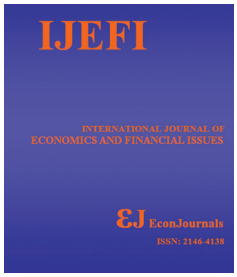

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Enhancing Operational Risk Management in the Mauritian Banking Sector: A Structured Approach

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ABSTRACT

The purpose of this study aims to improve risk control, mitigation, and interbank risk comparison by advocating for Mauritian banks to adopt a standardised operational risk definition. The study suggests improving operational risk reduction or hedging, encouraging openness in risk management capabilities, and standardising risk assessment methods in accordance with Bank of Mauritius requirements. The study also recommends that banks create operational risk management committees to supervise risk control and mitigation initiatives. These committees should be composed of experienced personnel who are well-versed in the consequences of operational risk in the banking industry. Using a mixed-method approach, insights are obtained from various banks operating in Mauritius, with data acquired from a substantial sample of 150 participants. Targeting Mauritian bankers, questionnaires were distributed across reputable banks, and data were meticulously collected and analysed. The findings highlight contemporary concerns regarding economic well-being and the security of assets held by banks. It is recommended to implement changes on a modest scale initially, subject to close monitoring over a specified period, with the possibility of gradual expansion if successful outcomes ensue. In conclusion, this research is significant due to the limited exploration into operational risk management within the Mauritian context.

Keywords: Operational Risk Management, Mauritian Banks, Mixed-method Approach, Risk Control and Regression Analysis
JEL Classifications: G21, G29, G32

1. INTRODUCTION

The economy's banking sector primarily deals with managing the financial assets of others and subsequently investing them to generate new wealth. The primary goal of this risk and return relationship remains wealth creation. In both, the banking industry, and several other sectors, pursuing higher returns, increased risks are inevitable. While banks continue to fulfil their core mission of providing financial services, they face various financial risks. The nature and occurrences of these risks differ based on the type of business activity. This suggests the existence of unique risks that exclusively impact banking operations (Akello, 2021; Ally, 2022; Young, 2001).

Similarly, the risks linked to banking services differ depending on the type of service provided. As banks engage in day-to-day operations, they encounter a range of risks. However, comprehending and effectively managing these risks are crucial for maximising profitability and determining the capital reserves a bank should maintain. Market risk, credit risk, and operational risk constitute the three primary hazards that most banks need to contend with. Market risk encompasses potential losses stemming from fluctuations in market variables, while credit risk arises when borrowers or counterparties default on their obligations to the bank (Akello, 2021; Young, 2001).

Operational risk pertains to losses incurred due to inadequate or failed internal processes, personnel, systems, or external events. This includes both expected and unforeseen losses. Despite its significance, this category of risk is often underestimated. However, mounting evidence suggests its seriousness, especially in developing economies (Akello, 2021).

The economy of Mauritius is currently evolving, ranking 25th in the 2020 Economic Freedom Index with a score of 74.9, an improvement of 1.9 points, primarily attributed to enhanced government integrity (Szerb et al., 2022). On the Sub-Saharan African scale, Mauritius holds the top position, boasting a significantly higher overall score compared to its regional and global counterparts. The population stands at approximately 1.3 million, with a GDP of around $30.0 billion (Cook, 2020; Szerb et al., 2022).

Following the liberalisation of the banking sector in the 1980s, Mauritius' banking landscape expanded. Presently, the country hosts 20 commercial banks, including 5 local institutions, 9 foreign-owned subsidiaries, 1 joint venture, 4 foreign institution branches, and 1 licensed private bank. Despite some successful reforms, the banking sector's impact on the national economy remains limited. The prevalence of non-performing loans prompted lenders to reduce credit lending rates. Poor risk management led to internal and external incidents in fiscal 2019, causing market turbulence, elevated interest rates, reduced investor confidence, and declines in investment and GDP (Beck et al., 2014; Léon and Zins, 2020).

Bank failures have occurred in both centralized and decentralized economies over time. Research conducted in Mauritius has identified both internal (micro) and external (macro) factors contributing to bank failures (Odit et al., 2011; Ramlall and Mamode, 2017).

Mauritian banks have incurred significant losses due to inadequate operational risk management. Unrestrained negative outcomes from this risk category lead to significant financial and reputational losses. Unlike credit risk ratings or market risk price fluctuations, quantifying operational risk for Mauritian banks is particularly challenging. The lack of theoretical knowledge, inadequate modelling technology expertise, and a subpar risk management culture have hindered the establishment of a robust operational risk management framework (Sookye and Mohamudally-Boolaky, 2019).

Prominent financial mishaps involving banks, non-bank entities, and government organisations have underscored the significance of risk management. Major bank collapses have emerged due to unclear internal threats. Remarkably rare events, such as the September 11 terrorist attacks and rogue transactions, have highlighted the importance of recognizing and quantifying operational risks. Given the dynamic risk landscape within which banks operate, an efficient risk management process categorized by risk type is imperative. Each risk factor must be precisely defined to allocate roles and responsibilities for their management. Despite this, operational risk often serves as a catch-all for unclassified risk variables, which can result in neglecting crucial aspects. As a relatively recent management concern, operational risk management continues to be somewhat enigmatic. The acceptance and management of operational risk and its factors warrant attention.

2. LITERATURE REVIEW

Whilst operational risk is not a novel risk, the concept of operational risk management as a discipline with its own tools, procedures, and management structure is new (Bockius and Gatzert, 2023; Mikes, 2009). The banking sector has made the advancement of operational risk management a priority in recent years (Cristea, 2021). When the 1990s were just getting started, operational risk was primarily seen as a leftover category for risks and uncertainties that were hard to measure, insure, or manage the conventional ways. Because of these factors, research mostly concentrated on operational risk, even though the term "operational risk" was used to refer to the sponsorship organisation committee of the treadmill committee until the late 1990s (Mikes, 2007, 2009; Sinha, 2019). Therefore, the literature reviews the determinants, approaches, identifications, and measurement of the operational risks in Banking concluding with the theoretical review.

Over the past decade, banks have increasingly emphasized operational risk management. Banking institutions are urged to scrutinize both internal and external risks, with major drivers for addressing such risks including financial sector scandals, fraud, and IT system failures. While various operational risk exposures for individual banks are not novel, the heightened reliance on technology, amplified competition, and globalization have rendered the business environment more susceptible to operational risks than in the past (Berger et al., 2022; Kirikkaleli et al., 2020).

In the banking environment, particularly in light of contemporary financial market upheavals, a single significant event during the daily operations of a bank can be more detrimental than its credit loss. Nonetheless, while banks evaluate and manage credit and market risk adeptly, their proficiency in evaluating, controlling, or mitigating the adverse economic outcomes of such events lags (Flores et al., 2006; Ko et al., 2019).

Companies generally have three distinct approaches to risk management: risk avoidance, risk reduction, and risk retention (Hopkin, 2018). Active risk management involves sustained vigilance and responsiveness to risks. By analyzing the nature of risks and organizational strategies, banks can respond to risks and devise appropriate methods (Calomiris and Herring, 2002; Mocanu, 2020). For managing operational risks, banks develop and enhance their own technologies, as there is no universally established method thus far. Many studies (Ahmed and Alam, 2023; Lyambiko, 2015; Nwe, 2018) concur that numerous banks currently adopt a top-down approach, allocating a certain percentage of non-interest expenses to compute their operational risk capital. However, this approach often fails to accurately reflect the bank's risk profile, resulting in only an approximate estimation of the total insurance required to mitigate potential operational risks (Mocanu, 2020; Nwe, 2018).

However, as time progresses, this top-down approach may no longer align with the actual requirements of the banking sector. Banks increasingly require a more intricate methodology to assess and mitigate operational risks. Thus, some banks are shifting to a bottom-up approach, assessing operational risks from the

perspective of each business unit that constitutes the organization's production process. This approach offers the advantage of creating a feedback loop, thereby averting severe consequences of bank failures such as crisis management and leadership changes (Lyambiko, 2015; Mocanu, 2020; Nwe, 2018).

The initial step in managing operational risk is risk identification. In the banking industry, operational risk factors lack a clear definition, making the identification of operational risks challenging (Altaf et al., 2022; Muermann and Oktem, 2002). An effective tool for identifying and isolating operational risks is a risk identification matrix (RIM). Reasons are employed to differentiate operational risks from other risks (Ofori, 2017). Operational risks encompass all unanticipated losses arising from internal errors, staff-related shortcomings in processes and systems, as well as external events (Altaf et al., 2022).

During the inception of operational risk management, two distinct schools of thought emerged. One school focused on numerical tools such as loss distribution, economic models, and risk indicators, reasoning that it is impossible to manage what cannot be measured. The other school contended that operational risks are inherently challenging to measure, advocating for humanized and qualitative methods like risk maps, self-assessment, and audit outcomes. Over time, it became apparent that relying solely on one method and neglecting others was problematic. The extent of operational risk can be measured through the likelihood and impact of inadequate internal control on unexpected losses from external events (Alawaqleh et al., 2022; Altaf et al., 2022; Muermann and Oktem, 2002; Van Greuning, H., & Bratanovic, S. B. (2020)).

Each bank should articulate its approach, analysis scope, and the quantitative or qualitative methods employed in the analysis. Banks must establish a clear step-by-step framework for the operational risk management process, ensuring that robust operational risk measures are implemented across all business departments. This development process should encompass a specific developmental stage to implement effective operational risk management (Arhenful et al., 2019; Lyambiko, 2015; Prabhu and Shankar, 2017).

The support and involvement of senior management are vital for a robust operational risk management framework. These individuals must grasp the significance of operational risk and allocate the necessary attention and resources. Without senior management support, operational risk management might be relegated to the bottom of the priority list or only pursued to meet minimal regulatory requirements (Komba, 2014; Lyambiko, 2015; Ng'aari, 2016).

As described by Embrechts et al. (1999), extreme value theory (EVA) is a component of statistics that addresses the range from the median of the probability distribution. Its goal is to assess the likelihood of an event from a specific sequential sample of a certain random variable, demonstrating greater risk than previously observed. The banking and insurance industries are undergoing significant transformations. The reinsurance sector is increasingly grappling with substantial losses and can only provide the requisite insurance. As financial instruments become more complex, the demand for more sophisticated risk management tools is rising (Calabrese and Giudici, 2015; Dahen et al., 2010; Van Oordt and Zhou, 2019).

This study is underpinned by EVA theory as it further enhances the understanding of operational risk management. The study particularly focuses on risk securitization, while alternative risk transfer accentuates the integration of finance and insurance at the product level. This theory plays a pivotal methodological role in insurance, reinsurance, and financial risk management.

3. METHODS

This study's focus was to assess the extent to which Mauritian banks possess appropriate operational risk identification processes and risk mitigation tools. Given the rich information available from a substantial sample of 150 participants, a mixed-method approach was deemed more suitable. The targeted demographic for this study was Mauritian banking personnel. While researching the entire population of Mauritian bankers would be ideal, it is not practically feasible. Hence, a random sample of 150 individuals was selected to participate in the survey. The questionnaire was distributed randomly to known bankers from various banks and shared through their respective HR departments. The questionnaire incorporated a mix of dichotomous, Likert scale, and multiple-choice questions. This research utilized a descriptive approach, given its reliance on quantitative data. The combination of quantitative and qualitative data collection methods constitutes a mixed-method approach, enhancing the study's comprehensive understanding.

Exploratory research, suitable for operationalizing theories and integrating past knowledge, was utilized to build operational risk management theories (Saunders et al., 2007). Descriptive research reviewed existing data related to the studies in the Literature Review section. The quantitative method was predominantly employed for this analysis, considering the necessity of employing precise questionnaires for statistical, mathematical, or numerical data analyses to ascertain the frequency of variable data. Simultaneously, the qualitative method aided in interpreting respondents' opinions to evaluate established hypotheses. By adopting a mixed research methodology involving both qualitative and quantitative data, this study aimed to achieve its research objectives.

The research's reliability and accuracy hinge on the reliability and validity of the study. The reliability can be assessed by testing the Cronbach Alpha value. A Cronbach value ($\alpha \geq 0.70$) is considered acceptable, as verified in Section 4, where data reliability is assessed. For data analysis, the study utilized statistical methods with quantitative approaches, employing the Social Sciences Statistics Package (SPSS 23).

4. RESULTS

In the interest of conciseness, the subsequent discussion focuses on responses concerning Operational Risk Management within the Mauritian banking context.

The Pearson correlation coefficient serves as a statistical metric to compute the relationship between two continuous variables, indicating their associations. Rooted in the principles of correlation coefficients, it stands as the optimal means of gauging the correlation between vital variables. This coefficient not only furnishes insights into the degree of interaction or association but also divulges the intensity of the relationship.

The Pearson correlation coefficient test was carried out between the implementation process and nine variables to analyse the relationship strength of the variables. As illustrated in Table 1, based on a significance level of 0.05, the data were then analyzed and it was found that there exists a correlation between the implementation process and the various variables, since the $P < 0.05$. Therefore, the various variables were significant enough to be used for other statistical analyses.

To understand the relationship between Practical banking experience and other variables, a pearson correlation coefficient test was also carried out. From Table 2, it was found that at a level of significance of 0.05, practical banking experience had a relationship with all tested variables except with the management committee. A chi-square analysis was then carried out.

Three Hypotheses were established to investigate the relationship of practical banking experience with knowledge of system exposure, measurement of operational risk, and implementation process.

The Chi-square test was carried out between the above-mentioned variable at a level of significance of 5%. The Null hypothesis was only rejected if the P-value was lower than 0.05.

4.1. Hypothesis 1

- H0: There is no relationship between practical banking experience and Knowledge of system exposure.
- H1: There is a relationship between practical banking experience and Knowledge of system exposure.

As shown in Table 3, the P-value is 0.000 which is <0.05, hence the null hypothesis is rejected which indicates that at a level of significance of 5%, there is a relationship between practical banking experience and knowledge of system exposure.

4.2. Hypothesis 2

- H0: There is no relationship between practical banking experience and the Measurement of Operational Risk.
- H1: There is a relationship between practical banking experience and the Measurement of Operational Risk.

Since $P = 0.00 < 0.05$ as displayed in Table 4, the null hypothesis is rejected and hence there is a relationship between practical banking experience and Measurement of Operational Risk at the 5% significance level.

4.3. Hypothesis 3

- H0: There is no relationship between practical banking experience and Implementation Process.
- H1: There is a relationship between practical banking experience and Implementation Process.

As illustrated in Table 5, $P = 0.00 < 0.05$, the null hypothesis is rejected and hence at the 5% significance level, there is a relationship between practical banking experience and Implementation Process. Colgate (1998) also reported that experience can severely impact the implementation process. The results of this study, therefore, clearly indicate that banking experience can severely impact

Table 1: Pearson correlation coefficient for implementation process and independent variables

Proposed relationship	r-value	P-value	Relationship
Type of Risk→Implementation process	0.659	0.000	Support
Primary factor of Operational Risk→Implementation process	0.575	0.000	Support
People Exposure to Operational Risk→Implementation process	0.656	0.000	Support
Knowledge of System Exposure→Implementation process	0.599	0.000	Support
System Exposure→Implementation process	0.696	0.000	Support
External System Exposure→Implementation process	0.620	0.000	Support
Element of Operational Risk→Implementation process	0.769	0.000	Support
Measurement of Operational Risk→Implementation process	0.497	0.000	Support
Management Committee→Implementation process	0.551	0.000	Support

Table 2: Pearson correlation coefficient for practical banking experience with independent variables and dependent variable

Proposed relationship	r-value	P-value	Relationship
Type of Risk→Practical Banking Experience	0.223	0.023	Support
Primary factor of Operational Risk→Practical Banking Experience	0.417	0.000	Support
People Exposure to Operational Risk→Practical Banking Experience	0.295	0.002	Support
Knowledge of System Exposure→Practical Banking Experience	0.406	0.295	Support
System Exposure→Practical Banking Experience	0.327	0.001	Support
External System Exposure→Practical Banking Experience	0.447	0.000	Support
Element of Operational Risk→Practical Banking Experience	0.209	0.034	Support
Measurement of Operational Risk→Practical Banking Experience	0.235	0.016	Support
Management Committee→Practical Banking Experience	−0.024	0.807	Not Support
Implementation Process→Practical Banking Experience	0.205	0.037	Support

the implementation process and this is why people with more experience should handle the implementation process as this will allow the successful implementation of the process.

In order to analyse which factors impact the implementation process for Risk Operation in Mauritius, a regression analysis was carried out. The regression model includes the following variables:

4.4. Dependent Variable

Implementation process.

4.5. Independent Variable

- Type of Risk
- Primary factor of operational risk
- People exposure to operational risk
- Knowledge of system exposure
- System exposure
- External system exposure
- Element of operational risk
- Measurement of operational risk
- Management committee.

As illustrated in Table 6 it was deduced that R value is 0.854 and R Square is 0.729. The percentage of variability of the implementation process was therefore 72.9% and it is explained by the dependents' variables.

From Table 7, F-value gives the overall significance level. The P-value was found to be 0.0000 and since it was <0.05, the regression model was found to be significant and thus accepted. Hence, the various predictors were used to identify factors that affect the process of implementation.

The next table shows various coefficients for the different predictors.

From Table 8, a regression model was constructed,

$$Y=0.673+0.191X1+0.120X2+0.202X3+0.13X4+0.79X5-0.014X6+0.329X7-0.270X8+0.175X9$$

Where,

Y=Dependent variable: Implementation Process Independent variables:

- X1: Type of Risk
- X2: Primary factor of Operational Risk
- X3: People Exposure to Operational Risk
- X4: Knowledge of System Exposure
- X5: System Exposure
- X6: External System Exposure
- X7: Element of Operational Risk
- X8: Measurement of Operational Risk
- X9: Management Committee

5. DISCUSSION

Observations indicate a positive and significant relationship between the type of risk and the implementation process (B = 0.191 and Sig value = 0.034). Consequently, X1's impact on the implementation process is acknowledged, given the P-value below 0.05. This corroborates Kwon et al.'s (1987) assertion that the type of risk directly influences the implementation process.

The primary factor of Operational Risk exhibits a positive and significant correlation with the implementation process (B = 0.120 and Sig value = 0.180). Thus, X2's effect on the implementation process is deemed inconsequential, with a P-value surpassing 0.05.

Table 3: Chi-square tests for practical banking experience and knowledge of system exposure

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-square	137.394[a]	39	0.000
Likelihood ratio	139.593	39	0.000
Linear-by-linear association	16.959	1	0.000
N of valid cases	104		

[a]53 cells (94.6%) have an expected count of <5. The minimum expected count is 0.43.

Table 4: Chi-square tests for practical banking experience and measurement of operational risk

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-square	195.454[a]	60	0.000
Likelihood ratio	191.256	60	0.000
Linear-by-linear association	5.706	1	0.000
N of valid cases	104		

[a]84 cells (100.0%) have an expected count of <5. The minimum expected count is 0.14.

Table 5: Chi-square tests for practical banking experience and implementation process

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-square	153.779[a]	48	0.000
Likelihood ratio	161.319	48	0.000
Linear-by-linear association	4.315	1	0.038
N of valid cases	104		

[a]68 cells (100.0%) have an expected count of <5. The minimum expected count is 0.43

Table 6: Model summary

Model	R	R Square	Adjusted R square	SE of the estimate
1	0.854[a]	0.729	0.703	0.32518

[a]Predictors: (Constant), Type of Risk, Primary factor of Operational Risk, People Exposure to Operational Risk, Knowledge of System Exposure, System Exposure, External System Exposure, Element of Operational Risk, Measurement of Operational Risk and Management Committee

Table 7: ANOVA[a]

Model	Sum of squares	df	Mean square	F	Sig.
1. Regression	26.688	9	2.965	28.042	0.000[b]
Residual	9.940	94	0.106		
Total	36.627	103			

[a]Dependent Variable: Implementation Process, [b]Predictors: (Constant), Type of Risk, Primary factor of Operational Risk, People Exposure to Operational Risk, Knowledge of System Exposure, System Exposure, External System Exposure, Element of Operational Risk, Measurement of Operational Risk and Management Committee

Table 8: Coefficients[a]

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	SE	Beta		
(Constant)	0.673	0.304	0.199	2.214	0.029
Type of Risk	0.191	0.089		2.152	0.034
Primary factor of operational risk	0.120	0.089	0.177	1.351	0.180
People exposure to operational risk	0.202	0.090	0.199	2.245	0.027
Knowledge of system exposure	0.013	0.087	0.017	0.150	0.881
System exposure	0.079	0.104	0.088	0.753	0.453
External system exposure	−0.014	0.076	−0.017	−0.182	0.856
Element of operational risk	0.329	0.080	0.452	4.126	0.000
Measurement of operational risk	−0.270	0.083	−0.287	−3.250	0.002
Management committee	0.175	0.086	0.180	2.028	0.045

Dependent Variable: Implementation Process

A positive and significant relationship is evident between People Exposure to Operational Risk and the implementation process (B = 0.202 and Sig value = 0.027). Therefore, X3's influence on the implementation process is acknowledged, attributed to a P-value lower than 0.05. This resonates with Cornalba and Giudici's (2004) findings, indicating that banker exposure to operational risk fosters tailored implementation models based on their experience.

Findings reveal that knowledge of System Exposure holds a positive yet statistically insignificant relationship with the implementation process (B = 0.013 and Sig value = 0.881). Consequently, X4's impact on the implementation process is considered negligible, due to the P-value exceeding 0.05. Aerts (2001) similarly contends that a sound understanding of system exposure doesn't necessarily equate to a robust implementation process, given considerations like international banking regulations such as Basel.

System Exposure demonstrates a positive and significant association with the implementation process (B = 0.079 and Sig value = 0.453). Thus, X5's effect on the implementation process is considered unsubstantial, as the P-value surpasses 0.05. In line with Chernobai et al. (2008), system exposure within a bank has a direct impact on its operational risk implementation process, although this study's outcomes didn't yield significance.

Notably, external system exposure showcases a negative and significant relationship with the implementation process (B = −0.014 and Sig value = 0.857). Consequently, X6's influence on the implementation process is deemed negligible, with a P-value exceeding 0.05. Echoing the notion of system exposure, Chernobai et al. (2008) corroborate these results by highlighting the direct effect of external system exposure on operational risk management implementation.

The Element of Operational Risk correlates positively and significantly with the implementation process (B = 0.329 and Sig value = 0.000). Hence, X7's impact on the implementation process is acknowledged, attributable to a P-value below 0.05. The alignment of these variables' positive and significant relationship was anticipated by Radomska (2014).

The Measurement of Operational Risk exhibits a negative and significant association with the implementation process (B = −0.270 and Sig value = 0.002). Therefore, X8's influence on the implementation process is affirmed, as the P < 0.05.

The variable Management Committee manifests a positive and significant correlation with the implementation process (B = 0.175 and Sig value = 0.045). Thus, X9's impact on the implementation process is recognised, given a P-value below 0.05. Management committees play a pivotal role in implementing operational risk systems within banks, as highlighted by Netter and Poulsen (2003).

Hence, based on the aforementioned insights, a novel regression model was constructed: Y=0.673+0.191X1+0.202X2+0.329X3–0.270X4+0.175X5

Where:

Y=Dependent variable: Implementation Process

Independent variables:

X1: Type of Risk

X2: People Exposure to Operational Risk

X3: Element of Operational Risk

X4: Measurement of Operational Risk

X5: Management Committee

6. CONCLUSION

The purpose of the research was to support the formal definition of operational risk by Mauritian banks in order to enhance their capacity for risk management, mitigation, and comparison. The data collected and analysed in this study that customers nowadays are more concerned about the safeguard of the economy and their assets that are in possession of the banks. They are keen to know more about the risks that banks face on a daily basis, but also want to know more about what banks are doing in order to mitigate these risks. Customers want to know how these risks occur, and whether banks have the resources and personnel to deal with the risks. As per the survey carried out, customers are in favour of the establishment of an operational risk committee, which shall comprise of qualified people.

However, it is to be noted that to be able to manage operational risk, a sound knowledge on system exposure has to be present, but this does not mean that it will lead to a successful implementation process. There are many other factors that have to be considered, for instance Basel amongst others.

In this study, it was also noted that to be able to successfully measure operational risk, a proper operational risk process should

be identified and implemented. The way the process is to be implemented has to be planned well in advance so that there is no margin of error.

While trying to compare the spirit of risk management in the banking sector and the efficiency of the Basel framework for risk management, the significant argument against the effectiveness of the framework is still there. However, other risks rates like credit ratings have been recommended to be eligible for the guide.

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8. DECLARATION OF INTEREST STATEMENT

No potential conflict of interest was reported by the authors.

9. AUTHOR CONTRIBUTIONS

Conceptualization: Lovena Ramdani. Data curation: Lovena Ramdani. Formal analysis: Lovena Ramdani, Sharanam Abbana, Ferina Marimuthu. Funding acquisition: Ferina Marimuthu. Investigation: Lovena Ramdani, Sharanam Abbana, Ferina Marimuthu. Methodology: Lovena Ramdani. Project administration: Lovena Ramdani, Sharanam Abbana, Ferina Marimuthu. Validation: Lovena Ramdani, Sharanam Abbana, Ferina Marimuthu. Visualization: Lovena Ramdani, Sharanam Abbana, Ferina Marimuthu. Writing-original draft: Lovena Ramdani, Sharanam Abbana. Writing-review and editing: Lovena Ramdani, Sharanam Abbana, Ferina Marimuthu.

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