

DFAST Stress Testing Principles: Part I

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Many banks are currently working through the challenge of the DFAST stress testing submissions. Integral to a successful submission is a strong framework to satisfy both regulatory guidance and management expectations. This Montana Analytics topic paper is part one in a three-part series on DFAST principles for institutions with total consolidated assets in the \$10B-\$50B range.

As a leader in Model Risk Management, Montana Analytics has been active in developing quantitative models and utilizing rigorous analytical methods for examining models since 2002.

Summary

The U.S. Federal banking agencies ("agencies") issued the Dodd-Frank Act ("DFA") Stress Test rules¹ in October 2012 requiring all institutions supervised by the agencies with total consolidated assets greater than \$10 billion to conduct annual company-run stress tests, termed the Dodd-Frank Act Stress Test or DFAST for short. The Federal Reserve Board (the "Fed", "FRB", "Board"), the Office of the Comptroller of the Currency ("OCC"), and the Federal Deposit Insurance Corporation ("FDIC") constitute the agencies who issued the guidance, referred to as "SR 12-7". Guidance issued in December 2015² required Savings and Loan Holding Companies ("SLHC") with total consolidated assets of more than \$10 billion to conduct their first stress test on January 1, 2017.

This topical paper focuses on DFAST principles for applicable supervised financial institutions (collectively, "companies", "firms", "mid-sized banks") with total consolidated assets in the \$10B-\$50B range, excluding those entities regulated by the Federal Home Finance Agency. All referenced firms must submit results to their primary regulator by July 31 yearly based on the composition of the portfolio as of December 31 in the prior year; public disclosure of the summary of results is required between October 15 and October 31. February 15 is the yearly deadline from the agencies to publish the Supervisory scenarios but these were released approximately two weeks earlier than the stated deadline the past few years.

¹ The agencies' rules for "Annual Company-Run Stress Test Requirements for Banking Organizations with Total Consolidated Assets over \$10 Billion Other than Covered Companies" were issued by the Board on October 12, 2012 (77 Fed. Reg. 623962), the OCC on October 9, 2012 (77 Fed. Reg. 61238), and the FDIC on October 15, 2012 (77 Fed. Reg. 62417).

² 12 CFR Parts 225 and 252, [Regulations Y and YY; Docket No. R-1517] RIN 7100 AE 33, Amendments to the Capital Plan and Stress Test Rules December 2, 2015.

SR 12-7, issued in May 2012, presents five general principles for a successful stress testing framework. DFAST principles relevant to the mid-sized banks participating in the DFAST exercise along with related guidance and ideas to effectively implement the principles are the subjects of this series. Implementation ideas include information from regulatory guidance, regulatory comments, conversations with regulators and vendors, practices in mid-sized Banks and Montana Analytics ideas, and. Montana Analytics has conducted many model validations covering all aspects of quantitative finance since 2005, with many projects focused on DFAST models since 2012. These DFAST projects afford the insight and experience shared in this three-part series.

Overview

SR 12-7 discusses general principles for a successful stress testing framework that are not specific to DFAST, though it's clear the agencies expect firms to consider the principles for such regulatory exercises. It is commendable the agencies stated these principles but they are a mix of theoretical principles and directives, which makes their interpretation and implementation challenging. Understanding the nature of the exercise, or any problem is important to solving it. Lack of directives in guidance is a common complaint by Banks since regulators are often reticent to provide prescriptive guidance on complex topics, leaving their charges guessing as to how best to implement without incurring the regulator's wrath. Certain principles in the 2012 guidance could be combined or at the least restated and there is overlap among many of them. One could not expect all principles to be independent but there is perhaps too much interconnectedness left unexpressed. Good risk management practices incorporate these principles so firms would be well served by implementing sound risk management policies and practices before implementing processes solely for DFAST. Risk governance activities have been a focus of examiners since the global financial crisis and were the principal cause for many large CCAR banks which failed that process, even for those with adequate capital. Scrutiny on mid-sized banks regarding governance practices is less thorough compared to CCAR banks, but examiners still assess governance and many participants would consider it critical to a successful DFAST submission and subsequent regulatory exam.

As with many parts of the process though, regulatory expectations for governance have increased over time. Various guidance and other references released since 2012 have helped to answer the questions on executing a successful DFAST submission:

- 1) SR 12-7: Supervisory Guidance on Stress Testing for Banking Organizations with More Than \$10 Billion in Total Consolidated Assets, May 14, 2012
- 2) SR 14-03: Supervisory Guidance on Dodd-Frank Act Company-Run Stress Testing for Banking Organizations with Total Consolidated Assets of More Than \$10 Billion but Less Than \$50 Billion, March 6, 2014
- 3) OCC (2014, 03 05): Supervisory Guidance on Implementing Dodd-Frank Act Company-Run Stress Tests for Banking Organizations with Total Consolidated Assets of more than \$10 Billion but less than \$50 Billion
- 4) FR-Y16 (2017 form): \$10-50 billion reporting form for DFA company-run stress tests

- 5) SR 15-19: Federal Reserve Supervisory Assessment of Capital Planning and Positions for Large and Noncomplex Firm, December 18, 2015
- 6) Policy Statement on the Scenario Design Framework for Stress Testing, January 1, 2014
- 7) Frequently Asked Questions: Supervisory Methodologies in CCAR 2012
- 8) Capital Planning At large Bank Holding Companies: Supervisory Expectations and Range of Current Practice (August 2013)
- 9) Comprehensive Capital Analysis and Review 2015 Summary Instructions and Guidance (October 2014)

Only the first 4 references are strictly applicable to firms with total consolidated assets in the \$10B-\$50B range; the other guidance is for larger firms with assets greater than \$50B. However, there is still valuable information to learn and possibly apply from understanding the guidance provided to large institutions that participate in the Comprehensive Capital Analysis and Review (CCAR) process. Many topics referenced and covered in detail in CCAR work (e.g., estimation techniques, governance, validation procedures, etc.) demand a more in-depth treatment that future Montana Analytics Briefings will delve more deeply into such topics.

Stress testing Overview

Fed Guidance SR 12-7 defines a stress test framework and high-level expectations for implementation:

An effective stress testing framework provides a comprehensive, integrated, and forward-looking set of activities for a banking organization to employ in order to assist in the identification and measurement of its material risks and vulnerabilities. A banking organization should develop and implement its stress testing framework in a manner commensurate with its size, complexity, business activities, and overall risk profile.

Identifying the risks and an approach to modeling these risks is likely to be the primary focus as firms should have classifications for most, if not all, of their business activities.

The Fed and the OCC have both defined various risk categories for supervisory purposes so it's instructive to review their definitions as one of these entities is the primary regulator for most mid-sized banks. The Fed³ defined risk categories for use in the supervision of large institutions, while the OCC⁴ has defined eight categories of risk for bank supervision purposes.

³ Framework for Risk-Focused Supervision of Large Complex Institutions (August 8, 1997).

⁴ See "Large Bank Supervision" booklet of the Comptroller's Handbook (Jan. 2010) and OCC BULLETIN 2014-45 (Heightened Standards for Large Banks; Integration of 12 CFR 30 and 12 CFR 170).

Figure 1 shows the mapping of the risk categories between the Agencies:

Figure 1: Types of Risk compared by the Fed and OCC for general bank supervision

Fed	OCC
Credit	Credit
Market*	Interest Rate
	Price
Liquidity	Liquidity
Operational	Operational
Legal	Compliance
	Strategic
Reputation	Reputation

* Market Risk also has a Foreign Exchange risk component

Risk categories are not mutually exclusive as any product or service may expose an institution to multiple risks so identification of the risks within the bank portfolio must be a factor in the evaluation of them. The OCC risk breakdown is more granular when compared to the Fed and is closer in practice as to how many financial institutions define sources of risk for management reporting and responsibilities. Classifying interest rate risk and price risk within market risk the way the Fed does is consistent with most market participants. Many firms use the Fed categories in their public disclosure of DFAST results so this Montana Analytics Briefing will follow that convention. Liquidity and reputation risks are not subject to the DFAST exercise so they are excluded from any discussion. Estimating Legal and Operational risks have less emphasis from both firms and regulators due to the rarity of these occurrences as will be discussed later. Banks would be well served in going through the other risk categories to determine how they apply across the organization for DFAST when preparing the submission.

The remainder of this paper lays out the principles discussed in the SR 12-7 guidance, interspersed with updated guidance along with typical practices of mid-sized firms. Understand that these are general principles for stress testing, not all parts of which are applicable to the DFAST exercise so this Briefing series focuses only on the relevant points for DFAST.

Stress testing Principles in SR 12-7

A firm should apply the following five principles when designing and implementing a stress-testing framework per the SR 12-7 guidance:

- Principle 1: A firm’s stress testing framework should include activities and exercises that are tailored to and sufficiently capture the banking organization’s exposures, activities, and risks.
- Principle 2: An effective stress testing framework employs multiple conceptually sound stress testing activities and approaches.
- Principle 3: An effective stress testing framework is forward-looking and flexible.

- Principle 4: Stress testing results should be clear, actionable, well supported, and inform decision-making.
- Principle 5: An organization’s stress testing framework should include strong governance and effective internal controls.

Principle 1:

The key points from the SR 12-7 guidance:

- *Appropriate coverage is important as stress testing results could give a false sense of comfort if certain portfolios, exposures, liabilities, or business line activities are not included.*
- *Each stress test should be tailored to the relevant level of aggregation, capturing critical risk drivers, internal and external influences, and other key considerations at the relevant level. ... include all major business lines and significant individual counterparties.*

Montana Analytics Interpretation of Principle 1:

Principle 1 states that coverage of the bank’s entire activities is necessary as is capturing the key risks associated with those activities. SR 14-3 highlights that the guiding principle for an institution’s compliance is “*conducting DFA stress tests that are appropriate for their risk profile, size, complexity, business mix, and market footprint*”.

The question remains of how to best identify and estimate these risks. Firms should go through the following high-level process⁵, referred to as the DFAST Risk Estimation Framework (“DREF”), to establish the stress testing framework to identify and forecast all relevant risks:

1. Identify business activities and risk exposures in business lines and in on- and off-balance sheet portfolios through a comprehensive process.
2. Identify risk categories and classify risk exposures in a manner consistent with the Fed’s risk categories described in Figure 1.
3. Given the identified risk exposures, determine the necessary outputs and forecast projections for DFAST and components of form FR Y-16.
4. Determine which risk categories and specific risk exposures are applicable to which outputs.
5. Develop models and other analytical methods to estimate the risk exposures.
 - This includes data collection, cleaning, analysis, and manipulation of data sources for analysis and modeling segmentation
6. Estimate and forecast outputs
7. Document the key assumptions and forecasting methodology.
 - This includes model and/or data limitations and any adjustments to mitigate them
8. Ensure an independent review of the methodologies and key assumptions for the most material portfolios, along with a review of all output.

⁵ This represents a simplified version of Montana Analytics’ ERM process guidelines to estimate critical outputs.

The DREF constitutes a strong framework to effectively implement a stress testing process consistent with the five principles in the SR 12-7 guidance. This three-part series maps the DREF's eight points to each of the five principles and discussed within the most relevant principle. Note that these points are not all sequential as the first four or five points are partly independent so that they can be performed concurrently. Principle 1 fully addresses DREF points 1-4 while other Principles discuss the remaining DREF points. Principle 5 discusses the importance of a sound risk management governance process, which is an overarching point of the DREF process that is not specific to any points but rather an important implementation piece for any complex framework.

Implementing Principle 1

The crux of Principle 1 is determining the outputs required for submission in DFAST and the associated risk exposures within the bank's portfolios and business lines/activities corresponding to those outputs. The first four DREF points outline the necessary activities to implement Principle 1.

As stated in the introduction to the DREF, the process is not a strictly sequential process in the first few points. Performing DREF points one to four somewhat concurrently is typical as they have a high degree of interdependence.

Fed bulletin SR 15-19 outlines a comprehensive assessment of a firm's risks based on its activities and exposures useful to performing DREF point one:

"A firm's risk identification process should include a comprehensive assessment of risks stemming from its unique business activities and associated exposures. The assessment should include on-balance sheet assets and liabilities, off-balance sheet exposures, vulnerability of the firm's earnings, and other major firm-specific determinants of capital adequacy under normal and stressed conditions. This assessment should also capture those risks that only materialize or become apparent under stressful conditions."

It's expected that firms will have a nearly complete, if not total, inventory of its business activities based on requirements to perform ongoing Asset-Liability Management ("ALM") and for financial reporting.

The guidance also states that any weaknesses in the risk measurement process *"should be assessed for their potential impact on the integrity of a firm's capital planning process"*. This puts the impetus on the firms to state how they mitigate such weaknesses in their stress test projections in the accompanying narrative to the submission, which is a component of DREF point seven.

Executing DREF Points 2 and 3

DREF points 2 and 3 are closely related as they address the necessary risks to estimate along with the required outputs for submission, which are critical to implementing Principle 1. DREF point 2 states that identifying the risks to estimate is critical and this is best accomplished by reading the outputs required for submission to the regulators which is part of DREF point 3. The submission form, FR Y-16, dictates clearly the required outputs. FR Y-16 dictates all required outputs for applicable firms in preparation of their submission to the regulators. SR 14-3 discusses the required high-level outputs and provides their definitions:

- Credit losses for with loan portfolios and securities holdings
- Pre-Provision Net Revenue (PPNR)
- Balance sheet and risk-weighted asset (“RWA”) projections
- Quarterly Provision for loan and lease losses (PLLL) and allowance for loan and lease losses (ALLL)
- Quarterly net income

FR Y-16 also dictates identifying the risks within the bank’s activities that include all business lines, portfolios, and exposures. Though not explicitly clear in the guidance, firms should focus on the following risks from the Fed classification for DFAST:

1. Credit
2. Market
3. Operational
4. Legal

Credit and market risks are the primary risks for most financial instruments, along with being the most complex ones to estimate, so firms spend most of their focus on analyzing them. Credit and market risk losses associated with loan portfolios and securities holdings must be estimated directly and separately in the appropriate segmentation per the FR Y-16 form. Operational and legal losses, if necessary, should be incorporated into PPNR estimation.

DFAST guidance defines PPNR for the stress tests as net interest income (“NII”) plus noninterest income less noninterest expense. Nonrecurring income and expense items should be excluded from PPNR, along with non-operational items since those are estimated elsewhere. Companies should address operational risk in their PPNR projections if such events are related to the supervisory scenarios provided, or if there are pending related issues, such as ongoing litigation, that could affect losses.

Legal and Operational risks have less emphasis by both firms and regulators alike in DFAST. Operational and legal losses are only included within PPNR if they would arise due to the regulatory scenarios as mentioned previously. One reason for this is partly due to the paucity of significant events within these categories across the industry for existing firms. Lack of data on these events leads to difficulty in forecasting and supporting results, though these issues are primarily applicable to operational risk as legal risk is an idiosyncratic risk that isn’t expected to reoccur in the normal course of business. There is great difficulty in quantifying the past impact of any operational losses for firms that have had such events, leading to the difficulty in forecasting them again, mainly owed to the lack of data and idiosyncratic events pertaining to these losses.

It is helpful to examine how the regulators assess legal and operational risks in their standard banking examinations since it illustrates the challenges in forecasting these risks. OCC Examiners assess the risk exposure for the eight categories of risk using the risk assessment system (RAS). This risk assessment is a large determinant of their supervisory strategies and activities. For six of the eight risks — credit, interest rate, liquidity, price, operational, and compliance — the supervisory process assesses Quantity of risk, Quality of risk management, Aggregate risk, and Direction of risk. They note that although the strategic and reputation risks—equivalent to the Legal risk defined by the Fed— affect an institution’s enterprise value, they are difficult to measure precisely. Consequently, the OCC assesses only the aggregate risk and direction of risk for these two risks. This acknowledges the difficulties in forecasting these risks from one of the primary financial regulators.

A clear correlation between the supervisory scenarios and both operational and legal risks has also been absent in the DFAST exercises to date. Forecasting legal risk on known events only is recommended as a result.

Once the firm has determined its exposures, classified the risk for estimation and identified the outputs required for submission, it can identify the risks its activities pose to execute DREF point three. Considering the risks to estimate from DREF point two in concert with the required outputs, firms can map these risks to the identified activities and exposures.

Executing DREF Point 4

DREF points one to three are complete by this stage. The firm has determined the bank’s activities and exposures, classified the risk categories, mapped the prior two tasks together, and identified the required outputs. The next logical step is to tie together the outputs to the correct exposures and associated risk classifications - DREF point four. One way to accomplish this is to first associate the exposures by financial instrument type with the required outputs. The exposures were mapped to the appropriate risk categories and as firms contemplate how to estimate the required outputs, this will also unveil if any risks or exposures have not been identified. Carrying out the first four DREF points should accomplish the main tasks of Principle 1 in SR 12-7: ensuring the stress testing framework includes activities that are tailored to and sufficiently capture the banking organization’s exposures, activities, and risks.

Part 2 of this series discusses implementing SR 12-7 Principles 2 and 3 in a DFAST environment.

Montana Analytics is a quantitatively-focused risk management consulting firm delivering innovative solutions in model risk management, analytical model development, asset valuation and risk analytics for all types of Bank assets. We have also developed an independent proprietary *Model Validation Program* that continues to receive critical acclaim.

We specialize in high-quality expert analysis coupled with an independent perspective that covers probabilistic risk exposure modeling, predictive models for performing and non-performing assets, competing-risks, Basel II PD, EAD, LGD models, economic capital, asset pricing and loan valuation techniques, default management and loss mitigation as well as solutions for CCAR/DFAST Stress Testing. We also analyze and develop consumer scoring solutions for origination decisions and behavioral analysis for community and regional banks. Additionally, since 2002, we have assisted in developing enterprise-level Model Risk Management programs and have conducted numerous independent validations of complex models.