THE BANKING SECTOR UNDER FINANCIAL STABILITY

COMPLETE VOLUMES ON THEORY AND PRACTICE OF FINANCIAL STABILITY

Volume 1:	Understanding Financial Stability
Volume 2:	The Banking Sector under Financial Stability
Volume 3:	The Corporate, Real Estate, Household, Government and Non-bank Financial Sectors under Financial Stability
Volume 4:	Economic Areas under Financial Stability
Volume 5:	Tools and Techniques for Financial Stability Analysis

Praise for *The Theory and Practice of Financial Stability*

Indranarain Ramlall's proposal is a great attempt at giving a comprehensive view of financial stability from a theoretical, practical and policy perspective. It aims at providing future students with the tools to understand the framework in which financial stability is assessed and understood today by international organisations and central banks across the world. To my knowledge, this is the only book that covers such a wide range of topics related to financial stability. It, therefore, has the potential to become a good reference book on the topic. I believe that Indranarain Ramlall has made a great proposal to provide a 'big picture view' on financial stability. I look forward to reading the textbook!

Celine Tcheng, Central Bank of France

Financial stability has become a major concern for central banks, after the 2008 global financial crisis. More and more research is tackling topics regarding the role of the financial system in macroeconomic models and the implementation of macroprudential policy. Therefore, a comprehensive overlook of financial stability issues, such as the one offered by *The Theory and Practice of Financial Stability* can prove particularly useful for experts working in the financial system, central bankers included. The textbook covers a diverse set of topics from policy matters to risk assessment analysis.

Elena Banu, Central Bank of Romania

This book is a comprehensive work on one of the most actual topics in the aftermath of the Great Recession. It covers a wide range of topics on financial stability complementing theoretical frameworks with practical examples.

Starting with a conceptual description on financial stability, the book overviews a history of the major financial crises and Basel regulation rules. Particularly useful is an inquiry of the financial stability perspectives across different asset classes and economy sectors. Another beneficial feature of this book is a complete oversight of stress testing methodologies.

The book is a thorough compilation of topics on financial stability and definitely deserves a place on the bookshelves of central bankers, government and private institutions' officials.

Vaidotas Sumskis, Bank of Lithuania

Dr Indranarain's book is an actual textbook for interpreting interrelations between all aspects and sectors of the international economy and will surely be a highly useful tool for credit institutions, investors, practitioners as well as academics. From a Central Bank's point of view this book provides an integrated approach to macroeconomic environment and the interactions between the various factors and an actual tool for assessing and measuring leading circumstances and indicators that affect financial stability and may cause vulnerabilities.

Vasiliki Vlachostergiou, Central Bank of Greece

This is a monumental work! I didn't find anything missing. I think it will be useful for students, economic and finance professionals and policymakers.

Christophe Andre, OECD

Financial stability was always a priority for financial sector regulators and it has surpassed other objectives since the global financial crisis. Given various complexities associated with the financial stability and rapid developments over time, existing literature tends to deal with specific aspects of financial stability. It is very difficult to get a comprehensive book dealing with the wide range of concepts, different segments of financial sector, ever increasing variety of financial instruments and regulations associated with financial stability. The current book is a very good attempt to fill this gap through its comprehensive coverage of almost the entire gamut of financial stability related topics. This book should be useful for financial sector regulators, related ministries in the governments, researchers, multilateral institutions, other financial sector stakeholders and general public who are interested to know the complexities of the financial sector and financial stability.

Ajay Prakash-an expert in Financial Stability

THE THEORY AND PRACTICE OF FINANCIAL STABILITY
VOLUME 2

THE BANKING SECTOR UNDER FINANCIAL STABILITY

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INVESTOR IN PEOPLE

Dedicated to God for making me an instrument of his own

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List of Acronyms

ALCO	Asset Liability Management Committee
ALM	Asset Liability Management
BIS	Bank for International Settlement
CAMELS	Capital, Assets, Management, Earnings, Liquidity and Sensitivity to market risk
CAR	Capital Adequacy Ratio
CCAR	Comprehensive Capital Analysis and Review
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
DTI	Debt to Income
EAD	Exposure of Default
EaR	Earnings at Risk
ECB	European Central Bank
EDF	Expected Default Frequency
EL	Expected Losses
ESRB	European Systemic Risk Board
EU	European Union
FSB	Financial Stability Board
FSC	Financial Stability Committee
FSIs	Financial Soundness Indicators
FSOC	Financial Stability Oversight Council
GAAP	Generally Accepted Accounting Principles
GDP	Gross Domestic Product
G-SIBs	Global Systemically Important Banks
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IRB	Internal Ratings-based
KRIs	Key Risk Indicators
LCR	Liquidity–Coverage Ratio
LGD	Loss Given Default
LTV	Loan to Value
NBFIs	Non-bank Financial Institutions

NPLs	Non-performing loans
NSFR	Net Stable Funding Ratio
PD	Probability of Default
RAM	Risk Assessment Matrix
RWAs	Risk-weighted Assets
SCAP	Supervisory Capital Assessment Program
SIFI	Systemically Important Financial Institution
SMEs	Small and Medium Enterprises
SPV	Special Purpose Vehicle
UL	Unexpected Losses
VaR	Value at Risk

Preface

Most economies in the world are characterised by a bank-based financial system, that is, the financial intermediation process is mostly performed by banks. It is therefore critically important to undertake a full-fledged analysis of the banking sector with respect to financial stability risks. By virtue of many issues being involved in the banking sector, a whole book is altogether being devoted to the banking sector in this series of five books on financial stability. Readers will appreciate from the reading that banks are unique in their nature-they assume higher risks on the back of borrowing short and lending long while they are endowed with lower capital buffers, explained by a low equity to total assets ratio. Balance sheet analysis of banks becomes a key element in financial stability risk assessment. Sources of banks' funding also pose risks to financial stability. The more banks resort to short-term wholesale funding, the higher are the risks to financial stability should a shock manifest.

Regulatory frameworks are also being given due consideration with focus on Basel III as a major advancement in dealing with the shortcomings which prevails in the US Subprime crisis of 2007. To bolster capital of banks, Basel III came up with countercyclical capital buffer and buffer for systemically important financial institutions. In the same vein, not only capital, but liquidity concerns were also given prominence following the introduction of two key liquidity ratios, namely, the net stable funding ratio and the liquidity coverage ratio. Another key regulatory issue tackled by the authorities pertains to host-home cross-border banking supervision in view of abating regulatory arbitrage.

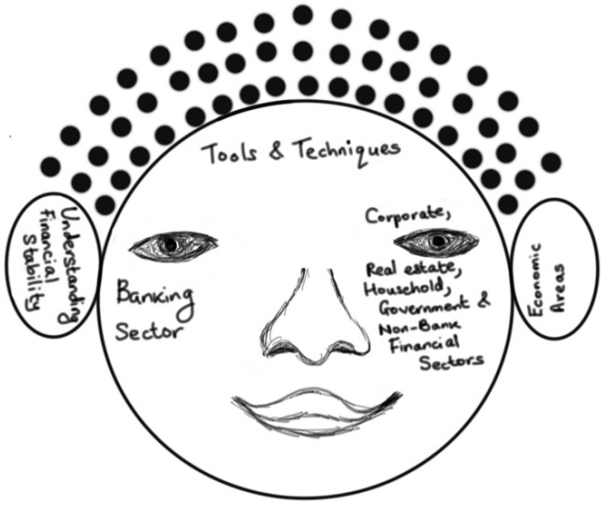
At the end of the day, there appears to be a growing consensus among policy-makers, academicians and researchers that a bank-based financial system may exacerbate the detrimental effects of a crisis. The rationale is based on the notion that should banks be affected, then, this unleashes a squeeze in loanable funds as to cut short the level of borrowings and investments by economic agents such as households and corporates. Consequently, the non-banking sector should also be given prominence as they can intervene to substitute for the fall-back in lending by banks to ensure that no curtailment in the level of economic activities. The book also focuses on microprudential and macroprudential regulation. On the same wavelength, different risks which impact on banks are covered in a comprehensive manner along with different risk maps.

The book has been written as a reference material to cater for the needs of both new and experienced professionals such as central bankers, researchers, economists and policy-makers who are involved in the field of financial stability. As a matter of fact, many central banks now have a financial stability unit or a department but so far there is no textbook which weaves through the various aspects of financial stability. Central bankers can use the book to beef up the analytical part of their financial stability reports by incorporating new tools of

assessments. The book appeals to courses/programmes on financial stability as provided by Yale School of Management (Macroprudential Policy or Financial Stability Regulation/Master of Management studies in Systemic Risk), Goethe Business School (Financial Stability and Regulation/Executive Education course) and Florence School of Banking and Finance (Banking and Financial Stability course). To date, there are no textbooks or referenced materials which undertake an intensive and coherent approach to financial stability. For example, there is no such framework as to how financial stability, as a process, should be performed. This book attempts to provide all key issues in a highly comprehensive and critical manner. In that respect, the book is expected to be widely used worldwide, both by professionals and researchers.

The author expects the book to be particularly useful to economists, policy-makers, researchers and students in the sphere of financial stability in the banking sector. As at date, there is no textbook on financial stability which weaves through all aspects of financial stability-from theory to practice. This series of five books on financial stability attempts to fill in such a vacuum. Comments and suggestions can be made to i.ramlall@uom.ac.mu/iiramii3@gmail.com. The author seizes this opportunity to thank an anonymous referee from the London School of Economics for his suggestions and reviews made by professionals from central banks and reputable organisations.

Dr Indranarain Ramlall
June 2018



Financial Stability as a field of its own.
Dr. I. Ramlall 20/09/18

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Chapter 1

Banks, Risks and Risk Management

1.1. Introduction

The objective of this book is to provide a thorough analysis of banking sector risks with respect to financial stability assessment. The word 'bank' originates from the Old Italian term 'banca', referring to the 'bench' people seeking loans from moneylenders used to sit on. A systematic approach is considered to be the best approach as it assists in avoiding undue risks on the financial system. Such a systematic approach requires a sound framework for the banking sector financial stability. Readers can scan the following website (http://www.relbanks.com) to glean information about the top 100 banks in the world. Beyond a certain critical point level, a bigger banking and financial system starts to act as a drag on economic growth and not a spur to it. Wolf (2014) stated that 'Sounder banks do not necessarily generate faster growth in demand. Indeed, causality goes far more in the opposite direction'. After the US subprime crisis, banks are now considered to be well capitalised in the world following the building up of more stable deposits relative to the volatile wholesale deposits and enhanced liquidity states, all promulgated under the Basel III approach to liquidity-enhancing strategies under the Net Stable Funding Ratio and the Liquidity Coverage Ratio. Nonetheless, looming economic risks still prevail for the weaker banks in the world.

1.2. Difference between a Bank and a Non-financial Firm

The chief creditors of banks consist of depositors. The financial statements of a bank are not the same as that of a non-financial firm due to the following reasons:

- Bank's funds are of a short-term nature.
- Banks constitute highly leveraged institutions which are endowed with low levels of equity. High leverage generates higher profits in the case that earnings are positive. Thus, since banks are inherently imbued with high financial leverage, then, in countries which have high-interest rate spreads, banks should be reaping larger levels of profits as to boost up their capital base, making them less vulnerability to financial stability shocks. Leverage emanates not only from the on-balance sheet but also from off-balance sheet items. Deregulation and innovation made the financial sector not only highly

leveraged but also highly competitive. As per the Basel Committee on Banking Supervision (2015) under its Basel III Monitoring Report 2015, the aggregate leverage of big banks fell from 29 times Tier 1 capital in the first half of 2011 to 22 times in the first half of 2014.

- Banks have a low proportion of fixed assets which thereby lead to low operating leverage. Operating leverage can be defined as the proportion of fixed costs to total costs.
- Banks have a large chunk of their assets invested in loans and advances and investments, all carrying high-interest rate risk.
- A large part of the revenues of a bank often emanates from interests on advances and investments.
- In the case of profits, net interest income of a bank is akin to gross profit for a non-financial firm.
- Banks tend to have volatile asset values on the back of changes in interest rates and defaults of borrowers.

1.3. Banking Business Inherently Risky: Low-profit Margin but High Leverage

The key metric for a bank balance sheet analysis pertains to its assets/equity ratio which constitutes an equity multiplier or leverage ratio. The banking business is inherently considered to be risky on the ground of low-profit margins but high leverage levels. The balance sheets of banks systematically show low levels of capital to liabilities ratio which is not often seen in any other type of business which falls outside the purview of the banking business. The leverage ratio constitutes the financial ratio which bears strong impact on default risk. To dampen procyclicality,[1] the authorities can also work upon the leverage ratio by increasing it. A microscopic analysis of leverage ratio is undertaken as follows.

$$\text{Increase in leverage ratio} = \text{Increase in } \frac{E}{A}$$

To increase equity or capital, a bank has two possible ways: either to directly add up new capital or to forgo dividend payments (retained earnings). The leverage ratio can further be split as follows.

$$\begin{aligned} \text{Increasein leverage ratio} &= \text{Increase in } \frac{A-L}{A} \\ &= \text{Increase in } 1-\frac{L}{A} \end{aligned}$$

[1]Another tool used to dampen procyclicality is the use of countercyclical capital buffers.

Table 1.1: Liability Structure of US Bank Holding Companies, 2009.

	$Trillion	**% of Assets**
Assets	15.927	100.0
Liabilities		
Deposits	7.502	47.1
Short-term wholesale funding		
Repurchase agreements and federal funds purchased	1.658	10.4
Other short-term wholesale funding	0.880	5.5
Trading liabilities	0.736	4.6
Total	3.274	20.6
Long-term funding		
Long-term wholesale funding	1.718	10.8
Subordinated debt and trust preferred	0.416	2.6
Total	2.134	13.4
Other liabilities	1.570	9.9
Total liabilities	14.480	90.9
Equity		
Common stock	1.309	8.2
Preferred stock	0.137	0.9
Total equity	1.446	9.1

Source: Hanson, Kashyap, and Stein (2011).

This implies that $\frac{L}{A}$ has to fall down in order to increase the leverage ratio. To initiate a decline in $\frac{L}{A}$, either A has to rise or L has to fall.

The table summarises the liability structure of US Bank Holding Companies as of 31 December 2009. The table is based on the data from the FR Y-9C reports that Bank Holding Companies are required to file with the Federal Reserve. It is clear that US banks operate under a high leverage ratio (Table 1.1).

1.4. Banking Sector and Financial Stability

In recent years, rising research interest has shown a strong relationship between the banking sector and financial stability by virtue of the fact that a financial crisis is usually related to a bank panic or a bank run. The underlying rationale relates to the fact that depositors can hardly monitor as to how banks use their money so much so that strong information asymmetry prevails as to the use of

depositors' money for generating sound profits but at a comfortable level of risk assumed by the bank. Once a bank is subject to a crisis condition, this unleashes strong systemic risks as to impact on the function of other banks because risk-averse people queue up to retrieve their deposited money. Such a state of affairs is automatically reflected through high levels of risks to banks as they all operate under the 'law of large numbers' whereby in a single day, no all depositors will withdraw their money. Intriguingly, the self-fulfilling prophecy works well in such cases as people who believe that all depositors will queue up tomorrow and thus today go to retrieve their money, ironically inciting massive withdrawals.

Most economies in the world tend to exhibit a bank-based financial system so that banking sector stability constitutes a key ingredient to financial stability. Jokipii and Monnin (2013) found a positive relationship between banking sector stability and real output growth. They defined banking sector instability as the probability of the banking sector becoming insolvent within the next quarter. Hogart, Reis, and Saporta (2002), Kroszner, Laeven, and Klingebiel (2007) and Dell'Ariccia, Detragiache, and Rajan (2008) all pointed out that banking crises can generate substantial economic slowdown. Laeven and Valencia (2010) stated that 'The economic cost of the new crises is on average much larger than that of past crises, both in terms of output losses and increases in public debt. The median output loss (computed as deviations of actual output from its trend) is 25% of GDP in recent crises, compared to a historical median of 20% of GDP, while the median increase in public debt (over the three year period following the start of the crisis) is 24% of GDP in recent crises, compared to a historical median of 16% of GDP'. They attributed such increase in impacts to larger shocks, the increasing size of the financial system and also to the concentration of the crises in high-income countries. However, analysing the effect of the banking crises may also depend on the type of economy under scrutiny. Devereux and Dwyer (2016) found that prior economic conditions helped to predict output losses for developed economies while having a stock market and deposit insurance helped to predict output losses in the case of low-income economies.

Binary and continuous variables prevail to capture banking sector instability. Under the binary variable, a crisis is defined based on the definition of threshold values – a crisis manifests in the case that the selected threshold value is being exceeded. Under a continuous variable, a crisis is defined as the banking sector's probability of default. The focus has been laid not only as to when a crisis pops out but also as to when a crisis ends. Laeven and Valencia (2012) defined the end of a banking crisis as 'real GDP growth and real credit growth are positive for at least two consecutive years'. Interestingly, banking sector risks may creep into currency crises. For instance, Lang (2013) pointed out that systemic banking problems constituted reliable leading indicators for currency crises.

The causes of the 1997–1998 Asian economies were related to a banking crisis[2] propelled by banks and customers taking on excessive levels of currency

[2]http://www.rba.gov.au/speeches/2007/sp-gov-180707.html

risk. The Asian economies failed to properly develop their financial infrastructure in order to properly deal with swings in international capital flows. The existence of fixed exchange rate regimes in the Asian economies aggravated the problem.

1.5. Risks Analysis in Banks

1.5.1. Risk Definition

Risk management is not about the elimination of risks but about managing risks so that upside risks are being harnessed to the best while downside risks are being reduced to the minimum. In the investment world, risk is widely perceived to be inseparable from performance, as pointed out by Hopkin (2010). In essence, risk is of dual nature, comprising upside risk and downside risk, synonymous with being the head and tail of the same coin. The subtle difference between risk and uncertainty is that the former is perpetually attached to a probability of occurrence. Risk is so vital that many organisations, whether financial or non-financial, adhere to a single metric to assess risk via a riskiness index, geared to act as a check on the activities of the organisation chiefly when many firms operate under extremely complex conditions. The main ingredients of the riskiness index comprise the probability of impact of certain risk factors along with their extent of impact (Figure 1.1).

> Risk comes from not knowing what you're doing. Warren Buffett
>
> The risk appetite statement is generally considered the hardest part of any enterprise risk management implementation. However, without clearly defined, measurable tolerances the whole risk cycle and any risk framework is arguably at a halt. Jill Douglas, Head of Risk, Charterhouse Risk Management
>
> Risk is like fire: If controlled it will help you; if uncontrolled it will rise up and destroy you. Former US President Teddy Roosevelt.

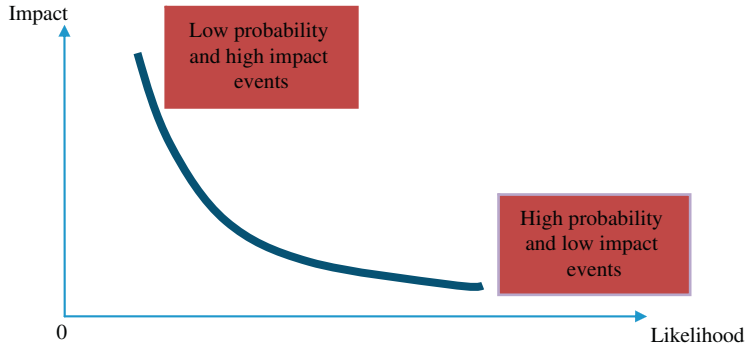

Figure 1.1: Impact and Likelihood. *Source*: Author's illustration.

The following section probes into the various types of risks that impact on banks. However, before embarking on various types of risks which impact on the banking sector, it is deemed considerate to have an appreciation of the widely coveted risk metrics.

1.5.2. Risk Metrics

Quantitative metrics for risk indicators are widely used in economics and finance. Risk metrics can be classified into three broad categories: sensitivities, volatility and downside risk.

Sensitivities factor in Greek letters such as delta, theta, gamma, vega and rho and are chiefly used in the case of options. Risk is widely captured by volatility which factors in both upside and downside risks. Volatility is defined as a crude form of risk as it captures dispersion from a central tendency. Volatility consists of two types, namely historical volatility and implicit volatility. Historical volatility is computed from historical data while implicit volatility (a forward-looking metric) is calculated by solving the Black-Scholes formula for volatility, based on numerical values for the other variables. The hitch related to implied volatility is that it is model dependent. Square root of time rule is used to convert daily volatility into n-day volatility. For instance, *n*-day volatility is equal to daily volatility times the square root of the *n* days. Similarly, assuming 252 trading days, annualised volatility can be computed as daily volatility times the square root of 252 days.

Downside risk is based on returns which are found below a targeted a mean return. Such a risk metric is also known as semivariance. In essence, while standard deviation and volatility focus on measures of volatility, semivariance focuses on negative fluctuations of an asset. Examples of downside risk consist of VaR, expected shortfall and semivariance metrics.

Value at Risk (VaR) also reflects a downside risk as it is based on the maximum amount which can be lost over a given time horizon at a specified confidence level. VaR for *t* days is computed as the VaR for one day multiplied by the square root of time. The statistical value for 95%, 99% and 99.5% in the case of VaR are 1.645, 2.326 and 2.58, respectively. It is of paramount significance to note that the results of VaR are misleading should the data behave in a non-normal manner. Nonetheless, VaR is widely employed in finance for risk management as it applies to all types of risks, let alone, that it is easy to compute. For instance, VaR is used to determine the economic capital (also known as risk-based capital) which is the capital needed to absorb potential unexpected losses. Indeed, VaR is considered as the basis for economic capital measures because it captures downside risk. However, by virtue of the fact that historical data for credit risk tend to be scarce, this may lead to incorrect risk estimation by VaR. The VaR is not additive because the VaR of a portfolio of two assets is not necessarily same as the combined sum of VaRs for these two assets. This implies that correlation needs to be given due consideration when focusing on portfolio VaR.

The selection of the confidence level in VaR should reflect the risk aversion of the company. In that respect, a higher level of risk aversion should be captured by a higher confidence level (or a lower significance level) as to increase the statistical value of VaR and its corresponding loss amount to be computed. The VaR is unlikely to capture the true value of loss in the presence of strong fat tails in the data which violate the assumption of normality. To curb such a problem, the student-t distribution of generalised hyperbolic distribution can be employed to be able to capture for the higher moments in the data. Compared to VaR which assesses 'How bad can things get?', expected shortfall asks the question 'If things get bad, what is our expected loss?'. Expected shortfall is more sensitive to the tail risk in the distribution and considers the time horizon and the confidence level, just like VaR. Expected shortfall computes the expected value of losses above a specified confidence level.

Choudhry (2013) pointed out that VaR underestimated risks during the global financial crisis of 2007/2008 at a time when it was most needed, disparaging its seriousness as a coveted tool for risk management. Such a state of affairs led to the Basel Committee on Banking Supervision to scrap VaR in favour of the expected shortfall as the risk management tool for banks. Another metric of risk is the Earnings at Risk (EaR) which constitutes a variation of VaR.

1.5.3. Risk Assessment Matrix

The Risk Assessment Matrix (RAM) is widely used by the IMF for country risk analysis as it generates a systematic approach to identify and qualitatively analyse the risks and their significance. The objective is to provide information as to a source of risk, its likelihood of realisation and the expected impact on financial stability in the case that such a risk does materialise. The RAM can be adjusted to assess the risks in an economy's banking sector. The benefit of RAM is that it unleashes a quick way to visualise the risks, their impacts and their respective probabilities of occurrences. For instance, the different risks impacting on banks can be assessed by using their probability of occurrences and severity of impacts. The main hitch related to RAM is that there can be subjective assessments in terms of probabilities used and impacts assessments. The scope of analysis can be enlarged by making the rows and columns more granular. For instance, the level of risk can be made to move from negligible, minor, moderate and major to extreme states. In a parallel manner, the probability of occurrence can be made more granular by incorporating various classifications such as almost certain, likely, possible, unlikely and rare. In this particular case, a 5x5 RAM will be obtained. Colours are widely used to stress the key zones such as zones imbued with higher levels of risks are usually coloured in red. Figure 1.2 provides an example of a RAM.

It is important to undertake a proper analysis of various risks as they impound on the profitability of banks. Thus, credit risk, liquidity risk, interest rate risk, currency risk and operational risk all generate effects on the profits of banks. For example, in the case of credit risk, low delinquency levels and high loan loss coverage ratio both impact on the bank's net interest margins.

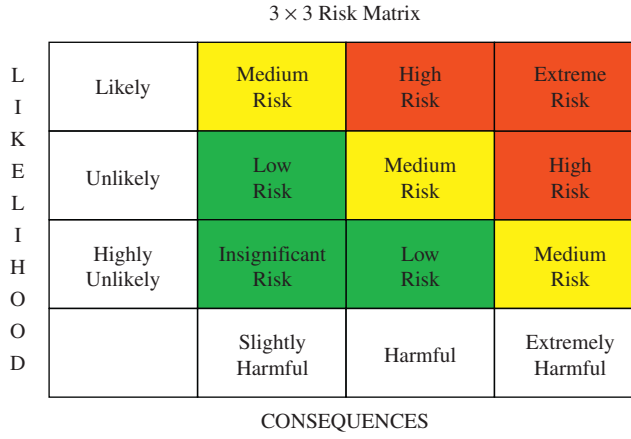

Figure 1.2: Example of a Risk Assessment Matrix. *Source*: https://www.risk-assessments.org/risk-assessment-matrix-3x3.html.

Table 1.2 provides a snapshot of different types of risks which affect banks along with their corresponding risk mitigation policies.

1.6. Effective Risk Management

Effective risk management necessitates a formalised approach to the risk management process in the bank. Other important features are required for a sound risk management process in the bank, as stated as follows:

- The risk management function should be communicated at all hierarchies in the organisation, stretching beyond the first layer of management.
- The risk management process should be clear and explicit.
- Relevant risk parameters should be set such as respective guidelines from regulators in terms of maximum values to be respected for ratios such as currency exposure, debt to equity ratio of borrowers, amongst others.
- Rigorous qualitative and quantitative analyses should be conducted on a regular basis.
- Complete, timely and up-to-date data should be gathered.
- The risk management process should not only focus on the current state of affairs but should also stretch into forward-looking analyses via the use of stress testing, scenarios and simulations. In fact, such forward-looking analysis brings in a proactive approach to risk management.

1.7. Financial, Operational and Environmental Risks Impacting on Banks

Greunig and Bratanovic (2009) classified banking risks into three major sources, namely financial risks, operational risks and environmental risks (Table 1.3).