Small Business (Background)

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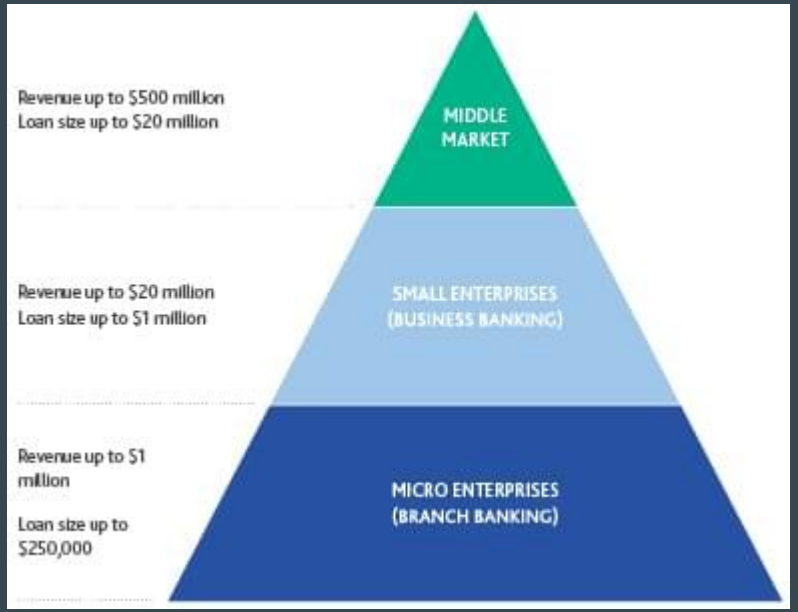
Background (Moody)

Source: *Moody Analytics*

https://www.moodysanalytics.com/risk-perspectives-magazine/convergence-risk-finance-accounting-cecl/principles-and-practices/future-of-small-business-lending



Background (Moody)

Bank lenders mostly require 3 years of financial statements in the form of:

- Unaudited financial reports
- Tax returns of the business

Above may be complemented with bureau data for

- Credit utilization
- Payment behaviour

Small Business (Credit Risk Management Framework)

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Best practices

CRM framework (Know your customer)

Source: *Risk Management Association*
https://www.rmahq.org/credit-risk-management-best-practices-techniques/

1. Know your customer (KYC)
    a. Customer onboarding. Assume Legal team does the AML.

CRM framework (Analyse nonfinancial risk)

2. Analyse nonfinancial risk.
   There is risk to every line item on the balance sheet and income statement and you must learn how to evaluate those risks, which fall into the broad categories of:
   a. Industry
   b. Business
   c. Management

Examples of what to investigate:

- *Is there enough capital available on the institution's balance sheet to support the risk being taken?*
- *Is the institution being adequately compensated for the risk?*
- *Are there adequate controls in place at the institution to assure the proper tracking of the risk and minimize the element of surprise?*

CRM framework (Understand the numbers)

3. Understand the numbers
    a. Know the Auditor
    b. Accounting Fundamentals
    c. Balance Sheet
    d. Income Statement
    e. Cash Flow
    f. Financial Efficiency - Cash Flow Drivers
    g. Developing projections
    h. Company financial statements

CRM framework (Structure the deal)

4. Structure the deal.

   Identify the characteristics that influence a company's success by studying:

   a. Nature of the business.
   b. Nature of the industry.
   c. Impact of economic conditions.
   d. Business strategy.
   e. The competencies or deficiencies of management.

CRM framework (Price the deal)

5. Determining the appropriate pricing is a critical credit risk management technique. It ensures that your financial institution will be adequately compensated for the risk of the deal.

   Many complex factors determine the final rate a bank charges its commercial clients. In addition to company-specific variables, factors that affect pricing include the following:

   - Marketplace in which the bank operates.
   - General economic conditions.
   - Matching of the pricing and maturity of the bank's assets and liabilities, i.e., Asset Liability Committee (ALCO) policies.

CRM framework (Present the deal)

5. Credit recommendation report
    A. **Summary and Recommendations** – *A one-page summary.*
    B. **Economic and Competitive Environments** – *Analyses of the company's current and evolving position in the industry and how susceptible it has been, and may be, to changes in the general economy.*
    C. **Management Assessment** – *Evaluations of the company's operations and management's capabilities.*
    D. **Financial Analysis and Projections** – *Analysis of the financial position of the company and evaluation of the projected performance of the company.*
    E. **Sources of Repayment** – *Identification of all projected sources of repayment and the appropriate loan structure.*

CRM framework (Monitor the relationship)

6. Monitor the risk profile of your client
    - A quantitative risk-rating system with a wide range of grades, which includes subjective factors, such as management quality. A wider range of grades allows the bank to assign credit costs more precisely.
    - An effective management information system to track credit exposure.
    - Risk pricing based on required rates of return that are then used in customer sourcing.
    - A business strategy that reflects a proactive role in guiding relationship managers on credit exposures in the portfolio.

Small Business (Risk factors)

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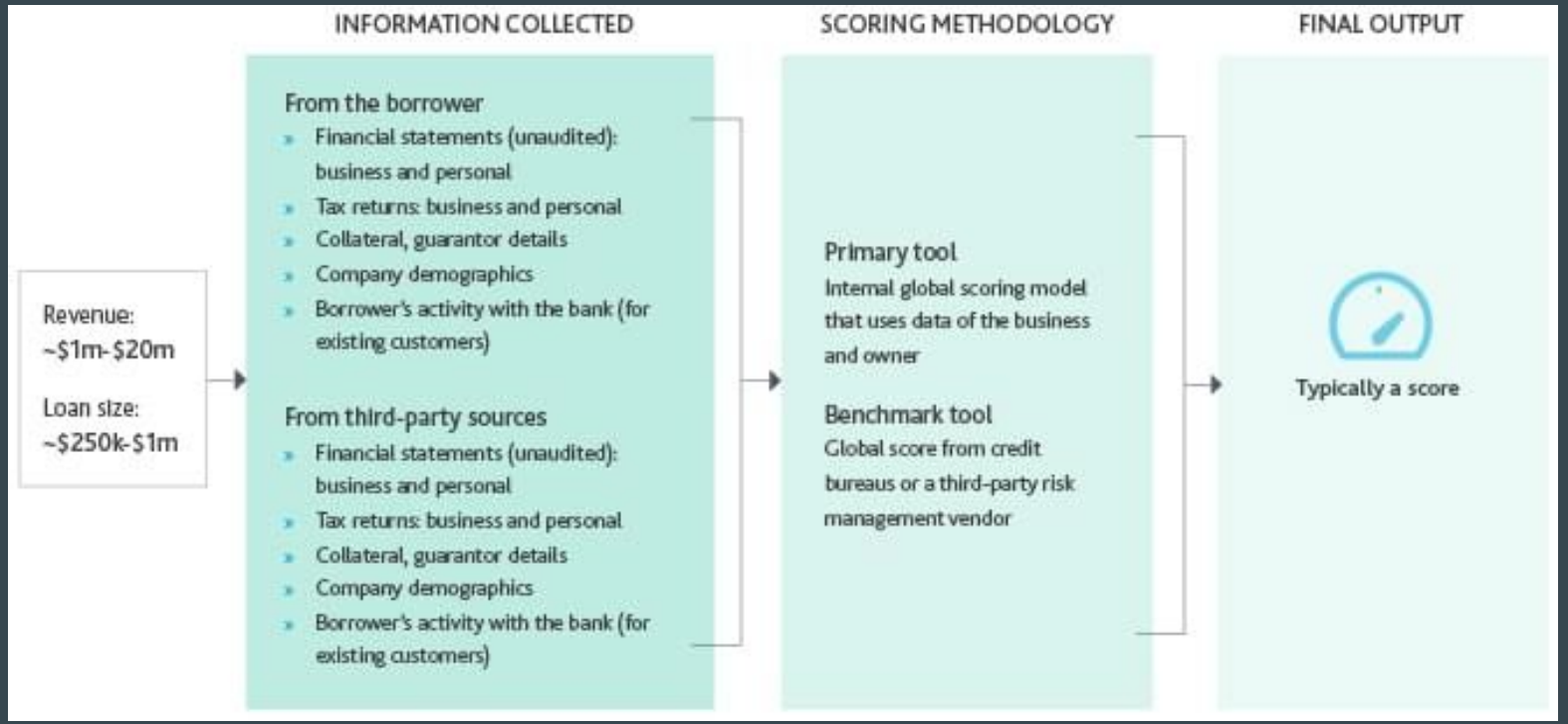
Information for Credit Scoring - High Level (Moody)



Information for Credit Scoring - High Level (Congressional Research Service)

Source: *Congressional Research Service -*

Small Business Credit Markets and Selected Policy Issues (Aug 2019)

https://fas.org/sgp/crs/misc/R45878.pdf

Common Business Credit Scoring risk factors

- Payment History
  - Late/missed payments; How much owed
  - Repayment ability due to seasonal patterns
  - Public record (bankruptcies, judgement filings, colletions...)
- Credit Utilization ratio
  - Amount of outstanding debt relative to credit limit.

Information for Credit Scoring - High Level (Congressional Research Service)

- Length of credit history
- Outstanding debts
  - Total oustanding debt
  - Largest amount of credit the business has extended in prev 6 months
  - Highest account balance in prev 12 months
- Financial Ratios
  - Debt-to-equity ratio
  - Solvency ratio (measures business's ability to generate cash)
  - Operating ratio (ability to sustain an ample profit margin)
- Industry risk
  - Probability of default for groups of similar businesses

Literature: Risk factors in predicting likelihood of default

Source: *Asian Development Bank Institute -*

A COMPREHENSIVE METHOD FOR THE CREDIT RISK ASSESSMENT OF SMALL AND MEDIUM-SIZED ENTERPRISES BASED ON ASIAN DATA (Dec 2018)

https://www.adb.org/sites/default/files/publication/473006/adbi-wp907.pdf

Literature: Risk factors in predicting likelihood of default

Background (*summarised from the literature*)

Data provided by Iranian bank for 1,363 SMEs. A large number of possible ratios have been identified as useful in predicting a firm's likelihood of default. Chen and Shimerda (1981) show that out of more than 100 financial ratios, almost 50% were found to be useful in at least one empirical study. However, this study does not contain nor assess such qualitative variables.

Proposed five categories to describe a company's financial profile: (i) liquidity, (ii) profitability, (iii) leverage, (iv) coverage, and (v) activity. For each of these categories, they created a number of financial ratios identified in the literature. Next slide shows the financial ratios selected for this survey.

Examined variables (*refer to next slide for some of the terminology*)

No	Symbol	Definition	Category
1	Equity_TL	Equity (book value)/total liabilities	Leverage
2	TL_Tassets	Total liabilities/total assets	
3	Cash_Tassets	Cash/total assets	Liquidity
4	WoC_Tassets	Working capital/total assets	
5	Cash_Sales	Cash/net sales	
6	EBIT_Sales	Ebit/sales	Profitability
7	Rinc_Tassets	Retained earnings/total assets	
8	Ninc_Sales	Net income/sales	
9	EBIT_IE	Ebit/interest expenses	Coverage
10	AP_Sales	Account payable/sales	Activity
11	AR_TL	Account receivable/total liabilities	

Terminology

Retained earnings refers to the percentage of net earnings not paid out as dividends, but retained by the company to be reinvested in its core business or to pay debt; it is recorded under shareholders' equity on the balance sheet.

Ebit refers to earnings before interest and taxes.

Account payable refers to an accounting entry that represents an entity's obligation to pay off a short-term debt to its creditors; the accounts payable entry is found on a balance sheet under current liabilities.

Account receivable refers to money owed by customers (individuals or corporations) to another entity in exchange for goods or services that have been delivered or used, but not yet paid for; receivables usually come in the form of operating lines of credit and are usually due within a relatively short time period, ranging from a few days to 1 year.

Literature: Risk factors in predicting likelihood of default

Methodology

1. Principal Component Analysis (PCA) of the risk factor variables for ‘correlation’ & dimension reduction. In other words, can we identify how the examined variables shape into risk factors.

2. Cluster analysis to observe any natural clusters/groups of SMEs based on the PCA risk factors.

Literature: Risk factors in predicting likelihood of default

PCA identified 4 key components. Total variation explained by the 4 components is 71%. In other words, information loss is only 29%.

Component	% of Variance	Cumulative Variance %
Z1	30	30
Z2	20	50
Z3	11	61
Z4	10	71

Literature: Risk factors in predicting likelihood of default

Z1, the variables with large loadings are mainly net income and earnings. Hence, Z1 generally reflects the net income of an SME. As this factor explains the most variance in the data, it is the most informative indicator of an SME's overall financial health.

Z2 reflects short-term assets. This component has three major loading variables:

- liabilities/total assets, which is negative, meaning that an SME has few liabilities and mainly relies on its own assets;
- working capital/total assets, which is positive, meaning that an SME has short-term assets; and
- retained earnings/total assets, which is positive, meaning that an SME has some earnings that it keeps with the company or in the bank.

These three variables indicate an SME whose reliance on borrowings is small and which is rich in working capital and retained earnings, and therefore has plenty of short-term assets.

Literature: Risk factors in predicting likelihood of default

Z3 reflects the liquidity of SMEs. This factor has two variables with large loadings (cash/total assets and ebit/interest expenses), both with positive values, which shows an SME that is cash-rich and has high earnings. Hence, it mainly reflects an SME's liquidity.

Z4, reflects capital. This factor has two variables with large loadings, both with positive values: equity (book value)/total liabilities and accounts receivable/total liabilities, meaning an SME with few liabilities that is rich in equity.

Z1 - Net Income (30%)	Z2 - Short Term assets (20%)	Z3 - Liquidity (11%)	Z4 - Capital (10%)
Cash/net sales	Total liabilities/total assets	Cash/total assets	Equity(book value)/total liabilities
Ebit/sales	Working capital/total assets	Ebit/interest expenses	Account receivable/total liabilities
Net income/sales	Retained earnings/total assets		
Account payable/sales			

Cluster analysis yield 3 groups of SMEs.

Group 1 healthiest.

Group 2 in between.

Group 3 least healthy.

59% of Group 3 are non-sound firms which means they have risk-weighted assets greater than their shareholders' equity.

Table on the left shows the Average of Financial ratios for the 3 groups of SMEs

Variables (Financial Ratios)	Group 1	Group 2	Group 3
Equity (book value)/total liabilities	1.11	0.77	0.33
Total liabilities/total assets	0.56	0.62	0.78
Cash/total assets	0.08	0.03	0.05
Working capital/total assets	0.15	0.11	0.04
Cash/net sales	0.06	0.05	0.05
Ebit/sales	0.24	0.26	0.13
Retained earnings/total assets	0.28	0.17	0.06
Net income/sales	0.2	0.25	0.18
Ebit/interest expenses	22.88	7.74	2.04
Account payable/sales	0.49	0.5	0.6
Account receivable/total liabilities	0.61	0.44	0.41

Business Loan Requirements (Business.Org)

From a Small Business specialist perspective

From a small business specialist perspective

Source: *Business.org - 6 Most Important Business Loan Requirements*
https://www.business.org/finance/loans/business-loan-requirements/

- Credit - Having a good personal credit score is essential. In most cases, you'll need a credit score of at least 600 (FICO) to acquire a business loan.
  - Lots of "free" credit reports and scores floating around, however lenders typically don't use those scores.
  - Recommend getting FICO credit score which is used by 90% of lenders but will cost.

Credit score tier	FICO credit score
Excellent credit	750+
Good credit	700–749
Fair credit	650–699
Poor credit	600–649
Bad credit	Below 600

From a small business specialist perspective

- Cash flow and income - Lenders look at the debt-to-income ratio of a business when assessing its risk. The higher a business's cash flow and income, the better the chances it has of getting a loan.
  - How profitable is the business.
  - Routinely deals with invoices = delayed payments = impact on cash flow.
  - Typical mitigation to invoices -> invoice factoring (accounts receivable financing) where sells unpaid invoices to 3rd party lender.

- Age of business - Most lenders only lend to businesses with a track record of at least 2 years.
  - ~ 20% business fail within the first year.
  - Lenders typically look at how long business bank account opened, not how long entity has been registered.

From a small business specialist perspective

- Current amount of debt - The other part of the debt-to-income ratio is debt. Businesses and borrowers with too much debt will have difficulty getting new loans.
  - % of monthly debt payments against monthly gross income.
  - Most lenders require debt-to-income ratio <= 50%
  - Lenders also will want to see balance sheet which includes the following
    - Assets
    - Liabilities
    - Equity
  - Not all debts are equal! For example, commercial real estate, Lines of credit, business acquisition loans, merchant cash advances all have different weights with the lender.

From a small business specialist perspective

- Collateral - Lenders view debt backed by things of value as less risky, so collateral-based loans can be easier to get and have lower interest rates.
    - Example of typical collaterals: invoices, equipment, real estate and businesses.

- Industry - During the loan approval process, lenders assess the risk of your type of business. Some industries are easier to get loans in than others.
  An example: https://www.biz2credit.com/research-reports/biz2credit-analysis-of-industry-2019

  Some insightful knowledge base on the different loan types or industry:
  https://www.biz2credit.com/small-business-lending-index
  (Left main tab, click Choose by Type or Industry)

Simple Case Study (Amazon - Biz2Credit)

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Biz2Credit Case Study

About Biz2Credit

Biz2Credit provides Biz2X, a fully-managed digital lending platform that helps banks and financial institutions extend credit to small businesses. It also serves as a lender to small businesses, and has funded $2.5B worth of loans to date. Biz2Credit is backed by Nexus Venture Partners and recently completed a Series B capital financing round of $52 million led by WestBridge Capital.

Initially, Biz2Credit relied on lending institutions to extend credit to SMEs. However, they realized that even with an automated onboarding process, it would still take 3-4 weeks for the lending institution to finalize their credit approval, which was not the seamless experience they had in mind for customers. As such, the company expanded its business model from where it started as a marketplace aggregator to also becoming a lender so that it could manage the end-to-end credit approval process.

Biz2Credit Case Study

- Reduced the turnaround time for loan approvals from 7-10 days to 24-48 hours using AI/ML
- Use AI/ML in conjunction with credit bureau data (Dun & Bradstreet) to digitalise and analyze customer information
  - Know your customer (KYC)
  - Ownership structure, directors, authorised signatories, bank statements, etc
  - Credit worthiness
    - Bank Statements
    - Transaction data
  - Estimate the following customers' information for cash flow analysis to measure credit risk
    - Revenue
    - Expenses
    - Seasonality

Biz2Credit - Small Business Loan Guide

Explore the following link

https://www.biz2credit.com/business-loan

Pricing

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Recommendation of Makers' protocol parameter values through simulation

Proposed methodology

1. Define Expected Return = Expected Gain + Expected Loss
2. Define Expected Loss ($) = Adjusted PD × EAD × LGD
    a. Adjusted PD (%) -> Historical default rate weighted using calculated Credit Rating.
    In the absence of historical data, either use
        i. the calculated Credit Rating for a generalised PD assignment
        ii. apply the Standardised PD assignment according to the BASEL framework
        https://www.bis.org/basel_framework/chapter/CRE/32.htm
    b. EAD ($) -> Maximum value of asset as collateral
    c. LGD ($) -> Model Loss = F(Asset sale ~ Market, Liquidity - Slippage, Recovery Cost eg: *Liquidation cost resulting in loss ~ Penalty fee*).
    In the absence of data, use
        i. the Standardised LGD assignment according to the BASEL framework
3. Define Expected Gain ($) = PG × [Stability Fee + PL × Liquidation] where PG is Probability of Gain and PL is Probability of Liquidation resulting in Gains
    a. Stability Fee ($) -> Stability Fee charged over a time period
    b. Liquidation ($) - > Two components
        i. Net gain in liquidation ($)
        ii. Probability resulting in net liquidation outcome (historical data) (%)

Proposed methodology

4. Monte Carlo Simulation to simulate asset price movements (eg: Geometric Brownian Motion)
   https://towardsdatascience.com/monte-carlo-simulation-in-r-with-focus-on-financial-data-ad43e2a4aedf
5. Apply each asset price movement to drive the Expected Loss, Expected Gain and therefore the Expected Return.
6. Obtain the empirical distribution of Expected Loss, Gain and Expected Return.
7. Summarise and identify optimal parameter settings.

Simulation Specification

Number of simulations according to an agreed # of combination of simulation parameter levels

Parameters	Type	Values/level (examples)	Note
Iterations (n)	Fixed (constant)	10,000	
Borrowing period (t)	Fixed (constant) / Variable (distribution)	3 months / N(X,Y)	
Slippage (s)	Fixed (constant) / Variable (distribution)	20% / N(X,Y)	
Debt Ceiling (d)	Multiple discrete	1000, 2000, 3000,, 5000, etc...	*Controlled through EAD*
Stability Fee (s)	Multiple discrete	1%, 2%, 3%, ...	
Collaterisation Ratio (r)	Multiple discrete	125%, 150%, 175%, 200% ...	