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NATIONAL BANKING SYSTEM
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Opening Remarks: Model Validation as a Process

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Model Risk

Financial firms and their regulators are comfortable thinking about financial risks—credit risk, market risk, and interest rate risk. While it would be convenient if we could physically observe and measure those risks, we cannot. Therefore, among the tools that we use to think about those risks are models to identify and quantify them.

It is intrinsic to the notion of models that they feature risk. In the realm of finance modeling, the object of interest is future outcomes—either expected or potential—and those modeled outcomes can be wrong. Humans construct models, so models are exposed to all of the sources of error of any other human construct—errors in logic, errors in execution, and errors in use. Those errors are what we call model risk.

However, determining whether models are wrong is difficult. It is often said—but still true—that all models are wrong by design, because they are simplifications of reality. Models reflect knowledge, beliefs or assumptions about important causal relationships. Those causal statements are, by design, highly abstract. They are not designed to capture every detail of reality, including the idiosyncratic factors that contribute to observed outcomes. Furthermore, when models are used to generate predictions—and risk models are included in that class—the ‘predicted’ outcomes reflect future outcomes of exogenous variables. Even a very good statement of the causal relationship will deliver wrong predictions under most outcomes for the exogenous variables. So the modeled outcomes are conditional on a very precise artificial construct and specific set of conditions. Under the most favorable circumstances, tests of such models are probability statements, but under most circumstances model adequacy is determined by expert judgment. While this is a disturbing notion for the non-modeler, it is one that must be confronted because it determines strategic choices in model building, model administration and model use.

Model-Risk Analysis

The appropriate response to model risk is to risk manage the use of models, just as we manage the risks of all other aspects of running the enterprise. The objective of the model builder is to devise the best model for the business use; the objective of model-risk management is to determine whether that has been accomplished.

Model users must acknowledge at the outset that models are imperfect and put in place a process for controlling the risk that they are not good enough to use. Model users need to employ a model validation process that is designed to provide the best available evidence that a model is good. Such a process entails the evaluation of model development, verification that it is operating as planned, and monitoring for evidence that contradicts the model. The model validation process is

ongoing, critically dependent on expertise, and costly.

At the OCC, we have responded to the growing importance of modeling in banking by examining for model validation processes. We embodied our expectations in a banking bulletin, (OCC Bulletin 2000-16, “Model Validation”), which is generally applicable in all modeling contexts. This bulletin describes a framework that values the principles of independence and assigned responsibilities in checking models, recognizes the importance of documentation and ongoing testing, and makes it clear that bank management is responsible for recognizing model risk and devoting adequate resources to addressing it.

Model-Risk Analysis in a Credit Risk Context

Credit rating and scoring models present a distinct set of challenges to model validation. The primary event of interest—default—is rare. When defaults do occur, they tend to happen in batches, implying long spells during which defaults are more rare. All of this means that the comparison of model predictions to outcomes—back testing—is not statistically powerful. Adding to the level of difficulty of the validation challenge, there is shortage of generally accepted standard models against which to compare.

Recognizing the challenges of model validation for credit rating and scoring models, it becomes increasingly important that the users of those models employ a complete process that offsets the limitations of any individual test.

- The first element of that process is to demonstrate that the model is well developed. Models should be logical on an a priori basis. Models need to be supported with empirical evidence that they can identify credit risks in a data set that is well designed for model development purposes. And modelers should be sensitive to the risk of trying to describe a development data set perfectly when some of the outcomes in the developmental data may be random.
- Given a well-developed model, the second element of the process is ongoing verification that the model is working as expected. Ongoing verification includes activities designed to confirm that the model is implemented as designed and activities designed to get an early read on whether the models is likely to be working. Process verification includes checking equations and the computer code that deploys the model. Equally important, process verification must include mechanisms to assure the quality of the data inputs. And process verification includes the evaluation of reports to confirm that they are understandable and well used. Another key aspect of ongoing verification is the comparison of model predictions to

predictions from other useful sources—benchmarking—to confirm the likely correctness of the predictions.

- The third element of model validation is outcomes analysis. In this phase, where practicable, model predictions are compared to actual outcomes. While theoretically compelling, model users must understand that statistically powerful outcomes tests may be rare, and must not count on this evidence alone.

capital framework, bank management will be responsible for model validation; bank validation processes will be the first line of defense against bad credit risk models. Just as we do in other risk management contexts, bank supervisors will examine the bank validation processes. It must be recognized, however, that the added importance of being part of the capital framework means that some validation deficiencies that supervisors might otherwise have deemed immaterial will be brought to management's attention.

Model-Risk Analysis in the Basel II Context

The advent of regulatory capital requirements that will be a function of internal bank credit risk assessments raises the stakes for model validation. While Basel II is a regulatory