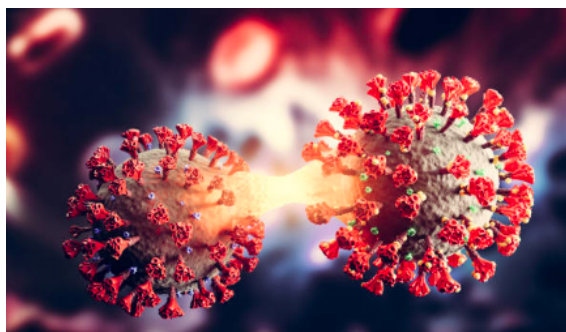


COVID-19: A Catalyst for Evolving MRM

By Amrendu Singh and Subhajit Basu



Abstract

The COVID-19 pandemic served as a wake-up call for the banking and financial services industry (BFSI), exposing shortcomings in the traditional models which consequently led to a re-evaluation of the model risk management (MRM) practices across various banks. This paper delves into the critical learnings gleaned from this unprecedented event.

The global COVID-19 pandemic took many businesses by surprise, as few anticipated an economic slowdown of this magnitude. This has been particularly challenging for businesses, such as banks, that heavily rely on a variety of statistical models for regulatory reporting and risk management. Typically, these models are built using data spanning three to five years, with many of them reflecting a period of economic stability. While these models perform well under normal circumstances, accurately reflecting long-term averages with minor adjustments for short-term changes, they can be less effective in extreme situations. The pandemic has highlighted the limitations of these models, leading banks to explore alternative methods for achieving more realistic results. This includes human intervention to adjust models, conducting scenario analyses, and comparing current performance with past crises.

The pandemic highlighted the need for a robust and an adaptable MRM framework. By incorporating the lessons learnt, BFSI institutions can build resilience against future crises and ensure responsible financial decision-making. By implementing the suggested practices, BFSI institutions can navigate a rapidly and constantly changing financial landscape with greater confidence and collaboratively contribute to a more stable and sustainable financial ecosystem.

Context and Background

The COVID-19 pandemic tested the BFSI's MRM practices and provided insights into previously unseen issues. Following the SARS outbreak in 2002 in China and Hong Kong, many institutions globally had begun using a pandemic as a stress testing scenario. However, the reality proved to be more complex than any prior stress test. The financial markets experienced substantial impacts from the COVID-19 pandemic in the first quarter of 2020. There were significant movements in stock markets, heightened volatility, and record lows in bond yields and rates. Credit default swap indices surged, indicating concerns about rising corporate default risks. These developments had widespread effects on risk model outputs used for risk-weighted asset computations, as well as for capital and financial reporting.

The origin of this global crisis, driven by a public health concern, led to an unprecedented economic shock impacting both demand and supply sides of businesses. The uncertainty surrounding the duration and potential recurrence of the pandemic further complicated the situation, requiring consideration of various future scenarios. Economic activity drastically slowed, resulting in a dramatic spike in unemployment, surpassing levels seen in previous crises. Macroeconomic forecasts rapidly deteriorated, with indicators suggesting a significant decline in gross domestic product (GDP) within a short period. This left BFSI with limited time to prepare and respond effectively.

Consequently, governments around the world responded with unprecedented fiscal stimulus packages and or forgiveness schemes. For instance, the US introduced the Coronavirus Aid, Relief, and Economic Security Act (CARES Act) and the Federal Reserve Main Street Lending Program. The Federal Reserve also intervened swiftly to inject liquidity into capital markets. Similarly, the Australian Government introduced the JobKeeper Payment scheme to support businesses significantly affected by COVID-19, providing wage subsidies to eligible employers. Likewise, the New Zealand Government came up with the Wage Subsidy Scheme to support businesses affected by COVID-19, providing financial assistance to help retain employees. Reserve Bank of Australia (RBA) and Reserve Bank of New Zealand (RBNZ) also implemented a range of monetary policy measures to support and alleviate the economy, including reducing the official cash rate and implementing a Large Scale Asset Purchase (LSAP) program to provide liquidity to financial markets. Consequently, in the wake of these fiscal and monetary measures, consumer default rates initially remained relatively low compared to what might have been expected in such a severe economic downturn. However, as some of these support measures began to wind down or be phased out, there were concerns about a potential increase in default rates. Some industries and regions were hit harder than others, leading to disparities in default rates across different sectors. Post-pandemic, the extent of this impact has varied. In some cases, government aid and support measures have helped stabilize the situation, while in others, the withdrawal of support has led to an increase in default rates.

The pandemic also triggered unprecedented changes in consumer and corporate behavior. Precautionary measures and restrictions led to a surge in the use of video conferencing platforms, increased reliance on delivery services, and a significant uptick in economic activity through online channels.

The challenges in model management were exacerbated by these pressures. Many of the models used by senior management and decision-makers were likely to have underperformed or failed to work effectively. Deciding when and how to adjust or replace these models was particularly challenging, especially given the limited data available to assess the pandemic's impact. Consequently, there was a surge in efforts related to model development and validation in the latter half of 2020 and beyond, as more experience and performance data became available.

Impact Specific to MRM

The COVID-19 pandemic presented challenges across the model management life cycle. Model developers and validators in the first and second lines of defense had to address these issues subject to both time pressure and resource constraints. Challenges were encountered at each stage, including model performance monitoring, (re-)development, and (re-)validation. Some examples are as follows:

Model Life Cycle	Foreseeable Complication(s)
<p>Periodic Performance Monitoring</p>	<ul style="list-style-type: none"> • Models break and fail to produce accurate results due to extreme fluctuations in macroeconomic factors, surpassing the scenarios considered in their development or testing phases. • Models do not meet the pre-defined performance standards outlined in current monitoring protocols. • Models no longer align structurally with the current range of products or market behaviors. For instance, models projecting commercial lending volumes post US CARES Act and Federal Reserve Main Street Lending Program, or retail credit models predicting customer default timing affected by the deferral programs.
<p>Model Development</p>	<ul style="list-style-type: none"> • Models lack sufficient outcomes for testing or redevelopment, such as final outcomes for currently deferred retail loans. • Relationship between products and macroeconomic conditions is disrupted, for instance, between macroeconomic conditions and defaults due to deferrals, or between the unemployment rate and default given government stimulus, and stock market rallying due to government stimulus. • Any model changes or redevelopment requires "chasing a moving target," as events over the coming months, such as the development of a vaccine, might fundamentally alter the nature of the work that needs to be done. A pandemic situation may invoke regime shift(s) in the economy. • Lack of consensus and guidance on the treatment of the pandemic period in model development, such as whether to include or exclude the period from the development dataset, and how to calibrate for the stress period.
<p>Model Validation</p>	<ul style="list-style-type: none"> • Absence of clear historical data or precedent for validators and developers to benchmark model performance for effective challenge as "past is not reflective of the pandemic" • Greater need to rely on "judgment calls" in model validation processes, as there is a likelihood of overlaying or replacing some quantitative model aspects with assumptions and expert judgment. • Capacity issues due to surge in model validation efforts as a consequence of models failing monitoring standards and potential delays in model (re-)development.

Table 1: Impact of COVID-19 across various stages of the MRM Life Cycle

The initial response to COVID-19-related model risk issues involved making swift adjustments and overrides. However, these actions might not have adequately resolved longer-term breakdowns in statistical relationships. Certain risk models might have required complete redevelopment or replacement with new types of models. Failure to take urgent and comprehensive model risk management actions could have led banks to rely on faulty output and draw incorrect conclusions regarding risk.

As is usually the case, the decision to implement out of model overlay(s)/adjustment(s) or opt for a strategic or tactical model rebuild depends primarily on whether the model is fit for purpose and performing as intended. Interestingly, the pandemic had varying effects on different types of risk models as detailed below:

Model Type	Potential impact and additional considerations, if any
Liquidity Risk	Liquidity model assumptions on outflows and inflows, large facility drawdowns, deferrals in loan repayments , and potential changing nature of deposit behavior all require review and should be adjusted to incorporate the recent “reality” when forecasting the cash flows for liquidity risk management.
Market Risk	Increased noise and lack of liquidity in market data , dispersion of spreads and high market volatility may lead to limit breaches, back-testing outliers and RWA increases. Remedial actions should focus on exception analysis, re-balancing risk positions (e.g. reducing exposure, VaR/ SVaR) and recalibrating models.
Operational Risk	The shift to remote work and changes in business operations have altered the risk landscape . Operational risk models may need to account for new types of risks , such as cyber-security threats related to remote work environments.
Valuation	Prudential valuation models should be reviewed with regards to their adequacy and methodology in lieu of the volatile market conditions. xVA model outputs may cause "Profit and Loss" swings and will therefore require more frequent monitoring, recalibration and validation.
Credit Risk	Capital and decisioning models face significant challenges due to their longer update cycles and reliance on historical data. Government relief measures and other relief schemes can mask credit risk , making it difficult for these models to accurately assess default probabilities. Recalibration of early warning triggers and Internal Ratings-Based (IRB) models may be necessary to reflect the actual default risk in the portfolio.
Stress Testing	Banks must re-assess stress scenarios and severity levels in light of the rapidly changing economic environment to ensure that their models provide meaningful insights for management. It is essential to incorporate external and internal perspectives on stressed forecasts into stress test outputs for capital and liquidity.
IFRS 9 or CECL	Payment holidays, guarantee schemes, rapidly changing economic forecasts, volatile collateral valuations, and credit risk uncertainty all necessitate the incorporation of additional factors and judgment. In the short term, post-model adjustments may be necessary, while in the long term, potential model redesign may be required.

Table 2: Impact of COVID-19 on Risk Models

So, to summarise, addressing the implications of COVID-19 on models will require making challenging decisions upfront, approached in a structured manner with input from senior stakeholders. These decisions aim to ensure consistency while allowing controlled flexibility to tackle the uncertainty surrounding the pandemic and the anticipated increase in model management workload. Financial institutions may need to consider approaches and options that were previously deemed unacceptable or suboptimal, such as increased reliance on expert judgment or using limited data to inform adjustments. Models relying on less data-driven approaches may still be preferable to those failing to meet performance expectations. Therefore, model (re-)development frameworks should accommodate prudent expert judgment to guide performance assessment and decision-making. While solutions will vary based on factors like model family and purpose, there are key practical actions institutions can take now to better manage model management challenges arising from the pandemic.

Navigating Model Risk in Turbulent Times

To prepare for future challenges like COVID-19 and avoid hasty solutions, banks should follow the "**four phases of emergency management**" framework. This approach is well-established in emergency management and helps in developing a strategic response. This framework has evolved over time and has been adopted by various organizations and agencies. However, the concept of dividing emergency management into distinct phases can be traced back to the early days of emergency planning and disaster response. One of the earliest mentions of a multi-phase approach to emergency management can be found in the work of civil defense agencies during the Cold War era. These agencies often outlined stages such as preparedness, response, and recovery in their planning efforts.

The current four-phase framework gained more prominence in the latter half of the 20th century and has since become a standard approach in emergency management. It is used by organizations such as the Federal Emergency Management Agency (FEMA) in the United States and the United Nations Office for Disaster Risk Reduction (UNDRR) to guide their disaster management efforts. The four stages are typically described as follows :

1. **Mitigation:** Actions taken to reduce or eliminate the risk of hazards. This phase involves long-term planning, regulations, land-use planning, and infrastructure improvements.
2. **Preparedness:** Activities undertaken to build the capacity to respond to emergencies. This includes planning, training, exercises, and public education.
3. **Response:** Actions taken immediately to save lives and protect property during an emergency. This includes emergency services, evacuation, and emergency shelters.
4. **Recovery:** Actions taken to restore the community to normal or near-normal conditions after an emergency. This includes debris removal, rebuilding, and restoring essential services.

Overall, the Four Phases of Emergency Management framework provides a structured approach to managing emergencies and disasters, helping organizations and communities effectively prepare for and respond to crises.

Now, specific to the topic of discussion here, table below summarises some MRM strategies across each stage:

Stage	Crisis Stage	Proposed actions
A	Mitigation - Before Crisis	<ol style="list-style-type: none"> 1. Scenario Planning: Develop and maintain scenario analysis for various pandemic scenarios to assess the impact on models and operations. 2. Model Governance: Strengthen model governance processes to ensure models are robust and adaptable to changing conditions. 3. Data Quality: Enhance data quality controls to ensure accurate and reliable data inputs, especially during periods of disruption. 4. Model Documentation: Improve model documentation to facilitate understanding and transparency, particularly for remote working environments.
B	Preparedness - Before Crisis	<ol style="list-style-type: none"> 1. Training and Awareness: Conduct regular training and awareness programs for staff on model risk management practices, focusing on remote working and crisis scenarios. 2. Testing and Validation: Regularly test and validate models to ensure they remain effective and fit for purpose, considering potential impacts of pandemics. 3. Contingency Planning: Develop and maintain robust contingency plans for model failures or disruptions, including alternative modeling approaches and data sources.

Stage	Crisis Stage	Proposed actions
C	Response - During Crisis	<ol style="list-style-type: none"> 1. Model Monitoring: Increase the frequency of model monitoring and review to quickly identify and address issues arising from the pandemic. 2. Decision Making : Implement processes for rapid decision-making regarding model adjustments or overrides based on real-time data and insights. 3. Communication: Establish clear communication channels to keep stakeholders informed about model performance and any necessary actions.
D	Recovery - Post Crisis	<ol style="list-style-type: none"> 1. Post-Crisis Evaluation: Conduct a thorough evaluation of model performance during the pandemic to identify areas for improvement in future crises. 2. Re-development: Rebuild models as necessary based on lessons learned from the pandemic experience, incorporating new data and insights. 3. Resilience Planning: Develop resilience plans for future pandemics or similar crises, ensuring models are better equipped to handle such situations.

Table 3: Model Risk Crisis Management Strategies

Specific to stage C, as outlined above, a specialized senior management "**Emergency Response Team**" **should be established** to guide banks during times of crisis. To effectively manage MRM during a highly disruptive situation, this team should have transparent governance, a structured operating model, and effective MRM tools. It will shift focus from regular business activities to crisis management. **Adopting an agile approach, the team should conduct a rapid and thorough review of MRM.** Leveraging clear methodologies and MRM tools like model inventory and a crisis-response dashboard, it can then formulate and execute a well-coordinated crisis-response plan which could primarily focus on some or most of the following:

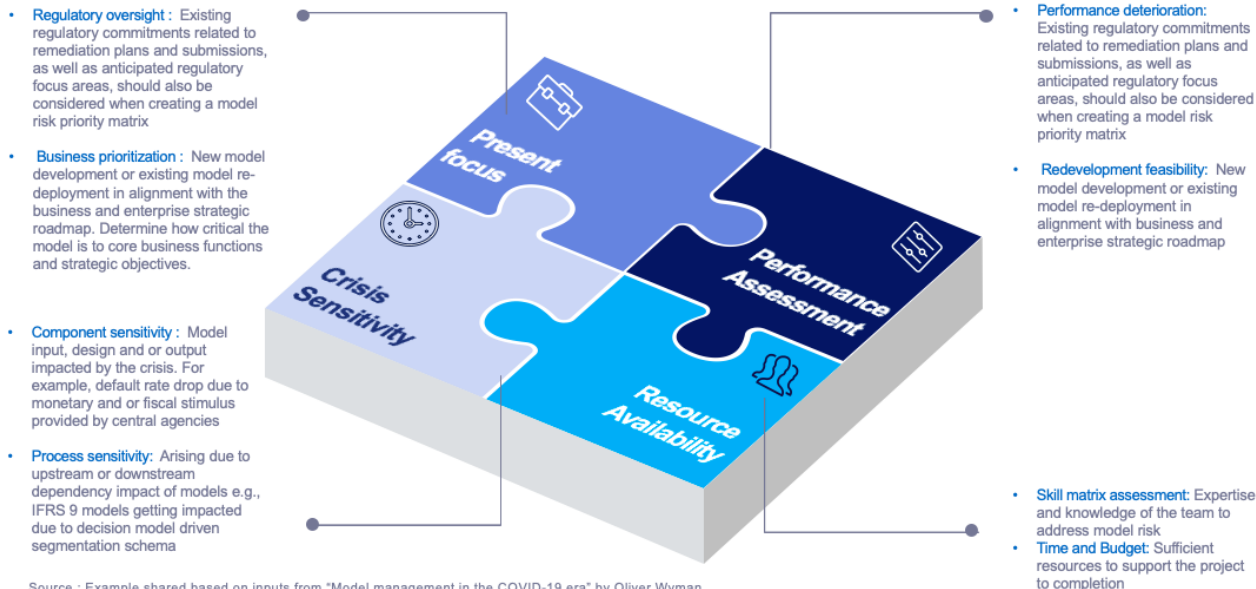
- **Model Adjustment Inventory and Risk Assessment :** The inventory should catalog model modifications and assess models at risk, identifying those that have failed or are likely to fail soon. It will also document all adjustments made to models and align them with the models identified as at risk.
- **Consistent model mitigation actions :** Consistent actions for mitigating model risk are essential. Adjustments should be uniformly applied across functions and operations. MRM must verify adjustments and underlying assumptions for various model types to maintain consistency and avoid conflicting messages and decisions.
- **Timely Review of model overlays or adjustments :** Reviewing model adjustments promptly is crucial. The team should rapidly conduct a thorough evaluation of all planned model adjustments and underlying assumptions, employing an agile approach and a focused review methodology.
- **Crisis Action Prioritisation Matrix(CAPM) :** MRM should prioritize model adjustments and redevelopment based on criticality and likelihood of failure; review applied adjustments and redevelopment needs accordingly. Banking institutions often rely on a **crisis prioritization matrix** considering factors such as degraded model performance, heightened regulatory and internal scrutiny on specific models, including those affected by shifting strategic priorities or new business initiatives, as well as models already earmarked for redevelopment. Also, BFSI should account for the pandemic's impact on the model and its related components and adjacent models (secondary model impact issue). This matrix should carefully select and calibrate factors and thresholds to determine the number of higher-tier models requiring revision, considering practical constraints like existing plans and resource availability. Finally, the agreed tiering matrix should allow for the exercise of judgment, ensuring that senior stakeholders can promptly agree on the highest priority models needing development and validation focus, and allocate resources accordingly.

The illustration below provides a schematic representation of how a "typical" matrix may appear:

Figure 1: Hypothetical Example Crisis Action Priority Matrix for a Bank

Bank MRM during crisis

Prioritize and concentrate efforts on models that have a 'High' (and possibly 'Medium') risk rating based on the following considerations :



However, aside these CAPM considerations, subjective judgment may also be required to arrive at any final decision here as we need to also consider the organization’s overall risk tolerance and appetite for model risk.

Process automation of business as usual (BAU) model monitoring and or periodic validations could also help relieve some resource capacity which may be quite during these troubled times. Dynamic MRM dashboard(s) may be developed, capable of alerting the bank to emerging model risks. They could also be customized to incorporate plans for comprehensive model redevelopment and MRM enhancement, while also facilitating progress tracking against milestones using key performance indicators. Some organisations have also attempted automation of decision-making process flows for senior management deliberation as sampled below:

Figure 2: Process flow for MRM Decision-Making Automation

Automated MRM decision-making process flow example



Source : Example shared based on inputs from "Model management in the COVID-19 era" by Oliver Wyman

These decision flow charts are crucial for guiding consistent decisions on model treatment across any institution. These charts should include both generalized versions and specific "case law" examples tailored to different model families or purposes. They will help identify key decision points, highlight potential pathways, and provide templates for managing model monitoring exceptions. Socializing and refining these decision trees will be necessary to ensure they accurately reflect the complexity of issues for each specific model type.

Financial institutions should also reassess compensating controls, like overlays, in light of increased need during the pandemic. They should evaluate all available options, including assumption changes and challenger models, for various parts of a model. Oversight should balance rigor with expediency, considering the pandemic's unique nature.

Post crisis, as BFSI move to Stage D, it should strategically manage their model portfolios with MRM, aiming to improve business efficiency, enhance decision-making, and increase model landscape resilience. BFSI should establish robust framework elements for informed business and strategic decisions, focusing on identifying at-risk models and understanding model interdependencies to anticipate risks.

Into the Unknown

The extraordinary and rapidly evolving nature of the COVID-19 pandemic posed a host of new and unprecedented challenges for model management practices across the financial services industry. This crisis led to a significant surge in model management activity, with the need for increased effort and resources becoming more acute as the year progressed. Senior executives were urged to take tangible actions upfront to ensure that institutions focused on the right set of problems and effectively managed the increased workload. Looking back, the context of present macroeconomic hardships, including the Ukraine war, fear of a global recession, and other geopolitical tensions, highlights the relevance of preparing for impending crises in the near future. The paper's insights on proactive steps for managing model risks can serve as a valuable guide for institutions seeking to strengthen their resilience in the face of future crises. By learning from the challenges faced during the COVID-19 pandemic and implementing effective model management practices, financial institutions can better prepare for and navigate through future uncertainties.

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