# Model Effectiveness and Model Risk Management During Times of Crisis

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**Large financial services companies are leveraging their models developed for financial projection, customer behavior, risk calculation and other use cases to inform rapid decision-making during this time of unprecedented change. The current health and economic situations, as well as many of the input variables for these models, are changing at a staggering pace and at amplified volatility. Qualitative adjustments or management overlays are increasingly being applied to model outputs when the outcome is not useful or for models that cannot incorporate the unprecedented actions taken by individuals and governments across the globe (e.g., stay-at-home orders, Coronavirus Aid, Relief, and Economic Security (CARES) Act). A postmortem review of the usefulness and accuracy of models during uncertain times will certainly be required.**

The stakes are extremely high for the public and businesses alike. This has been evident in the reliance of government policy for combatting COVID-19, which has been driven by epidemiological models for infection spread. Consider the United States and United Kingdom as examples, where initial policies were altered based on a report from the Imperial College of London showing a potentially significant number of lives lost[1]. While epidemiological models have been vital in guiding collective response to halting the spread of COVID-19, companies are using their own models to minimize the negative impact of the virus on their staff, supply chain and key financial metrics.

Only in hindsight will we be able to assess the effectiveness of the current model suite. A postmortem assessment can help determine which models were useful in managing through this crisis and which were found to be inaccurate or failed their use case. The information will also help drive the modeling and model risk management agendas in the future by identifying the most pressing model development needs and focusing model validation activities. We can be sure there will be another crisis to manage in the future, whether it is another wave of COVID-19,[2] natural disaster or other potential crisis, and models that are capable of providing timely and accurate information can be a differentiating factor for companies.

1. "Behind the Virus Report That Jarred the U.S. and the U.K. to Action." New York Times. April 2, 2020.
2. "CDC chief warns second COVID-19 wave may be worse, arriving with flu season." Reuters. April 21, 2020.

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Depending on the institution, liquidity risk, credit risk, market risk and others should be the most scrutinized models during this challenging time. The rapid acceleration of risk within these areas can be the kindling in unwanted model risk that stems from the thirst for information during a crisis. Rapid model output production as the result of multiple scenarios and volatility in the inputs can lead to implementation errors, relaxing of controls, not fully developed assumptions and models used for purposes other than which they were developed. Below is a more in-depth discussion of potential areas of risk.

### Liquidity Risk

Liquidity models are certainly among the most prominently used models amid crises as a company's cash flow and solvency is stressed. Clients may start drawing credit lines, market asset values decline, and funding sources may begin drying up. The interactions between these components present a challenge to risk managers and their models across the industry.

Changing portfolios and market shifts only amplify these challenges during crises. Models and their implementation infrastructure must be capable of increasing the frequency of model runs and ongoing monitoring cycles during these times. As of today, we have seen large scale intervention to support market liquidity by the Federal Reserve Board[3], however, banks should not rely on the security of a government backstop due to the unpredictable nature of the macro environment. The latest data should be used to refine existing models to optimize liquidity strategies with a focus on maximizing an institution's resilience while minimizing liquidity costs.

### Credit Risk

The virtual suspension of economic activity across the globe has caused significant struggle for small, medium and large enterprises alike. There will likely be a significant rise in default rates and deterioration of collateral quality given the impact on the economy due to the coronavirus. This will be especially true for certain industries that rely on customer foot traffic (e.g., restaurants, hospitality department stores) and clustering of increased credit risk along these lines will occur.

Credit risk models should be leveraged to identify those risk clusters early to allow for proactive mitigation strategies. Indeed, there will be losing industries with devastating defaults, but like in previous crises, winners

will emerge as well. The advent of mature artificial intelligence technology, including cluster algorithms and spatial analysis, offers possibilities to differentiate between them. Next, predictive exposure models must be able to project utilization increases before troubled customers start drawing their credit lines. Additionally, collateral models should be revisited on an ongoing basis as market volatility continues through the crisis.

### Market Risk

The most recent breaches in Value at Risk (VaR) models across the industry[4] are striking examples for the need of sound market risk models. Stakes are high especially in times of spiking volatility as dramatic losses in the trading book and regulatory capital increases can deteriorate profitability for years. Correlation models will need particular attention to ensure diversification and hedge effectiveness during crises when correlations historically behave erratically. Further, the change in interest rates as well as consumer behavior will require interest rate models to be adjusted to the "new normal." In fact, this necessary adjustment emphasizes and coincides with the need for revisiting interest rate risk and ALM models due to the upcoming London Interbank Offering Rate (LIBOR) transition.

### Postmortem Assessment and Planning

Performing a postmortem assessment across the model inventory and model risk management components are an important exercise to manage risk going forward and to help prepare for the next crisis. It is critical to conduct this exercise while the experience is fresh in the minds of model owners, users and developers so as to gather the core pain points experienced. An assessment of the models should focus on the key areas of model data, production, performance, ongoing monitoring, outcomes analysis, governance and control.

A good starting point is to assess where gaps existed in the availability of models required for response to the crisis. In other words, were there models that the company wish they had prioritized for development that were not available for use? Similarly, are there models that were leveraged during the crisis but required "on the fly" adaptation to produce the results needed? Both situations warrant the focus of model development, tuning or re-development activities in the very near future.

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3. **"Federal Reserve Board Takes Significant Action to Support the Economy and Market Functioning." DHG. June 5, 2020.**
4. **"HSBC Reveals It Was Caught Out as Lockdowns Snarled Gold Market." Bloomberg. May 6, 2020.**

For models that were leveraged throughout the crisis, a review should focus on speed and flexibility. Asking key questions of model owners and users can glean the model's effectiveness:

| KEY QUESTIONS FOR MODELS DURING THE COVID-19 CRISIS |
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| • Was the input data for the model available, timely and of sufficient quality to produce meaningful results? |
| • Was the model implementation environment sufficient to produce timely results? How long did it take to receive meaningful model output? |
| • Was the model built for how it was used? |
| • How did the model handle new parameters and assumptions? |
| • Were management or expert judgment adjustments made to model output and was it governed and reviewed? |
| • How did the model perform? |
| • Were there any model output errors? |

There are also opportunities for efficiency when reviewing model development needs. One area worth pursuing is to leverage existing models designed for other purposes and recalibrating them to support rapid decision-making. Stress testing models come immediately to mind as the rigor used to produce these models, including significant business involvement in understanding key macroeconomic and business risk drivers, ensure these models have a foundational conceptual soundness. Adjusting their use case may be more easily achieved then a de novo model development project.

On the side of model risk management, processes for model governance related to qualitative overlays, assumptions disclosure and sensitivity analysis will be at the fore of the review. Rapid decision-making drives the need for speedy model governance processes. Some key questions to ask from a model risk management standpoint include:

| KEY QUESTIONS FOR MODEL RISK MANAGEMENT DURING THE COVID-19 CRISIS |
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| • Does the model inventory capture all models employed for decision making during the crisis? |
| • Were models used outside of their use case and/or adapted without being revalidated for new use cases? |
| • Did qualitative adjustments undergo the proper level of review and governance? |
| • Were key assumptions disclosed in the reporting of model results? |
| • Was the appropriate sensitivity analysis performed to understand the impact of assumptions made? |
| • Did control lapses occur in the implementation process? |
| • What communication occurred between model developers and model risk management teams? |

## Path Forward

| CRISIS MODEL PLANNING |
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| **Determine Analytics Needs** |
| • Document the analytics requests across lines of defense to manage through the crisis. Assess gaps to current model capabilities and output alignment. |
| **Set Development Timeliness** |
| • Armed with an understanding of the needs for information, develop aggressive development timelines for crisis preparation. |
| **Create Rapid Approval Capabilities** |
| • Revisit model adjustment approval process to ensure capabilities for effective and efficient governance. |
| **Verify Model Inventory** |
| • Canvas models leveraged during the crisis and ensure model inventory is comprehensive. |
| **Validate Models** |
| • Establish aggressive timeline for validation of unvalidated crisis management models and align with development timelines for models to be developed. |

Suffice it to say, the global health crisis will change the way we live and work. Similar to the global financial crisis, the way we view models in support of crisis decision-making will also change. Applying strong model risk management requirements to models used during crisis across industries and public domains will be one of the lessons learned. Creating and adapting processes to be more efficient in the face of accelerating need for information should be a focus for all companies. Establishing a plan that prioritizes model development and sound model risk management activities is the starting point.

The progression of our mathematical and computing capabilities has granted us a relatively new ability to understand the nature of the world we operate in. The proper level of management and governance may be the difference between using this ability to our collective advantage or detriment.

For more information about DHG's Quantitative Advisory capabilities, reach out to us at riskadvisory@dhg.com.

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