ALVAREZ & MARSAL READINGS IN QUANTITATIVE RISK MANAGEMENT

Stress Testing, Human Behavior and the Management of Capital in the Post-Crisis World

Part Two: Stress Test Scenarios and Forecasts for Market Uncertainty

ALVAREZ & MARSAL

STRESS TESTING, HUMAN BEHAVIOR AND THE MANAGEMENT OF CAPITAL IN THE POST-CRISIS WORLD

Bruce Stevenson | Managing Director | *Alvarez & Marsal*

INTRODUCTION

This paper is the second in a two-part series examining the behavior of human beings in times of financial stress and how the changes in human behavior impact stress testing and the management of capital at banks. In part one, we examined the changes in human behavior in past financial crises, noting that these crises produce extreme risk aversion and a dramatic flight-to-quality when investors' inabilities to anticipate the outcomes of the crises transform everyday assessments of risk into unquantifiable uncertainty. If a crisis occurs following a period of economic growth and financial gains, investors' attitudes may suddenly shift from being myopic about future disaster to magnifying the potential for the worst possible outcomes to occur well beyond their true mathematical probabilities. The inability of humans to anticipate rare and extreme events causes them to react in dramatic ways when those events do occur. Their collective responses determine extreme outcomes for the global capital markets and, sometimes, for national economies.

The current paper examines the new requirements of U.S. banking institutions to assess the impact of possible future scenarios involving the U.S. economy on their operations and capital levels (so-called stress testing) in light of what we know about human behavior in periods of financial stress. We examine the human behavior implied in the scenarios designed by U.S. banking regulators for the Dodd-Frank Act Stress Tests (DFAST) and for the Comprehensive Capital Analysis and Review (CCAR) and whether financial markets learn from past crises and adjust to those experiences.

We conclude that there are many positive benefits of a regulatory requirement for stress tests, including the discipline of forward planning, anticipating worse outcomes than bankers may want, and ensuring that sufficient capital exists within systematically important financial institutions. However, as a tool to anticipate how the capital markets and individual banks will perform in hypothetical scenarios or the next financial crisis, the regulatory stress tests are a blunt, and potentially inaccurate, instrument. As implemented in CCAR and DFAST, the severely adverse (SA) scenario contains inconsistent patterns of investor behavior, even with the add-ons of a market crash or the failure of a counterparty. There is real potential for model risk that emerges from the fact that the forecasted patterns of investor behavior in this critically important scenario do not align with comparable patterns from history. Additionally, the SA scenario does not create the shock that causes extreme responses among market participants.

To be fully prepared for the next financial crisis, bank regulators and individual banks will need to create and execute stress scenarios that are both extreme and unforeseen by the markets, scenarios characterized by uncertainty rather than by risk. These are the scenarios that pose the greatest risk to individual banks and to the financial system, and these are the scenarios for which banks and regulators should be prepared.

A PROPOSAL

Much good has come from CCAR and DFAST. Banks now plan for the future much better than they have in the past and that planning includes consideration of a range of outcomes for the U.S. economy, forecasts of bank operations and capital levels in those scenarios, and public disclosure of these results. The structure of the programs, which includes reliance on essentially the same scenarios year after year, has enabled the banks to improve the processes necessary to conduct the stress tests and capital forecasts and to have comparability of results one year to the next. The program has also led to more richly capitalized banks and a stronger banking system.

However, the repetitive nature of these programs means that the shock value of the scenarios, particularly the SA scenario, progressively wanes. CCAR and DFAST do not test for scenarios outside the realm of perceived possibility so there is no uncertainty created in these stress tests.

Now is the time to improve the program of stress testing and the best place to start is a revamp of the SA scenario. Rather than repeatedly bringing forward a recession scenario that mimics the Great Recession with confusing and potentially inconsistent metrics of investor behavior, we believe this scenario should be restructured to reflect real and current risks in the U.S. banking system where an extreme event would produce the uncertainty and drastic investor behavior so characteristic of genuine stress in the banking system.

This scenario should be defined from the truths that the financial crisis in 2007 and 2008 made clear:

1. Shocks to the system that eventually threaten the banking system will come from those sectors where confidence ("disaster myopia") is greatest. This confidence almost certainly will be associated with the hottest sectors of the financial system that assume "this time it's different," and with the sectors in which banks and other lenders are experiencing the fastest growth. If the growth in lending to these sectors is outpacing economic growth within these sectors, the debt capital is almost certainly flowing to sub-prime customers that will default (Stevenson, 2010).
2. Financial leverage associated with sub-prime lending is the area in which credit crises routinely occur (e.g., leveraged buyouts, commercial real estate, sub-prime mortgages originated solely for distribution). Crises do not come from the contraction of the economy *per se*; they come from buildups of leverage beyond the capacity of the economy to absorb them (Stevenson and Fadil, 1994). If the concentration of leverage is great enough, then the banking system will be at risk due to that excess capital.

The SA scenario should be defined as a genuine, unanticipated shock, where disaster myopia is greatest, that creates a significant recession rather than the reverse. Only by simulating such a shock (e.g., an adverse idiosyncratic event in a "hot" sector that precipitates defaults among sub-prime borrowers) will the scenario produce the extreme response of investor behavior (e.g., market uncertainty and an extreme flight-to-quality) that will define the response of the capital markets.

Today, we are witnessing some of these very dynamics unfolding in the oil and gas markets where previously unforeseen and unpredicted oil prices below $30 per barrel will likely create significant levels of defaults of both public bonds and private bank loans. A large, investment-grade oil and gas producer defaulting is seen as unlikely, if not impossible. But perhaps this is precisely the disaster myopia that comes with very rapid growth in a sector (e.g., hydraulic fracturing) that has yet to experience the tectonic shifts that come following debt growth that exceeds economic growth.

A scenario that has oil prices level out at $20 per barrel, coupled with the default of a major oil and gas producer and the insolvency of two or three states in the U.S., might create the shock to the capital markets that produces the uncertainty truly characteristic of a stress test. A deep recession and the contraction of risky assets, including equities, commodities and real estate (especially in oil-sensitive geographies), are natural consequences. Such a scenario would impact individual banks differently and would provide very valuable information to both the U.S. banking regulators and the public at large.

Even if the U.S. regulators do not buy this approach for revamping the SA scenario, it is an approach that individual banks can take in their own stress testing program. We recommend that they do.

THE BENEFITS OF CCAR AND DFAST

Since 2013, U.S. banking regulators have mandated that all banks with more than $10 billion in total assets participate in the DFAST and test their individual capital adequacy against three scenarios of the U.S. macro-economy. These scenarios are characterized as baseline, adverse and severely adverse, in which the first is a forecast of how the U.S. economy could behave in a moderate growth environment and the latter two scenarios are economic recessions of varying degrees.

With the passage of time, U.S. banks are getting better at the processes of building and implementing stress test forecasting models, conducting forecasts with these models and developing capital plans specific to the macro-economic scenarios created by the U.S. regulatory agencies. The banks have benefitted from the consistent number and structure of the scenarios, in which there has always been baseline, adverse and severely adverse scenarios. Within each of these categories, the scenarios have largely been similar each year to the next, although the events of the scenarios have moved "forward" in time with each year.

By repeating essentially the same scenarios year after year, CCAR and DFAST enable the participating banks to "practice" stress testing and get their stress testing and capital planning processes and infrastructure in order. Given that stress testing and capital planning are essentially new activities for the banking industry, this process of repeating the same scenarios allows the banks to learn as they go and allows the regulators to increase the requirements as they go. Practicing stress testing has great value.

Despite all of the benefits of stress testing and capital planning (of which there are more than what is mentioned here), it is not clear that the processes of scenario selection and definition are as good as they can be.

REGULATORY STRESS TEST SCENARIOS: DO THEY ACCURATELY REFLECT HUMAN BEHAVIOR?

The CCAR and DFAST scenarios are described largely in quantitative terms. That is, the scenario forecasts are principally based on numeric estimates of economic growth or contraction, interest rates and prices of risk assets (mortgages and equities). There is limited discussion of how investors will behave in these scenarios, either as individuals or as groups. For example, the text that accompanies the description of the 2016 SA scenario makes only this reference:

FIGURE 1
2016 CCAR and DFAST Scenarios
Market Volatility Index
1Q2001 to 1Q2019

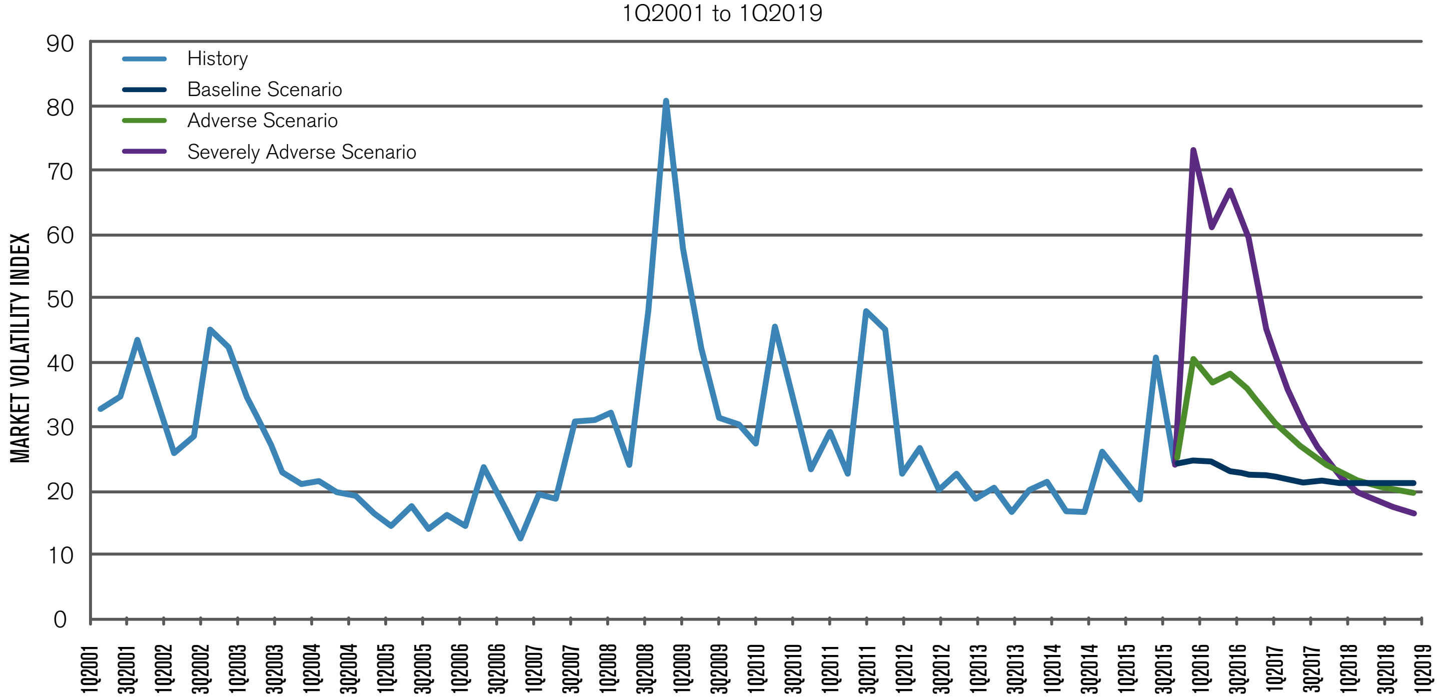
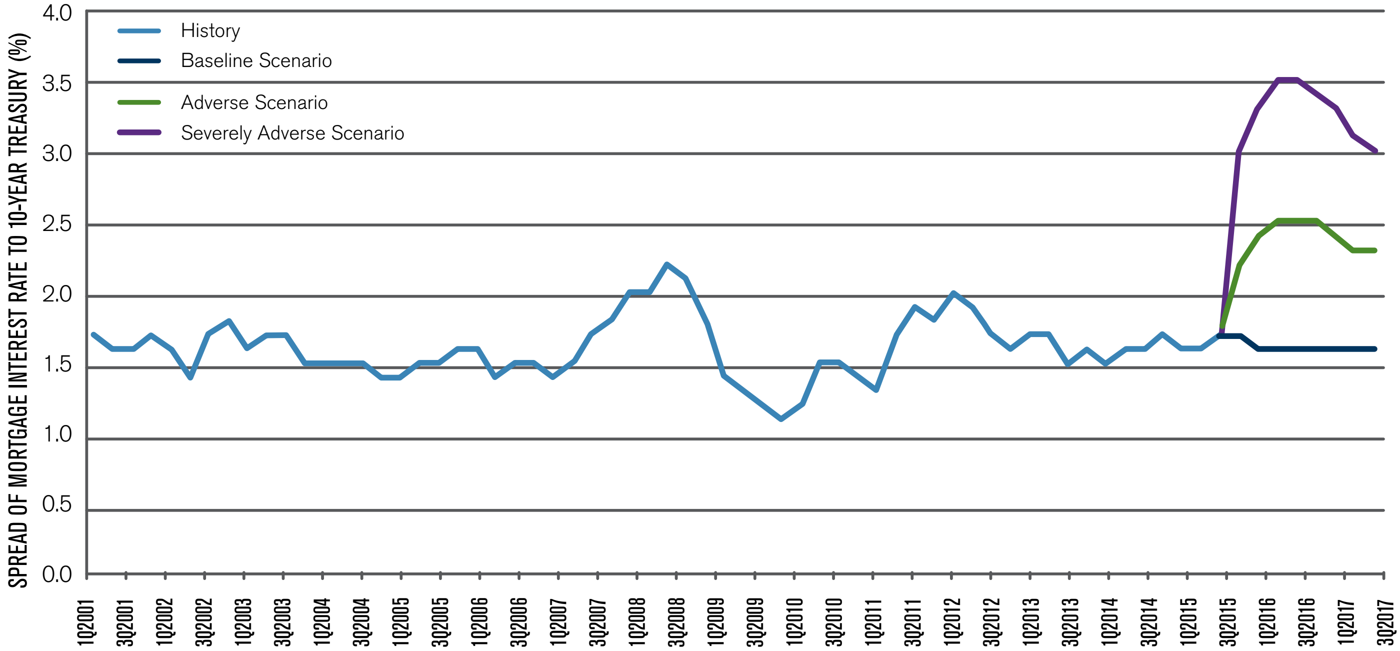


FIGURE 2
2016 CCAR and DFAST Scenarios
Spread of Mortgage Interest Rate Over Ten-Year Treasury Yield
1Q2001 to 3Q2017



> *"Corporate financial conditions are stressed severely, reflecting mounting credit losses, heightened investor risk aversion, and strained market liquidity."* [1]

The SA scenario interests us in this paper as this is the scenario that shows the most extreme stress and is the most important scenario for determining capital adequacy of individual banks. The recession portrayed is as severe as that of the Great Recession in terms of GDP contraction, relative decreases in home prices and so forth. Some have argued that it is designed explicitly to mimic the Great Recession.

In terms of the metrics that could describe human behavior in this scenario, we see a mixed pattern. For example, the market volatility index jumps up in this recession nearly as high as it did following the failure of Lehman Brothers (Figure 1). One might expect that, since this "fear index" has nearly the same pattern as that of the financial crisis, that an event almost on par with the Lehman Brothers' failure might be necessary to produce this response.

The regulators are silent on whether or not there is a failure of a major financial counterparty in this scenario *per se* but such a failure might be implied in the spike in the market volatility index. Historically, such spikes accompanied the failures of Lehman Brothers and Long-Term Capital Management.

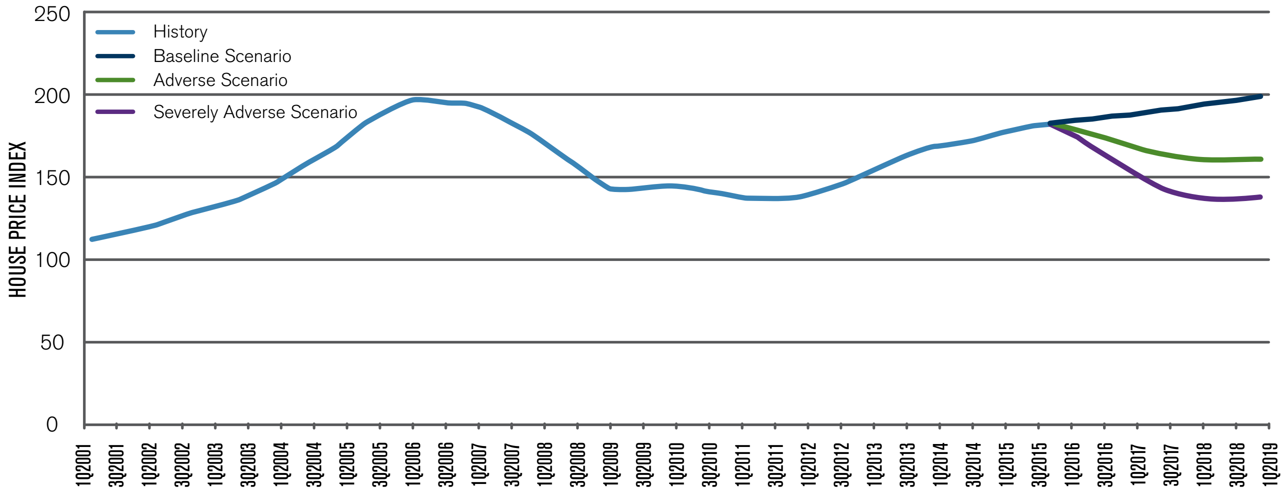
It is instructive to note that the 2016 CCAR requires that the eight banks with the largest trading operations include the failure of a major counterparty in their stress test and capital planning results for the SA, and that six bank holding companies factor a global market shock into the SA. The spike in the market volatility index may be a way for the regulators to convey to all CCAR and DFAST banks the impact of the global market shock resulting from the failure of a major financial counterparty.

In the SA scenario, the spread of home mortgage interest rates to the 10-year Treasury also shows a sharp spike (Figure 2). In fact, the spread jumps to 350 basis points (bps) at its peak, far higher than its historic peak of 220 bps in the third quarter of 2008. Given that 3Q2008 was at the peak of the financial crisis when the mortgage markets were in free fall, this 220-bp spread indicated the extreme risk aversion that investors felt toward mortgages and mortgage-backed securities during the crisis.

It is striking that the SA scenario should have a much wider spread between the risk-free rate and the interest rate on risky mortgages than actually occurred during the financial crisis. This forecast suggests that the banking regulators assumed investors in the U.S. mortgage market will demand a significantly higher premium for risk than they did at the height of the mortgage meltdown in 2007 to 2009.

1. Board of Governors of the Federal Reserve, Office of the Comptroller of the Currency, and Federal Deposit Insurance Corporation. "Annual Stress Test Baseline, Adverse and Severely Adverse Scenarios January 28, 2016", p. 5.

FIGURE 3
2016 CCAR and DFAST Scenarios
House Price Index
1Q2001 to 1Q2019

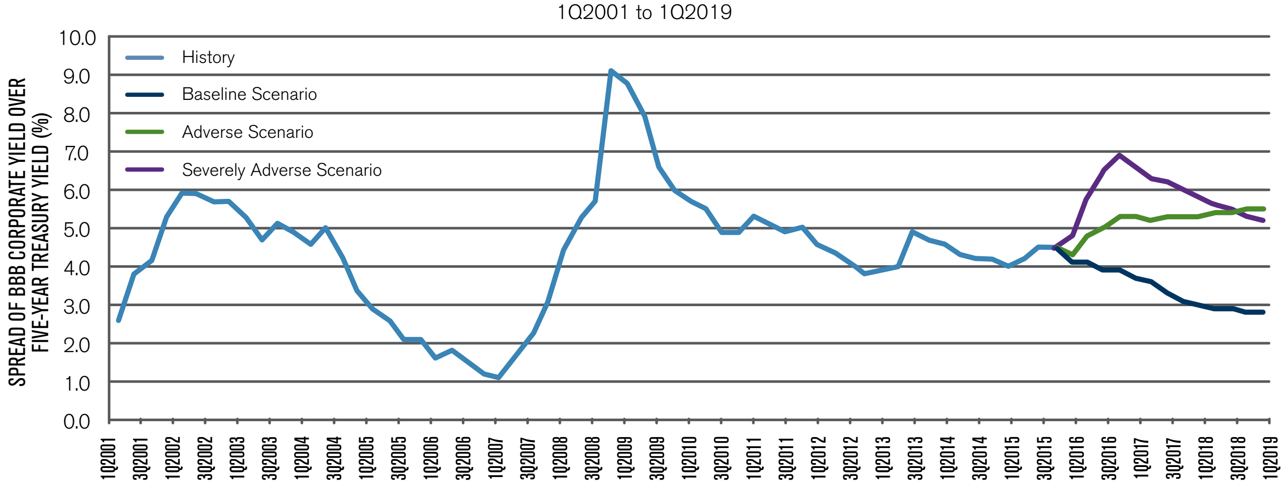


This spike in mortgage spreads is even more striking in light of the pattern of homes prices forecast to occur in the SA scenario. As shown in Figure 3, home prices decline by 27 percent from 3Q2014 to 2Q2017 in this scenario, quite comparable to the actual decline of 28 percent in home prices from 1Q2006 to 1Q2009. Since the mortgage market has recently experienced a drop of more than 25 percent in prices and the risk premium on mortgage interest rates increased by 220 bps during the financial crisis, it is surprising that the spread of mortgage rates to the risk-free rate should widen even further in this scenario, unless there is an event anticipated to create this sharp rise in risk aversion. The descriptions of the regulatory scenarios do not address this possible event and our interpretation is really a supposition.

If we dig deeper into the SA scenario, we see that other metrics of investor behavior do not act as they did in the past and these anomalies are inconsistent within the scenario. As seen in Figure 4, the spread of interest rates on corporate bonds relative to five-year Treasurys is muted relative to the large spike in such spreads during the financial crisis. Notably, this spread widens to a maximum of 690 bps in the SA scenario compared to 910 bps during the financial crisis.

Given the dramatic movement in mortgages spreads and the implied shock to perceptions of risk in that market, it seems unlikely that other credit markets would not also experience extreme levels of risk aversion. For bond spreads, we are left with the question: why are the stress impacts so muted relative to the spreads on risky mortgages that show extreme shock?

FIGURE 4
2016 CCAR and DFAST Scenarios
Spread of BBB Corporate Yield Over Five-Year Treasury Yield
1Q2001 to 1Q2019



An important consequence of the flight from risky assets to low-risk assets during times of financial crisis is a convergence of markets. Long-term correlations between assets and asset classes often change as investors leave equities and move into fixed income and gold (Bloom et al., 2010). In fact, during severe stress, correlations between investment assets converge on extreme values by moving from low values close to zero in "normalized" markets to values that approach either -1.0 or +1.0. Correlations are variables, known to change with changes in the U.S. economy (Williams et al., 2010), and major market events, such as the 1987 market crash and the 2007 to 2008 financial crisis, can significantly alter correlations between investment asset classes (Brocato and Smith, 2012).

These simple examples strongly suggest that the SA scenario lacks consistency in terms of the metrics that represent human behavior in times of financial crisis. While the market volatility index peaks at near-2008 levels in the SA scenario, the behavior of forecasted credit spreads does not conform to the patterns that emerged in the financial crisis. The reasons for this divergence are not explained and are at variance with the *a priori* expectation that markets would converge in this scenario, as they have in the past.

Further, by leaving the details of shock and the counterparty default up to the individual banks subject to the requirement, the Federal Reserve risks losing consistency with the core characteristics of the SA scenario that already has shock effects built into it, including some that are more extreme than any part of our recent history. The increment impacts required of this subset of important banks layered on top of the SA scenario may, minimally, produce an incoherent scenario because it will be "individualized" for each institution. Further, the requirement may produce a scenario that is so extreme as to lose connection to recent history, particularly if the individual firms layer incremental shock impacts on top of those already in the scenario.

As a final observation, we note that negative values are forecast for the three-month Treasury bill (T-bill) in the 2016 SA scenario. This forecast also introduces model risk, since such negative rates do not exist historically. Additionally, bank forecasting models calibrated on historical T-bill rates, spreads based on those rates or even yield curves including the T-bill will not have been calibrated on data that include negative rates.

Presumably, these negative rates represent one potential policy response of the Federal Reserve to the other conditions projected for the SA scenario, including the very deep recession. Perhaps the Federal Reserve seeks to know the impacts of negative rates on banks' net interest income and loan growth, since negative rates are one way to encourage banks to lend more actively.

> "RATHER THAN REPEATEDLY BRINGING FORWARD A RECESSION SCENARIO THAT MIMICS THE GREAT RECESSION WITH CONFUSING AND POTENTIALLY INCONSISTENT METRICS OF INVESTOR BEHAVIOR, WE BELIEVE THIS SCENARIO SHOULD BE RESTRUCTURED TO REFLECT REAL AND CURRENT RISKS IN THE U.S. BANKING SYSTEM WHERE AN EXTREME EVENT WOULD PRODUCE THE UNCERTAINTY AND DRASTIC INVESTOR BEHAVIOR SO CHARACTERISTIC OF GENUINE STRESS IN THE BANKING SYSTEM."

As of mid-February 2016, monetary policies of both the Japanese and European central banks that include negative short-term rates have spooked the global equity markets and contributed to the significant selloff in these markets in 1Q2016. This dynamic highlights the point that the unfamiliar and unexpected lead to risk aversion and a flight-to-quality.

FINANCIAL MARKETS LEARN AND ADJUST

In the first installment of this two-part series, I argued that much of the impact of the financial crisis was due to the extreme aversion to risk that investors displayed. When the mortgage markets collapsed and investment banks failed, investors experienced “Knightian Uncertainty” (unknown unknowns) during which they anticipated the greatest amount of risk (disaster magnification) because they were experiencing a shock not previously encountered.

The principles of Knightian Uncertainty and disaster myopia / disaster magnification presume that market participants can learn. For example, “risk” represents a range of possible outcomes for which both the probability and the magnitude of the outcomes can be understood and quantified. Market participants may individually and collectively understate the probabilities and outcomes of bad events (disaster myopia) and they may also overstate those probabilities and outcomes (disaster magnification). Nevertheless, these characteristics are estimable.

Today, mathematics is a principal tool for estimating historical patterns of the capital markets, and the use of mathematics to quantify outcomes and their probabilities is a standard feature of the markets. For example, funds that seek to take advantage of anomalies in current markets relative to past patterns (e.g., arbitrage) now invest hundreds of billions of dollars of investors' wealth. The models that underpin such investments are regularly recalibrated as the investing behavior of the funds changes the anomalies they seek to exploit.

In addition to this empirical evidence that markets learn from past experience and that some investors seek to exploit anomalies in current markets compared to past experience, there is considerable theory around the learning that takes place in global capital markets (e.g., Simpson et al., 2005; Pintus and Suda, 2015; Ramey, 2015).

“Uncertainty,” particularly Knightian Uncertainty, exists when outcomes and their probabilities are unknown. The “unknown” element of uncertainty refers to the fact that some possible outcomes fall outside of the experience of current market participants. For example, standing in mid-2007 without foreknowledge of the outcome of the financial crisis, virtually all market participants did not anticipate the failure of both Bear Stearns and Lehman Brothers because the last such circumstance occurred during the Great Depression, well before the birth of anyone who invested in the mid-2000s.

Uncertainty, then, is not estimable.

It is highly unlikely that the SA scenario, were it to unfold as the regulators forecast, would produce the extreme risk aversion implied in Figures 1 through 4. Why? First, a very similar, and real, scenario unfolded in the financial crisis and Great Recession. Second, similar SA scenarios have been implemented in DFAST and CCAR in the past several years and the results published for individual banks. In short, investors have experience with the assumptions of this scenario because they have lived through real events very much like them and, thus, they are unlikely to be surprised by the realization of this scenario.

STRESS TEST MODELS: CAN THEY FORECAST ACCURATELY IN DYNAMIC SCENARIOS?

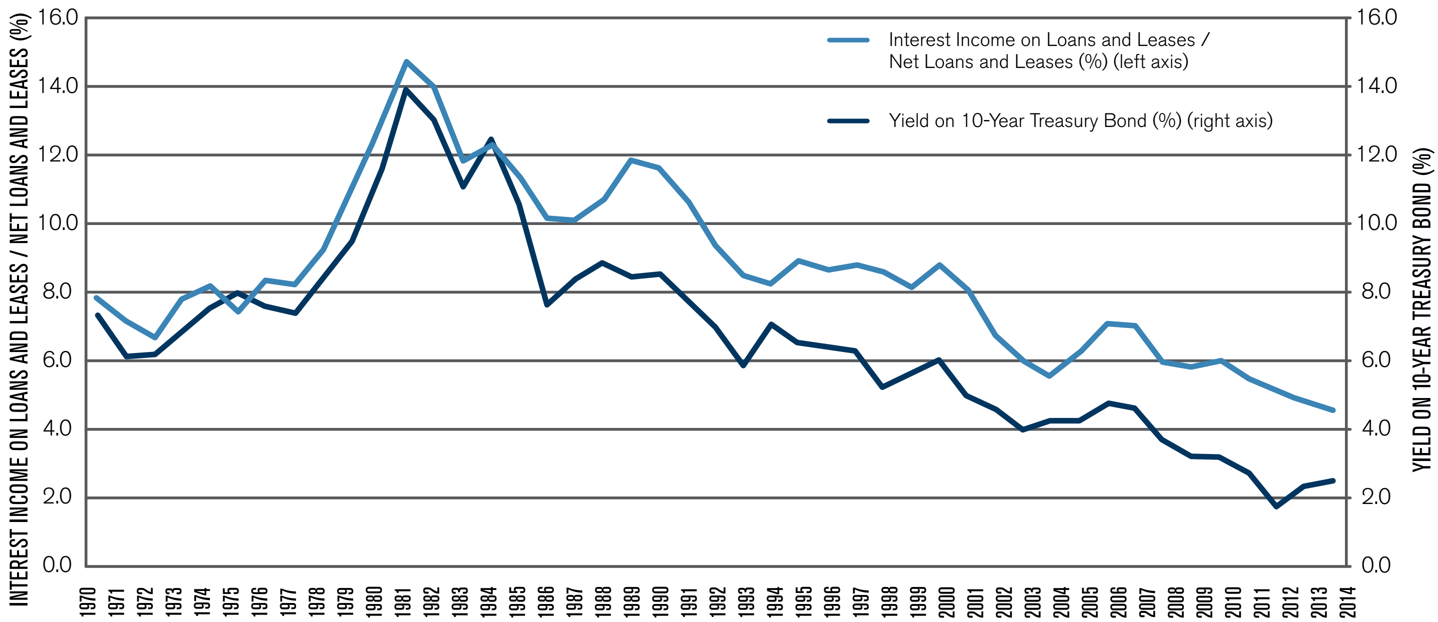
Why pay so much attention to the characteristics of the SA scenario? After all, it is just a hypothetical view of a possible outcome for the U.S. economy. Forecasts of our economic future are notoriously difficult to make and, when made, are more often wrong than right.

Implementation of CCAR, DFAST and other stress testing programs typically relies on mathematical models that forecast bank operating performance to changes in the U.S. macroeconomy. Such models are built from time series regressions linking economic variables as predictors to measures of bank dynamics, such as net charge-offs in the commercial and industrial loan portfolio, as the dependent (or predicted) variable.

We give a brief example of such a model in Figure 5. Here, the pattern of interest income for the 100 largest banks in the U.S., scaled to net loans and leases for the same banks, is compared with the yield on the 10-year Treasury bond. Interest income on the average loan clearly follows the same pattern as the 10-year bond yield, first moving up from the early 1970s through the mid-1980s and declining thereafter. In fact, through 1985, the correlation between interest earned on the average loan to the 10-year bond yield was very high (0.981) and the spread between the two (loan interest income less 10-year bond yield) was low (72 bps).

After 1985, the overall secular decline in yields continued for both loans and the 10-year Treasury. However, as seen in Figure 5, average loan interest income separated from the bond in the mid-1980s as bank loan portfolios shifted from investment-grade quality to non-investment-grade quality, first through underwriting junk bonds, then to commercial real estate development and eventually to subprime residential mortgages. In short, after 1985, bank customers ceased to be solely prime customers but increasingly became sub-prime.

FIGURE 5
U.S. Commercial Banking Industry
Interest Income on Loans and Leases
1970 - 2014



The correlation between interest income and the bond yield remains high from 1985 onward (0.964) but the spread between the two widens to an average of 244 bps, reflecting the increased credit risk in loan portfolios now dominated by non-investment-grade assets. In fact, it is possible to build a mathematical model over the entire time series that uses the 10-year Treasury yield to predict the interest income on the average loan, noting that we use a "dummy" variable to account for the structural shift in banking lending markets post-1985[2]:

$$\frac{\textbf{Interest Income}}{\textbf{Net Loans and Leases}} = \textbf{0.012 + (0.939} \times \textbf{Yield on 10-Year Treasury) + (0.014} \times \textbf{Post-1985)}$$

Regression $R^2 = 0.94$

Simply put, interest income on the average loan is the sum of the risk-free rate plus a spread for credit risk that changes after 1985.

Let us suppose, for a moment, that we were building this model not in 2016 but in 1985, just on the cusp of that structural shift to banks accepting non-investment borrowers. We might be very happy with the following model:

$$\frac{\textbf{Interest Income}}{\textbf{Net Loans and Leases}} = \textbf{0.608 + (1.314} \times \textbf{Yield on 10-Year Treasury)}$$

Regression $R^2 = 0.96$

This model captures the same dynamic: interest income on the average loan is the sum of the risk-free rate plus a spread for credit risk. In this case, though, it is calibrated to historical data reflecting banks' lending to investment-grade borrowers for which the credit spread was low to reflect the low risk of default of these counterparties. Of course, this second model lacks the dynamics of banks lending' to non-investment-grade counterparties with high margins for default risk that come with the junk bond boom in the mid-1980s.

Both Figure 5 and the preceding equations make the case that the second model would not forecast well in any scenario that included the actual shift in banking lending that began in the mid-1980s. The second pre-1985 equation would certainly understate interest income on the average loan because it was calibrated on data not representative of the post-1985 experience. Put differently, the pre-1985 equation would not forecast properly in a post-1985 "scenario" that included a major structural shift by banks to non-investment-grade borrowers.

Inappropriately applying a model to a data set containing relationships on which the model was not calibrated is a form of model risk. In the pre-1985 example, the range of interest income on which the model is calibrated is much narrower than the range over the entire data set and does not include the structural changes to credit markets and credit spreads that occurred after the introduction of junk bonds in this period.

This concern about model risk is applicable in all such applications of time series models to the future, whether it be the real future (e.g., out-of-sample testing for model validation) or hypothetical views of the future (e.g., scenarios developed for stress testing). For example, all banks participating in CCAR and DFAST are building and using models to forecast their performance under these regulatory scenarios. Most of these models are calibrated to the history of the bank and to the history of the U.S. economy. The models contain the structural relationships inherent in both sets of data – the historical interrelationships within the economy itself and the historical interrelationship of a bank's performance in that economy. If scenarios of the future economy do not have the same relationships that existed in the real economy historically, then the ability of the models to forecast accurately is uncertain.

Figures 1 through 4 suggest that there may be structural changes in the interrelationships within the simulated economy in the 2016 SA scenario compared to the history on which forecasting models were calibrated, implying that there is potential model risk in the forecasts made by these models for at least this scenario. Simply put, models calibrated to the historically interconnected economy will not forecast accurately if the scenarios of the future do not contain the same interconnectedness.

2. In this example, we use annual data to make the display of information easier to understand. For more complete models, quarterly data would produce a sounder model with more statistical degrees of freedom.


Global Stocks
Technology Stocks
Portfolio P1
Portfolio P2

IMPLICATIONS FOR STRESS TESTING AND CAPITAL MANAGEMENT

Both risk that is quantifiable and uncertainty, including unknown unknowns, are critical concepts in successful stress testing and capital management programs. Both should be integrated into these programs at individual banks and across the industry (e.g., DFAST).

Mathematical models, when properly calibrated and validated, should produce accurate and reasonable estimates if they are used to forecast in scenarios that meet at least these conditions:

1. The scenarios project values for the models' predictor variables that are within the ranges of values on which the models were calibrated. That is, the models, when applied to forecast scenarios, are applied on forecasts that are within the conditions on which they were built, tested and validated.
2. The scenarios themselves maintain historical interrelationships among variables used as predictor models and do not create interrelationships among the scenario variables that are unprecedented.

In short, forecasting models work properly when they are applied to circumstances that maintain interrelationships among predictor variables and between predictor variables and the dependent variable.

The SA scenario does not meet these criteria as the measures of investor risk aversion are projected to behave in ways inconsistent with the past and at variance with one another. Further, the SA scenario misstates how investors would respond to the macro-economic characteristics of the scenario because those characteristics are within their frame of reference, having actually occurred in the financial crisis.

This condition may pose model risk for any forecast that uses these measures as predictors in one or more forecasting models or uses measures of risk aversion to form judgments about values of traded assets or liquidity in the capital markets in this scenario. Under such circumstances, banks may need to apply judgmental overrides to ensure that the forecasts in this scenario are reasonable and that their models are not pushed beyond their ranges of statistical reliability.

Uncertainty, arguably, is the most important element for banks and other financial institutions since it is the shock of encountering unfamiliar and extreme market conditions that precipitates extreme risk aversion and a dramatic flight-to-quality. Under uncertainty, investors shed risky assets, debtors default and the values of bank assets plummet. Banks hold capital for precisely this purpose — to protect against unforeseen losses that emerge in illiquid markets driven by investors' fear (disaster magnification).

However, neither CCAR nor DFAST really test for uncertainty. The annual repetition of very similar scenarios, which provides so much benefit to banks and regulators in terms of the processes of stress testing and capital planning, means that all parties, including the capital markets, become increasingly familiar with the scenarios and with their outcomes. The fact that virtually all banks "pass" in virtually all years means that CCAR and DFAST have succeeded in preparing the U.S. banking system for these now readily identifiable scenarios. CCAR and DFAST test for risk (which includes quantifiable outcomes from measurable probability distributions).

Even by requiring select large banks to simulate a market shock and / or the default of a major counterparty within the SA scenario does not quite address system-wide uncertainty because these "add-ons" are unique to the individual banks executing them. While it is clear the SA scenario contains shock to investors, the source of the shock and the underlying changes to the financial system are not identified. The SA also does not explicitly address the convergence of inter-asset correlations to extreme values and the capital implications for those changes in correlations.

The net result is that individual banks and the banking system are well-capitalized for a now-familiar and oft-repeated scenario (the SA) that describes yesterday's stress (the financial crisis). This strong capital position holds even though there likely is model risk baked into the stress test and capital forecasts of the participating banks since the SA has a confused pattern of metrics for investor behavior that does not align with historical patterns. Familiarity with both the financial crisis and with the SA will almost certainly mean that investor behavior will be more muted than described, should this scenario come to pass. This familiarity likely will mean that the risk aversion, flight-to-quality, and extreme inter-asset correlations and other traits of crises characterized by uncertainty and disaster magnification will be muted, if they occur at all.

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Bruce Stevenson is a Managing Director with A&M in New York, with more than 27 years of experience in applying quantitative technology to challenges within the financial services industry. He has a unique blend of experience developing analytical solutions within banks and as a financial services consultant.

An industry thought-leader, Mr. Stevenson has published nearly 20 papers on risk management, portfolio management and quantitative analytics in lending and risk management journals.

Bruce G. Stevenson
Managing Director
Alvarez & Marsal
Financial Industry Advisory Services, LLC
600 Madison Avenue
New York, New York 10022
1-212-328-8595 (Office)
1-917-565-2593 (Mobile)

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