

BUILDING AND PRICING A LOAN/FINANCIAL PRODUCT (Risk-Adjusted Return on Capital (RAROC)) (11.03.15)

The basic approach is to identify the “production” costs related to a loan (parts I – V) and then determine the profit (part VI) that is necessary for the loan.

I. Cost of Funds - Use *Marginal Cost* to set rates and *Average Cost* to evaluate profit

A. Acquisition Costs

1. Marginal Costs (common proxy is rate on deposits, LIBOR, Fed Funds Rate; may also use a weighted average of marginal costs for different types of debt and equity)
2. Average Costs = (total acquisition costs/net loanable funds), e.g., [interest expense + administrative costs – service charges + deposit insurance premiums + interest on required reserves]/[average collected balance X (1 – reserve requirement)]

B. Opportunity Costs – what can we do with the funds? The cost- and risk-adjusted return on the loan should be greater than other investment opportunities, e.g., yields on short-term Treasuries, Fed Funds, CDs, repurchase agreements, and 1-year Treasuries)

C. Maturity of funds source vs. maturity of loan (See section IV.)

D. Financial market stress may cause rates to behave differently than the past (See section V.)

E. Current and historical interest rates for the U.S. and major international debt markets may be found at www.wsj.com/bonds.

II. Administrative Costs - differ by loan type and size, see FCA examples; as loan size increases, administrative costs as % of loan decrease. Economies of scale may also be important, e.g., mortgage servicing and credit cards. This factor is also relevant to life insurance and smaller health insurance policies under the new health care reforms that limit the relative percent of premiums that cannot go to paying for health care benefits, e.g., 20% for smaller health plans and 15% for larger plans. Compliance costs are also affected by size and are a major consideration for smaller banks.

III. Default or Credit Risk Premiums (probability of loss times expected loss in default) - differ by loan type and economic conditions, see FDIC diagram for examples. It is important to recognize that the lender is trying to estimate default risk so it can be reflected as a cost in estimating the loan rate. A major problem with estimating risk is that the future may not behave in the same manner as the past and as risk increases the estimation range, i.e., confidence interval, around the estimate increases. The most common reason for banks to fail is not correctly estimating and pricing credit risk. Many terms of the loan may affect credit risk and a risk associated with one term or factor may be offset by reducing the risk associated with another factor, e.g., offset a low credit score with a low loan to value (LTV). Credit standards and loan covenants may be relaxed due to good economic times or increased competition while they may be increased during economic stress. During boom times more seasoned bankers will remind less experienced bankers that then is when they are making the loans that will go bad in a couple of years.

A. **5 Cs of Credit** - (These are the most commonly used 5 Cs.)

1. **Capacity** (ability to pay, e.g., payment/income ratio and variability of income and payments, e.g., adjustable-rate mortgage payments) – verify income
 - a. Consumer loans – all current and proposed debt payments/income
 - b. Residential mortgage loans – like consumer loans but property taxes, property insurance, and possibly condo or homeowner association (HOA) fees are added to required payments
 - c. Commercial loans – long-term debt service coverage ratios
 1. Times interest earned = EBIT (earnings before interest and taxes)/interest payments
 2. Times interest earned on a cash flow basis where depreciation and amortization are added to numerator = EBITDA/interest payments
 3. Fixed (Financial) Charge Coverage =

$$\frac{[\text{EBT} + \text{interest payments} + \text{lease payments}]}{[\text{Interest} + \text{lease payment} + (\text{principal payment}/(1 - \text{tax rate}))]}$$

This ratio is more inclusive since problems can arise just as easily from a failure to pay *fixed financial charges* other than interest such as lease payments or principal payments associated with bonds or amortized loans. The interest and lease payments are added back to the numerator because they were deducted to determine EBT. Principal payments are not tax deductible therefore they are not added to the numerator and they are divided by (1 – tax rate) to determine the before-tax level of earnings necessary to cover the principal payments. It also is better if lease payments or amortized debt are common in the industry. Examples of equipment leases include aircraft, commercial vehicles, copiers, heavy machinery, and healthcare equipment for small and large businesses. Depreciation and amortization may be added to numerator to examine coverage of cash flows to fixed charges.

4. The Office of the Comptroller of the Currency (OCC), Federal Deposit Insurance Corp. (FDIC) and Board of Governors of the Federal Reserve System (FRS) issued “Interagency Guidance on Leveraged Lending” in March 2013, outlining principles of safe-and-sound leveraged lending activities. They sought to restrain the underwriting of loans that would push a borrower’s debt beyond six times free cash flow (EBITDA). This was done to limit banks’ exposure to highly leveraged positions and, ultimately, to promote

financial stability.

- d. Long-term Commercial loans – long-term debt and profitability ratios
 1. (current, long-term or total debt)/assets
 2. (current, long-term or total debt)/equity; Experian uses tangible net worth (common equity – intangibles such as goodwill) instead of equity because in liquidation the intangibles will probably have a value of zero.
 3. gross profit margin = (sales – cost of goods sold)/sales
 4. net operating margin = net operating income (NOI or EBIT)/sales
 5. net profit margin = net income after taxes/sales
 6. return on assets = net income after taxes/average total assets
 7. return on equity = net income after taxes/average common equity; Experian uses tangible net worth (common equity – intangibles such as goodwill) instead of equity because in liquidation the intangibles will probably have a value of zero.
- e. Short-term Commercial loans – short-term liquidity and activity ratios. It is important to obtain a credit report in evaluating these ratios because some of the assets may have liens on them that may negate their normal interpretation.
 1. current ratio = current assets/current liabilities
 2. quick ratio = (current assets – inventory)/current liabilities
 3. net working capital = current assets – current liabilities
 4. cash turnover = sales/(cash + cash equivalents)
 5. average collection period (aka days sales outstanding) =
accounts receivable/daily credit sales
 6. inventory turnover = sales/average inventory and
Cost of goods sold/average inventory

credit

2. **Character** (willingness to pay, e.g., credit history from credit reports, and scores from FICO or VantageScore) FICO factors used to score a consumer, in order of importance: (1) major derogatory items on your report (bankruptcy, collections, foreclosure, slow pays); (2) time at present job; (3) occupation (Professionals are given heavy weight); (4) time at present address; (5) ratio of balances to available credit lines (the lower the better); (6) Are you a homeowner? (if you are, this is heavily weighted); (7) number of recent inquiries; (8) age (50+ is the best); (9) number of credit lines on your report; and (10) years you have had a credit in the credit bureau database. A problem with any statistical approach to estimating default is that the model assumes the behavior in the past will continue in the future. The increasing use of “strategic defaults” (a borrower with the ability to make payments on a loan defaulting on a home loan because the home value is significantly less than the loan value) in 2008-2010 has led to lower predictability by earlier models.

3. **Collateral** - Secured Loan (common on real estate, auto, and commercial loans)
 - a. ↓ risk but need to charge for any investigating and monitoring costs; also better claim in default rather than being general creditor
 - b. Types - marketable securities, accounts receivable, inventories, fixed assets, mortgages on real estate, autos; value should be independent of borrower
 - c. Bank's claim on collateral must be perfected (Uniform Commercial Code(UCC)); as foreclosure difficulty increases in different states or countries, loan rates and credit standards increase
 - d. As marketability of collateral increases the expected value is more certain and loan size as % of collateral should increase. An example is the quality of a real estate appraisal. Real estate appraisals are based on three approaches: (1) present value of cash flows, (2) market comparisons, and (3) replacement cost. As the volatility for real estate prices increases, the uncertainty of the appraisal increases and the risk associated with the loan increases. The appraiser of the collateral should be independent of the borrower, the broker, and the lender and be familiar with the local market for the collateral.
 - e. The lender may want a debt covenant that prevents using any assets as collateral for another debt.
 - f. Positive value derivatives may be collateralized.
 - g. Overcollateralization where the value of the collateral is more than the loan or debt amount is a method to decrease risk.

4. **Capital** – If the loan is related to a type of collateral then the value of collateral may be separated into two components, (1) the down payment or borrower's equity and (2) the loan amount. As the loan/value (LTV) decreases the risk of the loan decreases. A lower LTV or higher equity signals borrower's expectations, and decreases moral hazard because the borrower absorbs all the losses before the lender. The borrower has "skin in the game."

5. **Conditions** (Economic conditions affect other 4 Cs as they change over time.)
 Financial regulators expect financial institutions to have a process in place (staffed by skilled individuals) that serves as an "early warning" system to adequately identify deteriorating credit risk in loans. The annual credit review of commercial borrowers is the critical element of this process. Obtaining and analyzing current financial statements is an important part of this process, along with guarantor analysis, site visits, market and industry review, collateral coverage determination, and the appropriateness of loan structuring. An example of changing collateral and capital follows. The median price of a condo or townhouse in the Orlando MSA in February 2014 was \$104,000. Prices for the multifamily housing units in Orange, Lake, Seminole and Osceola counties are far from their peak of

\$166,100 in 2006, but prices have more than doubled since hitting a low of \$49,300 in August 2010. Condo prices decreased by 70% from their peak in 2006 to their low in August 2010. February 2014 prices represent 63% of their peak prices. Source: “Orlando condo prices up 26 percent in past year,” Mary Shanklin, OrlandoSentinel.com, 5:16 PM EDT, March 20, 2014.

- B. Loan portfolio diversification - loan and geographic types, borrowers, correlations; may use loan purchases, participations or loan-backed securities to diversify
- C. Hedging with Credit Derivatives (primarily credit default swaps which are similar to default insurance), guarantees, insurance, standby letter of credit, or cosigner.
- D. Asset-backed securities may repackage default risk by tiering default risk with different levels of securities that are subordinate to other levels, e.g., collateralized debt obligations (CDOs). Retention of the most risky level by the originator will usually lead to lower default because the originator has “skin in the game.” For example, Title IX of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 requires securitizers to retain at least 5% of the credit risk of “non-qualified mortgages” underlying residential MBS and it prohibits hedging or transferring the credit risk.
- E. Credit scores, e.g., FICO, and credit ratings, e.g., S&P, Moody’s, Fitch, DBRS, and A.M. Best, consider all these individual factors, e.g., firm risk, and other considerations such as industry and economic factors in trying to estimate the probability the borrower will make timely payments. A given credit score or rating is a snapshot of the borrower’s risk profile at the time the score is obtained. What lies beneath any given credit score is its “probability of default,” or PD. As economic conditions change, so do credit behaviors, and as a result PD shifts as well. For example, a credit score of 600 may have represented a PD of 4% in 2005, while in 2010, the PD for the same score may have increased to 8%. The latter time period represents the housing market’s collapse and the great recession. To maintain a target PD it is reasonable for lenders to change minimum scores to reflect changing PDs or to change risk premiums.

IV. Interest Rate Risk or Maturity Premiums - differ by loan type

- A. Market Risk Premium for Interest Rate Risk: Longer term debt instruments usually have a higher interest rate than shorter term instruments because they have more interest rate risk. One common graphical representation of the pricing of interest rate risk at a point in time is the yield curve for US Treasury securities. The use of US Treasury securities to measure interest rate risks removes many of the other risk factors such as default risk. A lender may borrow funds at a short term rate and lend funds for a longer period. A premium for this interest rate risk differential needs to be added to the cost of funds. The *proxy* we will use from the US Treasury yield curve is (Treasury interest rate for maturity of loan minus Treasury interest rate for maturity of funds used in cost of funds). Other market-driven indexes are the Federal Home Loan Bank advance curve, the swap curve, or the LIBOR rate-based curve.
- B. Yield Curve Effect - When a lender makes loans with a longer term than the maturity of its cost of funds, the market risk premium for maturity embedded in the interest rate on the loan will be reflected as an accounting profit. The effect on accounting profit will be approximately equal to the volume of mismatched loans times (int. rate on long-term loan

minus int. rate on short-term loan). As the volume of these maturity-mismatched loans increases, the risk increases. The risk is also a function of the interest rate spread. As the yield curve flattens or inverts from its normal upward-sloping yield curve, the profit on the loan will decline and may even turn into a loss. For example, as the yield curve flattened in 2006 and 2007, the spread on longer-term loans decreased and worried many analysts that it would lower the level of accounting profits due to this lower spread. The respective yield spreads in 2002 for (2 years – 3 months), (5 years – 3 months), and (10 years – 3 months) were 1.00%, 2.18%, and 2.97%, while the same spreads in 2006 and 2007 averaged -0.075%, -0.075%, and 0.05%.

C. Duration is a better interest rate risk measure than maturity and we may want to substitute duration for maturity in the US Treasury yield curve. Consider the case of a five-year zero-coupon bond vs. a five-year regular bond vs. a five-year amortized car loan. Although they all have a five year maturity they have different durations. For example, if the yield to maturity and the coupon rate where applicable are 9% with semi-annual compounding, the durations for the zero-coupon bond, the regular bond, and the amortized loan are 5.000, 4.134, and 2.570 years, respectively. The duration for the amortized loan of 2.570 years would be approximately the same as a regular bond with a maturity of 2.92 years or 2 years and 11 months.

D. Adjustable rates and indexes - One way to decrease the interest rate risk for a longer term loan is to set the interest rate to a floating or adjustable short-term rate. This is a common practice on commercial loans, e.g., prime rate, LIBOR, Fed Funds, credit card loans, and some real estate loans, e.g., 1-year Treasuries. As adjustable rates increase, the higher payments may negatively affect the credit risk associated with the loan because the payment/income ratio will increase.

E. Prepayment risks – When interest rates on debt decline substantially it is a common practice for the borrower to try to borrow new funds at a lower rate to pay off the outstanding debt. This practice negatively affects the lender because the lender must now reinvest the funds at a lower rate. To increase the cost to refinance the borrower's loan and to offset the loss to the lender the lender may charge a prepayment penalty. This penalty may be found on long-term, fixed-rate real estate mortgages and about one third of commercial loans. The penalty usually increases as prepayment period decreases and there may be no penalty after a certain period. Borrowers may be given a refinancing option and charged a higher rate or fees. This factor is similar to a callable bond that may be called after a certain period when rates decline and they have to pay bondholders a call premium.

F. Repackaging of prepayment risks – asset-backed securities such as collateralized mortgage obligations (CMOs) repackage interest rate risk, particularly the early prepayment of principal, by tranches that prioritize the early payments of principal and create different expected maturities

G. Maturity Mismatch Risk Premium – Even though we may have captured the market risk premium for maturity, there still may be a very high risk associated with borrowing short and lending long, e.g., if current rates increase the rates on current long-term loans will stay the same while rates on short-term sources of funds will increase. To reduce or eliminate this risk the lender may (1) hedge the risk with the use of interest rate swaps, forwards, futures, or options or (2) eliminate the longer term obligation through loan

sales or participations or securitization. The elimination of the obligations may also decrease default risk.

H. Floor risk – at low levels of interest rates, decreases on loan rates, e.g., Fed Funds rate or prime rate, may be greater than decreases on cost of funds, e.g., deposits or LIBOR, which indicates a lower net interest income. To offset this risk, a bank may establish a loan rate floor. For example, in the January 2009 Senior Loan Officer Opinion Survey on Bank Lending Practices, 80 percent of the banks surveyed indicated they increased the frequency of including loan rate floors on *business* floating-rate loan agreements and 43 for *household* floating-rate loan agreements.

Another justification for setting floor rates on loans is when benchmark rates go negative. For example, on April 14, 2014, some countries had negative rates for benchmark rates set by their central banks, e.g., the Federal Funds target rate in the U.S. Examples include Switzerland (-0.75%), Denmark (-0.75%), and Sweden (-0.25%). These countries were trying to lower the value of their currencies relative to the Euro. (Source: <http://www.fxstreet.com/economic-calendar/world-interest-rates>) Euribor rates, a common benchmark rate in Europe, on April 13, 2015 were one-week (-0.075%), two-weeks (-0.064%), one-month (-0.024%), two-months (-0.004%), and three-months (0.011%). (Source: <http://www.euribor-rates.eu/current-euribor-rates.asp>) In some cases, the bank may have to pay the borrower, i.e., the benchmark rate plus any markup is a negative rate, usually in the form of lowering the principal.

I. Refinancing at maturity risk – many commercial real estate investors in 2007 financed their properties with five-year loans that are coming due in 2012. The problem is that for properties that are under water, i.e., the value of the property is worth less than the current loan amount, the loan is much riskier. To refinance the borrower may have to add equity to the property to lower the loan-to-value (LTV) to current norms, pay higher interest rates, or provide a credit guarantee; otherwise, the borrower may default on the loan. This factor was also used in bank regulators' stress tests in April 2009 for properties maturing in 2009 and 2010. A refinancing option may also require a minimum LTV.

V. Liquidity Risk - Principle 4 from *Principles for Sound Liquidity Risk Management and Supervision*, Basel Committee, **June 2008**, <http://www.bis.org/publ/bcbs138.htm>, page 9.

“A bank should incorporate liquidity costs, benefits and risks in the product pricing, performance measurement and new product approval process for all significant business activities (both on- and off-balance sheet), thereby aligning the risk-taking incentives of individual business lines with the liquidity risk exposures their activities create for the bank as a whole.”

Examples of liquidity risk:

Remember that the **liquidity for a bank** is the ability to meet funding/deposit withdrawals and loan demand, possibly more than expected from lines of credit extended to customers, by selling assets or borrowing funds. **Liquidity for a security** is the ability to sell it quickly at or near the current market price.

The **liquidity coverage ratio** rule (finalized in the U.S. on 9/3/14) will for the first time create a standardized minimum liquidity requirement for large and internationally active banking organizations. Each institution will be required to hold high quality, liquid assets (HQLA) such as central bank reserves and government and corporate debt that can be converted easily and quickly into cash in an amount equal to or greater than its projected cash outflows minus its projected cash inflows during a 30-day stress period. The ratio of the firm's liquid assets to its projected net cash outflow is its "liquidity coverage ratio," or LCR.

The **net stable funding ratio** (NSFR) is effective in 2018 and requires banks to develop so-called stable funding for over one year to cover an extended stress scenario by limiting the use of volatile short-term borrowings to fund illiquid assets.

Mortgages that are being held for sale or mortgage-backed securities where the market collapses, such as subprime loans or jumbo, nonconforming loans;

Derivatives that are sold over the counter have less liquidity and it may be difficult to measure "fair value" and make them difficult to sale;

Stand by letters of credit (SLCs) by a bank where the bank must back up lines of credit at a greater volume and a higher cost of funds than anticipated;

Flights to quality, e.g., heavy purchases of Treasury securities, may cause the costs and returns of different financial instruments to diverge from past history, e.g., LIBOR vs. Fed Funds rates;

If a bank's default risk increases it may have to add capital at high costs or significantly increase its deposit rates to retain and attract funding;

A bank with a large source of core or retail deposits that are less likely to be withdrawn is more liquid and less risky than one with a lower level of these deposits, e.g., the loan/deposits ratio is considered a measure of a bank's liquidity.

The market for municipal debt is vast, with roughly 60,000 borrowers and 1.2 million individual bonds. Only a relatively small number of the bonds—from large states and cities such as California and New York—see their securities frequently traded, according to industry experts. That is partly because the features of the market, including the tax-exempt status of most securities, encourage most investors to hold their bonds until maturity.

Other examples of the liquidity of a security include issue size, volume of sales, and the bid-ask spread. Another example is the amount of a particular security held by a financial firm divided by the average trading volume for the security which gives an estimate of the number of days it would take to sell the firm's holdings of the security without a loss from the current market price.

Will a "lender of last resort," e.g., the FED discount window, provide liquidity when needed? How long will the loan be provided and what is the collateral?

VI. Profitability – Sections I to V are an attempt to calculate the costs associated with the loan but now one must determine how much profit the lender needs to earn above the costs. The lender needs to consider the loan, profit targets, competition, and the whole customer relationship, e.g, other borrower activities where the lender may be earning a profit. The approach below is based on setting a target return on equity for the lender and the allocation of equity to different risk categories to determine the profit margin. These risk allocations may be similar to the capital allocations used by the regulators under the Basel Accords.

- A. Net loanable funds = Loan - (Compensating Balance X (1 - Reserve Requirement))
- B. Loan Revenue = interest and fees, e.g., commitment fees on the unused portion of commercial credit lines; interchange fees, late and over limit fees, and annual fees on credit cards
- C. Required or desired allocations of equity to different types of loan may vary (RWA)
- D. Target Return on Loan (ROL) = [(Target ROE/(1-tax)) X (Equity/Loan)], e.g., [(15%/(1-.34)) X .08] = 1.82% [Note: some use CAPM or DCF to estimate target ROE]
- E. Whole customer relationship considers other non-loan revenues and expenses
- F. The usage of capacity relative to demand is also important. If short-term demand is much greater than capacity then a bank is more likely to adjust its profits up. If demand stays high then a producer is more likely to add more capacity.
- G. If competition is high, i.e., the demand is low relative to capacity, then a producer may lower its profits or increase the risk of the loan without raising the interest rate, e.g., increasing maturity, lowering prepayment penalties, less restrictive loan covenants. If demand stays low relative to capacity then a producer is likely to reduce that capacity.

VII. Additional Loan Risk-Return Control Procedures (other than interest rate)

- A. (Compensating Balances, above normal level) X (1- reserve requirement)
 - 1. ↓ risk: offset if default with legally enforceable netting agreement
 - 2. ↑ effective return by lowering net amount of loan
- B. Covenants – tighter (more restrictive) covenants decrease default risk through restricting actions that may negatively affect the lender and violations of the covenants decrease the liquidity risk associated with credit lines by limiting potential uses of the credit lines when conditions worsen.
 - 1. Updated financial and nonfinancial information filed on schedule
 - 2. Constraints on subsequent financial transactions related to dividends, salaries, selling or pledging of assets, new debt, maintaining minimum financial ratios (common equity/total assets; EBITDA/Interest; Fixed Charge Coverage), and insurance (See later excerpts from Credit Lines article.)
 - 3. Acceleration clause - if covenant violation occurs, lender can insist that entire loan amount becomes immediately due and payable
 - 4. Written repayment schedule
- C. Cosigners
 - 1. ↓ risk; guarantor's risk is substituted for borrower & affects guarantor's credit
 - 2. Should have impeccable credit record (e.g., parent for child, parent company for affiliate)

3. Increases risk of cosigner because his debt payments and financial obligations will increase if he applies for a new loan related to him.
- D. Require loan insurance, guarantee, standby letter of credit -
1. ↓ risk but may ↑ processing costs
 2. Examples - Ex-Im Bank, Small Business Administration, FHA-VA, private mortgage insurance (PMI), Federal Student Loan Program
- E. Make fewer small loans because they have relatively higher operating expenses per loan; affects mainly consumers and small businesses. Size is also an important component in producing and pricing insurance, e.g., life and health insurance.
- F. ↑ Various assessments and fees - ↑ effective return (e.g., discount points on real estate, closing costs, finance company processing costs)
- G. Restrict purpose of loan (productive, e.g. homeowner, vs. speculative, e.g., investor) - ↓ risk
- H. Restrict by customer relationship characteristics
1. Old vs. new and local vs. nonlocal - better information at lower cost
 2. To the extent credit scores can predict risk then lender can expand service area
 3. Potential profitability of long-run relationship in all services
- I. Loan commitments are credit lines and the costs are usually based on an interest rate indexed to a short-term market rate, e.g., LIBOR or prime rate, times the USED or borrowed amount of the credit line. There is also a percentage fee charged on the UNUSED portion of the credit line. This practice encourages the borrower to make more accurate estimates of their needs to decrease the costs associated with the unused portion. It also provides the banker with more accurate estimates of the timing of the borrower's needs which lowers the liquidity risk associated with the loan commitments. (See later excerpts from Credit Lines article.)
- J. Loan documentation – “stated” documentation of income riskier than “full” documentation. The Credit Card Act requires credit card companies to consider an applicant's income or assets and current debts before approving credit. The three big credit bureaus (Experian, Equifax, TransUnion) have products to estimate income or assets. Mortgage borrowers may have to provide copies of tax returns or fill out IRS Form 4506-T to allow the IRS to release tax filings to lenders.
- K. Exchange rate risk – if loan payments are in non-domestic currency
1. Hedge currency risk with derivative, e.g., forwards, futures
 2. Write loan such that payments are in domestic currency; however, if the borrower's currency devalues relative to the domestic currency, the exchange rate risk may affect the borrower's default risk
- L. Require escrow accounts – require payments for property taxes, hazard insurance, condo or homeowner association (HOA) fees; even reverse mortgages have had defaults for borrowers not paying taxes or premiums
- M. Used cars that can be remotely electronically disabled and located with GPS, e.g., will not start after being turned off, and/or located if payments fall behind; encourages payments and reduces repossession expense.
- N. Regulatory pricing risk – The 2009 Credit CARD (Card Accountability Responsibility and Disclosure) Act protects Americans from exploitative credit-card companies by

limiting penalty fees and interest-rate adjustments. When lenders cannot price credit risk efficiently and promptly to changing risk profiles they will change other terms, e.g., charge a higher interest rate on larger risk groups, including some lower risk borrowers, issue fewer loans in terms of numbers and size. The higher costs and lower availability are likely to affect lower-income and higher credit risk customers and potentially drive them to payday lenders, pawn shops, and local loan sharks with much higher costs.

STRESS TESTS: Larger banks will now have to run stress tests on an annual or semi-annual basis for the regulators and/or financial statements. Examples from the The Supervisory Capital Assessment Program (aka the Stress Tests): Design and Implementation, April 24, 2009, Board of Governors of the Federal Reserve System, illustrate the default risk factors for different types of loans. Key points about measuring default (credit) risk from B. Supervisory Review and Benchmark Assessments by Category

First and Second Residential Mortgages:

Certain attributes, in particular FICO, LTV, vintage (year or time of origination), product type (first mortgages, home equity lines of credit (HELOCs), and closed-end second-mortgages), and geography were found to be strongly predictive of default.

In evaluating RMBS (residential mortgage-backed securities) Moody's projected delinquencies are converted into projected losses using *roll rates (the probability of transition to default)*, for example, 60% for 60-day delinquencies, 90% for delinquencies greater than 90 days, 100% for foreclosure and 100% for REO. Actual losses, the severity assumption, are predicted over different time periods. The expected loss is finally compared to credit enhancement to derive a rating.

Credit cards

FICO scores, payment rates (percent of outstanding debt paid), utilization rates (percent of credit lines available used), and geographic concentrations.

Other consumer loans, e.g., auto loans, personal loans, and student loans,

FICO scores, LTV, term, vehicle age, geographic concentration, and historical loss experience.

Commercial and Industrial (C&I) Loans

Analysis of C&I loan loss projections was based on the distribution of exposures by industry and by internal rating provided by the firms. This information was confirmed and supplemented by external measures of risk, such as expected default frequencies from third party vendors.

Commercial Real Estate (CRE) Loans

Information on property type (office, industrial, warehouse, multifamily, retail), loan to value (LTV) ratios, debt service coverage ratios (DSCR), geography, and loan maturities. The supervisors analyzed loans for construction and land development, multi-family property, and non-farm non-residential projects separately. The supervisors employed common industry vendor models, and developed proprietary models, to generate independent loss estimates for

each portfolio. Specifically, for loans maturing in 2009 to 2010, the supervisors constructed a model that compared current LTV ratios to benchmark LTVs in order *to assess the probability that borrowers would be able to refinance their exposure*. For loans maturing beyond 2010, the team used vendor models that incorporate factors such as property type, LTV, DSCR, and geographic market factors. For construction loans, the geography and nature of the project received special attention. The resulting loss estimates were compared with the firms' submissions.

Excerpts from “Credit Market Conditions and the Use of Bank Lines of Credit,” C.M. James, FRBSF Economic Letter, #2009-27, August 31, 2009.
<http://www.frbsf.org/economic-research/files/el2009-27.pdf>

A line of credit is a commitment in which a borrower receives a promise from a bank or other financial institution to provide a loan over a set period at predetermined terms. The interest rate on most credit lines is based on a fixed markup over a benchmark, such as the prime rate or the London interbank offered rate (Libor). As a result, although the cost of credit-line borrowing varies with changes in the benchmark, the fixed markup protects the borrower from rate increases caused by widening of marketwide credit spreads, as well as changes caused by declines in the borrower's credit quality. Because credit-line loans are available on relatively more attractive terms when marketwide risk spreads increase and other types of credit become less available and more expensive, borrowers would typically be expected to draw down their lines during such periods. Credit-line commitments protect borrowers against decreased credit availability, as well as borrower specific and marketwide changes in credit risk premiums, but the insurance is not complete. One obvious contingency is that the lender may not be able to advance funds when the borrower needs liquidity.

Other potentially limiting contingencies have to do with the financial health of the borrower. For example, most credit lines have material adverse condition clauses. Although rarely invoked, such clauses permit lenders to withhold funds if a borrower's credit quality deteriorates significantly. A far more important potential limitation is the requirement that borrowers comply with cash flow, coverage, liquidity, and other covenants specified in the credit agreement. Cash flow covenants restrict borrowing if cash flow, EBITDA (earnings before interest, taxes, depreciation, and amortization), drops below a preset minimum, or the ratio of debt to cash flow exceeds a preset maximum. Debt Service Coverage covenants require that a borrower's coverage ratio (typically the ratio of EBITDA to fixed charges or interest expenses) remain above a minimum. Liquidity covenants require borrowers to maintain liquidity, typically defined as cash and cash equivalents plus the unused portion of the credit line, above a particular level. *From January 2007 to March 2009, 84% of credit lines of publicly traded companies and 88% of lines of privately held companies contained at least one of these covenants.* Credit-line availability will also vary depending on how tightly covenant threshold levels are set. For example, if a borrower's maximum debt-to-EBITDA is set at 4.5 and the ratio is already 4.25 when the commitment takes effect, then even a small EBITDA decline may violate the covenant threshold. Overall, such loan covenants in effect make credit availability contingent on borrower operating performance. If a firm's performance deteriorates, as it may during an economic slowdown, credit availability will be reduced. Lenders typically react to violations of financial covenants

(so-called technical defaults) by reducing or limiting additional borrowing under the line. Thus, for lenders, credit lines provide a contingent form of insurance against liquidity shocks.

Other potential covenants not in the article are:

- (1) restricting the use of any other assets as collateral for another debt;
- (2) a "change of control" covenant that protects debt holders in the case of a buyout such as a leveraged buyout (LBO) where the new owners finance the purchase with new debt which increases the risk of the whole firm, even debt with a higher priority. The debt holders may be able to sell the debt back to the issuer at par or a premium.
- (3) liquidity: minimum current ratio
- (4) leverage: maximum total liabilities/common equity ratio
- (5) capital expenditures: limit on long-term investments
- (6) require a hedge on the value of assets, e.g., if the major asset is oil or some other commodity, require a hedge to protect the value of the assets against price decreases.

The shares of companies with loan covenants that can cause the loan to be recalled for violations vary by area: North America (75%), UK & Ireland (55.3%), Global (50.3%), BRIC countries (42.5%), and Mainland Europe (34.7%). Source: "Lease Accounting Changes May Trip Up Bank Loans," WSJ.com, September 2, 2014, 3:46 AM ET.

Venture capital firms may also protect their equity investment through covenant-like negotiable terms such as voting rights, seats on the start-up's board and assurances that a future fund-raising won't unduly dilute the venture capital firms' stake. The liquidation preference is among the most important of these protections and provides that the venture capital firm's investment will be repaid before the founders and employees are rewarded. It may negotiate an even more protective form, known as the senior liquidation preference, which provides that the firm will be paid not only before the common stockholders but also before anyone else who bought preferred stock in earlier rounds. These provisions apply in a sale but not in an initial public offering of stock. The idea is to ensure that even if the investment does not perform well, the venture investor will still get back its initial money

How do leases, insurance, pension funds and annuities fit into this framework?

Leases – The lessor owns property, e.g., real estate or equipment, to which a lessee receives use and possession in exchange for a lease payment. If the lender takes repossession of property during or at the end of the lease then it is important to estimate the residual value of the property. As the uncertainty of the residual value increases, risk increases, e.g., SUVs in 2008 with high gas prices vs. 2-3 years earlier or computer equipment. Leases usually carry a higher cost than a traditional loan but allow the lessee/customer to have no down payment and only pay for the value of the equipment that is expected to be depleted during the lease term.

Insurance – insurance is similar but the default risk (probability of loss times expected loss in default) is replaced with loss risk (probability of insured event times expected loss with insured event). Examples include life insurance, auto insurance, home hazard insurance, hurricane/wind

insurance, flood insurance. For a longer period, e.g., life insurance, the loss risk in each year is discounted to a present value for the time period.

A **defined-benefit pension plan** is similar but the default risk (probability of loss times expected loss in default) is replaced with payment risk [(estimated payment to beneficiary based on vesting requirements, number of years of service, a measure of salary, benefit factor per year, and a cost of living adjustment (COLA)) times (predicted number of years of payments based on mortality rates from the Society of Actuaries)]. One current problem with defined-benefit plans includes decreasing mortality rates, e.g., in 2013 the Society of Actuaries extended the expected lives for males at age 65 from 82.6 in 2000 to 86.6 in 2013 and for females from 85.2 to 88.8. The present value of these expected payments are discounted back to the present value at a discount rate, e.g., the expected return on investment grade corporate bonds. A common discount rate is 7.5-8%. As the discount rate increases the present value decreases; however, if the pension fund cannot earn that discount rate then it will not be able to fund all the payments. An **annuity** is similar in that it promises to pay a stipulated payment for the rest of one's life.

Default risk factors on insurance, annuities, and defined pension funds: A common credit risk rating for insurance and annuities is provided by A.M. Best. The Pension Benefit Guaranty Corporation (PBGC) provides limited coverage of corporate pension fund payments. Corporations pay the PBGC for each employee covered and the fees will rise from \$42 in 2013 to \$64 by 2016. Pensions provided by insurance companies are not covered by PBGC and should be considered riskier. The legal and political risks for government insurance and pension funds, e.g., public worker pension funds, Social Security, Medicare, and Medicaid has increased. As the expected payments increase the government must increase its return on investments or increase taxes to meet those obligations. Many corporations and governments are shifting these risks to the individuals by putting employees in defined contribution plans, e.g., 401(k) plans, where retirement benefits are based on contributions by employees and employers and the investment returns on those investments.