Credit risk is the potential that a bank borrower or a group of borrowers will fail to meet its contractual obligations and the future loss associated with that. For most banks, loans are the largest and most obvious source of credit risk. However, other sources of credit risk exist throughout the activities of a bank, including the banking book and trading book, and both on and off the balance sheet. Banks are also increasingly facing credit risk in various financial instruments other than loans, including acceptances, interbank transactions, trade financing, foreign exchange transactions, financial futures, swaps, bonds, equities and options, in the extension of commitments and guarantees, and the settlement of transactions. Since the exposure to credit risk continues to be the leading source of problems in banks worldwide, banks and their supervisors should be able to draw useful lessons from the experiences. Banks should now have a keen awareness of the need to identify, measure, monitor and control credit risk as well as to determine that they hold adequate capital against these risks and that they are adequately compensated for risks incurred.

By definition, credit risk is the risk resulting from uncertainty in counterparty’s ability or willingness to meet its contractual obligations. Credit risk relates to the possibility that loans will not be paid or that investments will deteriorate in quality or go into default with consequent loss to the bank. If credit can be defined as “nothing but the expectation of a sum of money within some limited time,” then credit risk is the possibility that this expectation will not be fulfilled. Credit risk exists as long as banks lend money. Credit risk is not confined to the risk that borrowers are unable to
pay; it also includes the risk of payments being delayed, which can also cause problems for the bank. The default of a small number of large exposures or cluster defaults in an important loan segment (e.g. housing loans, etc.) could generate very large losses and in the extreme case, could lead to a bank becoming insolvent. As a result of these risks, bankers must conduct proper evaluation of default risks associated with the borrowers.

The effective management of credit risk is a critical component of a comprehensive approach to risk management because lending is the core activity of the banking industry and, hence, such practice is necessary for long-run success in a more complex and competitive global market. The introduction of Basel II has incentivized many of the globally best practiced banks to invest in better credit risk management techniques and to reconsider the analyses that must be carried out to mitigate such risk of loss and benchmark their performance according to market expectations. More importantly, the recent US sub-prime crisis in the mortgage market has further stressed the importance of adopting a better risk management system (especially in the bank’s loan book) with appropriate mix of quantitative and qualitative metrics, improved transparency in the decision-making process, and review valuation issues that enhance model validation and monitoring process. It has been observed in developed as well as emerging markets that rapid expansion of credit increases the possibility of relaxation of income criteria/lending standards. This is why, besides good models, due diligence in lending should continue to be the cornerstone of sound banking practices.

The interest in credit risk modelling and their conscious usage has grown significantly over the past few years and is attracting strong interest from all market participants, financial institutions (commercial banks, investment banks and hedge funds) and regulators. The need to react to market developments including venturing into new business or launching new products and services, business continuity issues and meeting the changing regulatory requirements, make risk management a dynamic exercise.

### Major Drivers of Credit Risk

Credit risk arises because in extending credit, banks have to make judgements about a borrower’s creditworthiness – its ability to pay principal and interest when due. This creditworthiness may decline over time due to change in its financials, poor management by the borrower or changes in the business cycle such as rising inflation, recession, weaker exchange rates or increased competition.
Introduction to Credit Risk

The major drivers of credit risks are:

- **Default risk**: Obligor fails to service debt obligations due to borrower-specific or market-specific factors
- **Recovery risk**: Recovery post default is uncertain as the value of the collateral changes unexpectedly
- **Spread risk**: Credit quality of obligor changes leading to fall in the market value of the loan
- **Concentration risk**: Over-exposure to an individual borrower, group, entity or segment
- **Correlation risk**: Common risk factors between different borrowers, industries or sectors which may lead to simultaneous defaults

Factors affecting credit risk (expected and unexpected losses arising out of adverse credit events) are as follows:

- **Exposure at default (EAD)**: In the event of default, how large will be the expected outstanding obligations if the default takes place. The basis for EAD is the outstanding and the external limit booked in the official process systems. EAD has to be estimated on transaction level from historical default information available in the bank. For term loan with full utilization (e.g. bullet or amortizing loans), where there is no chance to further increase the loan exposure in excess of the set transaction limit, EAD = outstanding. However, for lending product facilities such as overdraft, revolving line of credit (viz. credit card) that are characterized by an external limit and average of the utilization of the month (outstanding), EAD = outstanding + UGD × free limit. Where UGD = usage given default or the credit conversion factor (CCF). A portion of the unutilized or free limit has been considered in EAD calculation is because it is expected that a counterparty close to default tends to increase its utilization, while the bank will work against this by reducing the available limits.

- **Probability of default (PD)**: The probability that the obligator or counterparty will default on its contractual obligations to repay its debt. It is generally estimated by reviewing the historical default record of loans in a pool with similar characteristics (e.g. rating grades, asset class, industry, region, etc.) or from the temporal movement of gross non-performing assets from standard category of advances.

- **Loss given default (LGD)**: The percentage of exposure the bank might lose in case the borrower defaults. Usually it is taken as: LGD comprises the fraction of exposure at default which will not be recovered by the bank following default. It comprises the actual
Managing Portfolio Credit Risk in Banks

Cost of the loss along with the economic costs (legal costs, interest foregone, time value for collection process, etc.) associated with the recovery process. Historical evidence shows LGD is lower for loans with higher value, more liquid and senior collaterals.

- **Default correlations**: Default correlation measures the possibility of one borrower to default on its obligations and its effect on another borrower to default on its obligations as well. This default dependence is due to common undiversifiable factors. Default events are not independent. Defaults may occur in clusters due to correlation across sectors, regions due to common systematic factors. Correlation of default adds to the credit risk when a portfolio of loans and advances is in consideration vis-à-vis single loans or advances. When many borrowers default together, correlation effects become more pronounced. Thus, the correlation contributions need to be considered carefully in the risk measurement and management of credit portfolios.

Credit risk is generally measured as a risk on individual counter-party transaction or default risk and portfolio risk. The credit risk of a bank’s portfolio depends on both the external and internal factors. The elements identified for credit risk are shown in Chart 1.1.

**Chart 1.1: Key Drivers of Credit Risk**

![Credit Risk Diagram](chart1.1.png)

*Source: Author’s own illustration to explain different drivers of credit risk.*

As a result of these risks, bankers must know which, when and how much credit risk to accept to strengthen bottom line, and also conduct proper evaluation of the default risks associated with borrowers. In general, protection against credit risks involves maintaining high credit standards,
Introduction to Credit Risk

appropriate portfolio diversification, good knowledge of borrower’s affairs (or behaviour) and accurate monitoring and collection procedures.

Based on the Basel Committee recommendations, encouraging banking supervisors to provide sound practices for managing “credit risk”, Reserve Bank of India (RBI) has issued Guidance Note on Credit Risk and advised banks to put in place, an effective Credit Risk Management System.

**Borrower Level Risk vs. Portfolio Risk**

When making credit decisions during lending, there is always a risk that the borrower might default on its contractual obligations to repay principal and interest. The risk factors that are unique to the borrower causing them to default are called borrower-specific default risk. Borrower-specific risk can be measured by using credit rating (e.g. borrower-specific PD and facility-specific LGD) and tracking the borrower-rating movements. Portfolio risk arises from the composition of or concentration of bank’s exposures to many assets to various sectors. Systematic factors are the external risk factors that affect the fortunes of a proportion of the borrowers in the portfolio. Concentration risk results from having a number of borrowers in the portfolio, whose fortunes are affected by a common factor. This common factor is also called correlation factor (default or asset correlation). Systematic factors correlate the portfolio risk to changes in macroeconomic environment (e.g. GDP growth rate, unemployment rate, fiscal deficit, etc.).

Credit-risk modelling is being extended into evaluating portfolio risk, especially in the areas of commercial and industrial loans, management of asset allocations in the loan portfolio and portfolio monitoring. The portfolio risk is influenced by idiosyncratic borrower-specific risk and external systematic risk. The internal borrower-specific risk can be managed by adopting proactive loan policy, good quality credit analysis, prudent loan monitoring and sound credit culture. The external risk factors can be managed by diversifying the portfolio, correlation analysis, setting norms for borrower and sector limits (VaR based or regulatory limits), and through effective loan review mechanism and portfolio management.

**Importance of Management of Credit Risk in Banks**

Lending is the major activity of banks and, thus, is the constant credit risk faced by them. Adequately managing credit risk in a bank is critical for its long-term survival and growth. Credit risk management is important for banks because of the following reasons:
A. Market realities

- **Structural increase in non-performing assets**: These result in massive write-downs and losses. The increase in stressed assets badly hit the banks as provision and capital requirements go up sharply, which squeeze their profit level. Subprime loans in the housing sector were one of the most important causes of the US financial crisis of 2008. Recently, a sector-wise analysis by RBI (2014) demonstrates the challenge of stressed assets in the Indian banking system intensified during 2013–14 due to the rising incidence of loan defaults in infrastructure, retail, small-scale industries (SSIs) and agriculture. This has resulted in slowdown in the system-level credit growth.

- **Higher concentrations in loan portfolios**: Over-exposure to a borrower or related group of borrowers can pose risks to the earnings and capital position of a bank in the form of unexpected losses. Higher loan concentration makes banks vulnerable during economic downturn due to incidents of clustered defaults.

- **Capital market growth**: It produces a “Winner’s Curse” effect due to increased competition as many companies have alternate channels to raise funds (through bond and equity instruments).

- **Increasing competition**: Higher competition among banks to book big loans leading to lower spreads and net interest margin. This is a primary concern for top management in banks.

- **Declining and volatile values of collateral**: A decline or volatility in collateral value warrants greater amount of credit risk due uncertainty in loan recovery. Both the East Asian crisis (1997–98) and US subprime crisis (2008) have revealed that collateral value falls faster than the borrowers’ increasing chance of default.

- **Growth of off-balance sheet credit products**: The rapid growth of off-balance sheet products like various structured products (e.g. collateralized debt obligations), credit derivatives (like credit default swaps), etc. to trade the credit risk positions has heightened the need for more prudent bank regulation.

B. Changing regulatory environment

- Basel II (pillar I, II and III requirements) and Basel III (dynamic provisioning, stress testing, counter cyclical buffer, etc.)

  The regulatory compliance enables a bank to establish a risk management framework, set appropriate control process and improve corporate governance
Introduction to Credit Risk

framework. The regulatory compliance is involuntary in nature and enhances a lot of values for the organization.

C. Institution’s risk vision

- **Capital is a scarce resource, need optimal utilization:** The success or return in a project of a Financial Institution (FI) is observed by its stakeholders (market competitors, shareholders, debt-holders, etc.). If the FI is engaging into new business or expanding its existing business, it requires capital as a buffer against unexpected risk of losses.

- **Improve Risk-adjusted Returns on Capital (RAROC) and risk-based pricing:** A Risk Adjusted Performance Measurement Framework would guide it to link its business growth targets, risk management process and shareholders’ expectations.

Combining the principles of risk management with those of shareholder value creation allows the lender to exploit the strengths of each for better strategic planning. In this regard, a risk adjusted performance measurement framework may act as a comprehensive tool for a financial institution. Risk management makes bankruptcy less likely, by making us aware of the volatility of overall cash flows. It reduces the cost of financial distress and gives a bank better access to capital markets. A comprehensive credit risk management framework is crucial for better reputation with the regulators, customers, shareholders and employees.

**Role of Capital in Banks: The Difference between Regulatory Capital and Economic Capital**

While housing prices were increasing in the US market, consumers were saving less and both borrowing and spending more.¹ Easy credit, and a belief that house prices would continue to appreciate, had encouraged many sub-prime borrowers to obtain adjustable-rate mortgages (ARM). The credit and house price explosion led to a building boom and eventually to a surplus of unsold homes, which caused the US housing prices to reach its peak and then begin declining in mid-2006. Refinancing became more difficult, once house prices began to decline in many parts of the US that resulted in higher loan to value ratios (LTV). Borrowers who found themselves unable to escape higher monthly payments began to default. The US sub-prime crisis has, thus, revealed the vul-

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¹ See Bureau of Economic Analysis – Personal Savings Chart (2009).
Managing Portfolio Credit Risk in Banks


nerability of the financial institutions due to interaction between falling housing prices and homeowners’ home equity lines of credit.\(^2\) The fall in house prices led to sharp rise in mortgage defaults and foreclosures, which had increased the supply of homes on the market and caused house prices to fall further. The rising unemployment rate at a latest state has attenuated the trouble for the industry, and the economy was caught under a vicious cycle (Figure 1.1). To break this trap, the US government needed to step in with capital injections as revival measure for banks and the entire system.

Figure 1.1: Vicious Cycle of Capital Problem

![Vicious Cycle of Capital Problem](image)

Source: Author’s own summary of various causative factors that were responsible for the housing loan defaults in US and how increased foreclosures induced vicious cycle. This was indicated by various studies in the US done by Moody’s, many reviews by Federal Reserve, USA; Dept. of Statistics and Operations Research (STOR), UNC; and also mentioned in Wikipedia.

\(^2\) On a national level, housing prices peaked in early 2005, began declining since 2006. Increased foreclosure rates in 2006–07 by the U.S. homeowners led to a crisis in August 2007 for the sub-prime mortgage market that has triggered global financial crisis and recession.
A bank can also be trapped in such a vicious situation and hence veer towards bankruptcy due to rise in bad quality of assets. A significant deterioration in asset quality will increase the risk weighted assets and provisioning requirements and will thereby eat away its capital and profit. In order to assess the overall capital adequacy ratio (represented by CAR) of the bank, the risk weighted assets (RWA) are added up and then compared with the total available (eligible) capital. A fall in capital adequacy ratio (or CAR) will reduce bank’s overall rating and erode the retained earnings due to rise in funding cost and will further worsen its solvency position. Recently, the financial stability report (FSR) of Reserve Bank of India (RBI, 2015) has raised concern over significant erosion in capital and profits of Indian Banks (especially the public sector) due to rise in bad debts and restructured assets. The NPA and restructured loans together increased to 11.1 per cent of the total advances at the end of December 2014. Most of the stressed assets were in five subsectors – mining, iron and steel, textiles, infrastructure and aviation that together constituted 25 per cent of the bank loans in India. An analysis of Table 1.1 containing quarterly data by bank groups shows that gross non-performing assets (GNPAs) have been increasing continuously since March 2012 for public sector banks (PSB) and old private sector banks. The FSR report has also noted that the gross non-performing assets (NPA) ratio for the Indian banking system could touch 4.8 per cent by September 2015 from current 4.6 per cent in March 2015. In view of these developments, it is vital for banks to understand the role and importance of capital for long-term survival.

Capital acts as a buffer to absorb future unidentified losses that protect the liability holders of a bank (depositors, creditors and shareholders). It plays the role a safety belt in the car (same concept like capital adequacy ratio (CAR)) as a protection against any accident. The concept of “Economic Capital” differs from “Regulatory Capital” measure. The Basel Accord uses a two-tier concept of regulatory capital, where core tier 1 consists of retained earnings, equity capital and free reserves, and tier 2 includes mainly borrowings. 3 Internationally, the total capital adequacy ratio is not

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3 Additional tier 1 capital consists of certain debt capital instruments which have loss absorbance capacity. For example, Perpetual Debt Instruments (PDI) and share capital instruments like Perpetual Non-cumulative Preference Shares (PNCPS), etc. are considered as tier 1 capital. Similarly, provisions for NPA or loan loss reserves held against unidentified losses for standard assets, certain type of hybrid debt instruments and share capital instruments like Perpetual Cumulative...
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| Source: Author's own computations; compiled from CMIE Prowess and Ace-Equity database. Note: PSB: Public sector banks, IIP: Index of industrial production.