we examine the different components of the profitability equation it is important to keep in mind that many of these inputs must be based on allocations or other assumptions that can never be demonstrably “right” or “wrong” for any given loan. Rather than seeking exactness (which can never be determined with certainty anyway), the banker should employ inputs that are rational, reasonable and consistently applied. Another maxim to follow is the avoidance of assumptions that are bank-specific, in favor of those that are reflective of industry norms for a high-performing bank. The reason for this is that to the extent that a bank’s own results are higher or lower than industry norms, using these values as pricing assumptions will lead to systematic overstatement or understatement of an individual loan’s earnings contribution and Return On Equity (ROE), and possibly lead to faulty pricing decisions. For example, if a bank enjoys the lowest cost of funds in their

market, and uses its own cost of funds as a pricing assumption, the conclusion will invariably be that all of their loans are extremely profitable, and that the bank can offer the lowest loan rates in its market while still reaching any reasonable rate of return goal. Doing so will have the effect of passing along the benefit of its low-cost funding base to the bank's customers, rather than to its shareholders.

The numerator of the loan ROE formula is structurally similar to the profit/loss statement of the institution overall:

	<i>Loan income (interest + fees)</i>
Less:	<i>Cost of funds</i>
	<hr style="width: 100%;"/>
	<i>Net interest margin (gross profit)</i>
Less:	<i>Loan loss provision</i>
Less:	<i>Other risk premiums</i>
Less:	<i>Non-interest expenses</i>
	<hr style="width: 100%;"/>
	<i>Pre-tax net profit</i>
Less:	<i>Income taxes</i>
	<hr style="width: 100%;"/>
	<i>Net income</i>

We'll now look at each of these components:

Loan income: This is perhaps the least ambiguous line item on the loan income statement. It is the expected average annual loan interest income (based on the loan average balance), enhanced by any origination and/or annual fees, amortized over the expected life of the loan.

Cost of funds: Two assumptions should be applied to the cost of funds calculation, these being 1] pricing at the margin (i.e., using the current cost of acquiring funds, not the cost of the bank's existing funding) and 2] match funding. Whether the bank funds its loans this way or not, these are rational assumptions to make for determining loan profitability, as they eliminate the obfuscating effects of timing risk from the analysis. (Timing risk is the form of interest rate risk created by funding assets with liabilities that have different maturity or repricing characteristics.) Timing risk is generally considered beyond the scope of loan pricing decisions and is best addressed independently from the lending and credit functions; the bank's Asset/Liability Committee and Treasury function are the appropriate forums for measuring and managing these risks. Accordingly, for profitability measurement, loan balances are assumed to be match-funded with debt priced off a funding cost curve representing the bank's (or, more accurately, the industry's) current cost at each maturity/paydown point for the loan's principal. For most lending institutions, the current cost of an advance from their regional Federal Home Loan Bank (FHLB) is an appropriate proxy for the marginal cost of funds.

Finally, the effective cost of funds may be adjusted by an equity credit; i.e., to the extent that the bank funds its lending activity through some combination of debt and equity, it does not pay interest on the equity funding. The most straightforward approach to adjusting for this is to simply multiply the weighted average cost of funds by one minus the capital allocation used in the overall loan ROE calculation. Thus, if the weighted average funding cost is 3.00%, and the equity allocation is 8.0%, the loan's funding cost for profitability measurement would be $0.03 \times (1.00 - 0.08) = 2.76\%$. Some practitioners will also include a core deposit credit to further lower the effective funding cost, arguing that low-cost core deposits, which are present to some extent on every commercial bank's balance sheet, allow the industry to fund its lending activities at something less than the marginal cost of debt. ProfitStars' Margin Maximizer Suite does not assume a core deposit credit (although individual clients can build this into their customized assumption set) as this is a more conservative assumption and avoids the introduction of additional subjectivity and uncertainty into the equation.

Loan loss provision (credit risk): The ultimate goal here is to ensure that the bank is being adequately compensated for the risks it is taking in its lending business. Computing a risk-adjusted return on capital ("RAROC") requires considering three elements of risk:

Credit risk – the risk of loss due to the inability of the borrower to make good on his/her payment obligations, also called "default risk";

Market risk – for a loan not being held for sale, this would be its interest rate risk, or risk in adverse changes in its value to the bank due to timing risk: this risk is effectively eliminated from our profitability equation by the match-funding assumption in our cost of funds calculation;

Operational risk – these risks will be addressed in the next section.

Quantification of credit risk is often more art than science, and the events of the past several years illustrate that even the "best and brightest" in the field often make grievous errors in its measurement. Thus, ProfitStars' approach to credit risk is to base its application on actual industry experience. Our recent review of credit experience in the U.S. community banking industry (over the five year period ending 12/31/2009) found that the average annual charge-off rate for commercial loans over that period was 0.65%, or 65 basis points, of gross commercial loan balances. Accordingly, this is our default annual risk expense for commercial loans graded "average" on a bank's risk rating scale. Using this as a starting point, progressively lower (or higher) credit charges can be applied to loans graded higher (or lower) on the bank's risk rating scale. This results in a simple, conceptually sound means of pricing for risk, as the loan rate required to achieve a consistent target rate of return rises or falls as a function of the bank's assessment of its credit risk.

Other risk premiums: There are various elements of operational risk that may be considered in the profitability calculation; among the more significant are:

Prepayment risk – the risk that the loan will be paid off prior to the maturity of the matching debt, necessitating reinvestment of the loan principal at a reduced or negative spread to the matching debt for the duration of its term. This risk increases with the term of the loan and its matching debt.

Cap risk – the risk associated with not maintaining the targeted net interest margin due to the effects of periodic and lifetime caps on floating or adjustable rate loans. Cap risk rises as the cap level declines, the term of the cap protection extends and/or the loan rate reset frequency is shortened.

Pipeline risk – the risk associated with loan commitments failing to close; also, the negative cost of carry involved in acquiring funding for a loan prior to closing. Pipeline risk increases in a falling rate environment, while negative cost of carry increases when the yield curve steepens.

While pipeline risk is often small enough to be deemed immaterial, prepayment and cap risk are perhaps the most challenging variables in the profitability equation, due to their materiality and difficulties presented in quantifying them. As both of these risks arise from embedded options in the loan terms, the only conceptually sound means of quantifying these risk premiums is through some variation of option pricing theory (typically Monte Carlo simulation using stochastic methods). Applying such techniques to every loan pricing decision is beyond the resource and cost/benefit constraints of most banks and thus, necessarily, these values are arrived at through processes ranging between an "educated guess" and a "swag". Most bankers will intuitively price a longer-term fixed rate credit at a higher spread to the cost of funds than he/she would an adjustable rate credit, tacitly acknowledging the greater prepayment risk. The same goes for an adjustable rate credit with restrictive rate caps versus one with no limitations on rate adjustment. ProfitStars has built into Margin Maximizer capabilities to measure the variation in a loan's return in different hypothetical interest rate paths, but does not assign specific premiums for these risks.

Non-interest (operating) expenses: The bank must of course ensure that its operating costs, from the electric bill to lender incentive pay, are fully recovered in its lending activities. A simplified way to account for this is to charge an amount equal to the average loan balance times an efficiency ratio representative of industry norms for a high-performing institution (approximately 55 basis points is a good estimation). While simple to apply,

this approach assumes costs rise and fall proportional to the loan size; a tenuous assumption at best. A better approach (and the one used by Margin Maximizer) is to assign unit-level costs to originate and service loans of different types and sizes. By tiering assigned costs based on loan size we can acknowledge that a \$100,000 loan costs less to originate and service than a \$1 million dollar loan, but not one-tenth as much. We can also assign different costs to different types of loans that are the same size, based on their presumed level of relative effort. The unit costs themselves should be based on industry norms. Unfortunately, publically available industry data is insufficient to make these cost allocations with a high degree of confidence. Therefore the "rational, reasonable and consistently applied" maxim should apply.

Income taxes: When all income and expenses are considered you have determined a pre-tax income. An income tax expense on these earnings can then be applied, typically at the combined (federal/state/local) effective marginal rate. Rates, like other assumptions, should be an average among local competitors. Tax-exempt credit unions will normally price at after-tax levels, to avoid systemic under-pricing of loan products. To the extent they seek to "beat the banks" this would normally be accomplished through a lower targeted rate of return than a taxable entity would typically find acceptable.

Capital allocation: Once the loan's average annual contribution to the bank's bottom line has been determined, the result can be divided by allocated capital to calculate a return on equity. Numerous approaches to capital allocation exist, with the simplest one being to allocate capital at a consistent ratio to the average loan balance across all loan types. This ratio should, like other assumptions, reflect industry norms for a high-performing bank. "High-performing" in this context means "ROE maximizing", so the value should reflect as high a leverage ratio as possible while remaining well-capitalized by all regulatory standards; 8%-10% of book equity is a reasonable range. More complex methodologies will adjust the allocation ratio based on one or more variables, such as the type of loan, its risk rating, its expected life or maturity and possibly others. If capital allocations are not adjusted, rate of return expectations and goals normally will, as higher returns should be demanded for assuming risk in any form.

For more information on solutions to improve loan profitability, please visit our Online Knowledge Center at: <http://discover.profitstars.com/commercialending/home/>