Thoughts on Stress Test Testing & Economic Capital

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Backdrop:

The recent financial crisis put pressure on governments & regulators to act, creating uncertainty over future regulations for FIs and other government policies

• Some policy proposals appear to try to reduce systemic risk by establishing draconian capital requirements for FIs

• Merely increasing total capital held within the financial system may be un-economic and may not be effective in preventing crises

• To avoid such policy outcomes, feasible alternatives need to be suggested and debated

• The division of responsibility between governments /regulators and financial institutions hinges on transparency, and on the capabilities and incentives for each
Proposition - Financial institutions (FIs) can effectively manage capital cushions and reduce insolvency risk if:

1. The government’s role in mitigating catastrophic systemic risk is sensible and clearly articulated
2. FIs use accurate point-in-time (PiT) risk assessment systems
3. Model risk is reduced by tying model outputs to observables

The combination of government clarity, intent, and effective FI management of capital buffers can produce a stable, growth-oriented economic environment

*This presentation is directed toward FIs whose primary activities are to originate and hold risky assets
High Level Policy Considerations

1) In its role of “lender of last resort”, the Fed needs to clearly articulate the criteria that identify a ‘systemic’ crisis, and affirm its intention and responsibility to respond.

2) Establishing a the range of systemic stress that defines FIs need to hold capital to keep themselves from failing defines the competitive landscape and provides the FIs with clear guidelines.

3) With FIs’ Ecap responsibilities more explicitly defined, thresholds for establishing the FIs ability to meet those responsibilities can be more clearly defined in terms of risk assessment capability, data availability, and a convincing and adequate reduction of model risk.
Observations On Severe Loss Modeling
GDP is not an ideal basis for credit cycle measurement due to poor trending, leads & lags, and component idiosyncrasies.

Gross Private Domestic Investment vs Personal Consumption Expenditures (~85% of GDP)

Conclusion: Retail and Commercial Cycles Differ.
For C&I charge offs, the default rate captures most of the cyclical movement.

Basis Matters: Total Charge Offs and C&I Charge Offs Exhibit Different Patterns
The strength of the C&I relationship can be demonstrated with a simple linear regression

Simple Regression Model

C&I Charge Offs ~ Default Rate (1 Qtr Lag) + Default Rate (No Lag)

Coefficients:

|                     | Value | Std. Error | t value | Pr(>|t|) |
|---------------------|-------|------------|---------|----------|
| (Intercept)         | -0.2027 | 0.0750    | -2.7015 | 0.0088   |
| Default Rate (1 Qtr Lag) | 0.3668 | 0.1086    | 3.3772  | 0.0012   |
| Default Rate (No Lag) | 0.1116 | 0.1080    | 1.0334  | 0.3053   |

Residual standard error: 0.3074 on 64 degrees of freedom

**Multiple R-Squared: 0.8095**  Adjusted R-squared: 0.8036

F-statistic: 136 on 2 and 64 degrees of freedom, the p-value is 0
C&I charge offs vs regression fit based on default rates only (1996-2012)
For Consumer charge offs, both the PCE and the HPI capture most of the cyclical movement (with lags)
The strength of the Consumer relationship can be demonstrated with a simple linear regression

**Simple Regression Model**

Consumer Charge Offs ~ HPI (3 Qtr Lag) + HPI (4 Qtr Lag) + PCE (3 Qtr Lag) + PCE (4 Qtr Lag)

Coefficients:

|                      | Value   | Std. Error | t value  | Pr(>|t|) |
|----------------------|---------|------------|----------|----------|
| (Intercept)          | 4.1936  | 0.1280     | 32.7657  | 0.0000   |
| HPI (lag 4 qtrs)     | -0.0348 | 0.0694     | -0.5013  | 0.6180   |
| HPI (lag 3 qtrs)     | -0.0539 | 0.0706     | -0.7630  | 0.4485   |
| PCE (lag 3 qtrs)     | -0.1043 | 0.0444     | -2.3499  | 0.0221   |
| PCE (lag 4 qtrs)     | -0.1787 | 0.0445     | -4.0199  | 0.0002   |

Residual standard error: 0.6072 on 59 degrees of freedom

**Multiple R-Squared: 0.7216**   Adjusted R-squared: 0.7027

F-statistic: 38.23 on 4 and 59 degrees of freedom, the p-value is 8.882e-016
Consumer charge offs vs regression fit based on PCE & HPI (1996-2012)
Commercial default rates provide good empirical bases for predicting government intervention thresholds and buffer tolerances.

Moody's Default Rates

Significant Historical Intervention Levels

That's 90 years! Each cycle had different economic antecedents. Note: thresholds for serious gov’t intervention are basis-independent.
Given a presumption of government action above certain thresholds, how can an FI manage an effective capital buffer to protect itself?

1. Establish timely default risk monitoring (PiT PDs) and comparable Consumer risk indices
2. Figure out what benchmark applies to each portfolio
3. Associate critical risk index levels with quantiles of their estimated potential loss distribution
4. Evaluate the cyclical volatility of the loss levels associated with these quantiles
5. Establish a mechanism to link capital held with implied capital (e.g. a capital management process)
TTC ratings not only do not monitor risk in a timely way, they cannot be associated with specific default rates that would work in this context.

Moody’s One-Year Default Rates by Rating Category; 1920-2010

Using long-term average default rates (for B’s about 3.4%) creates a significant asymmetry with respect to stress.

The outputs of sophisticated portfolio models cannot easily be interpreted when the inputs have this level of imprecision.
Managing to a default-rate based cycle requires forward-looking PDs

TTC ratings are often used in Ecap calculations because they lead to more stable capital requirements. If conservatively parameterized, such capital requirements may be said to include a capital buffer, *but it is a passive buffer*

TTC ratings are problematic because:

- They do not fully represent the true risk an institution faces at any given time
- They are impossible to define, unless we presume the existence of predictable credit cycles
- They are backward-looking and usually calculated via historical averaging
- Even if expressed in PD terms, they represent ordinal measures, whose purpose is to rank-order obligors. While very useful for certain purposes, they are less effective for stress testing and Ecap estimation

The historical regulatory emphasis on TTC ratings probably reflects the historical overdependence on rating agency practices and data
Basis matters – FIs need the data to define and defend a credit cycle proxy that is relevant for their portfolio.

The Spec-grade default rate may not be a good proxy - for diversified FIs 13% was probably not reached in the last cycle. Valid internal default rate data is a requirement for credible Ecap modeling.
The relationship between approximate default rate and loss quantile is a critical to understanding stress tests and managing economic capital.
Tail analysis establishes realism/credibility
In this example, for a roughly spec-grade portfolio, the Moody’s Spec-Grade default rate seems to make sense

How much capital should be held against this portfolio? A number based on a quantile above 95% is probably too high. *Agency rating reference point not needed*, 1 in 10,000 analogy not needed.
Tail characteristics must be reasonably related to government policy thresholds and FI management objectives.

Very high quantiles of the loss distribution may not correspond to realistic conditions beneath the intervention threshold.
For portfolios with dynamic LGDs, tail analysis must include this extra dimension.

FIs need to convincingly describe all relevant tail dynamics or model-based Ecap calculations should not be taken seriously.
Conclusions:

1. History (default rates) provide regulators and FIs with meaningful thresholds for defining systemic stress levels

2. Default rates fairly accurately measure loss potential and capture correlation effects

3. A systemic crisis intervention threshold defined in default rate terms would clarify FI responsibilities for limiting insolvency risk via economic capital

4. PiT default risk measures combined with valid internal benchmarks for default rate ranges arm FIs with the tools required to estimate realistic and economic capital levels, reducing insolvency risk to acceptable levels