Thoughts on Stress Test Testing & Economic Capital

Federal Reserve Symposium

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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

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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

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High Level Policy Considerations

1) In it's 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

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Observations On Severe Loss Modeling

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GDP Is not an ideal basis for credit cycle measurement due to poor trending, leads & lags, and component idiosyncracies

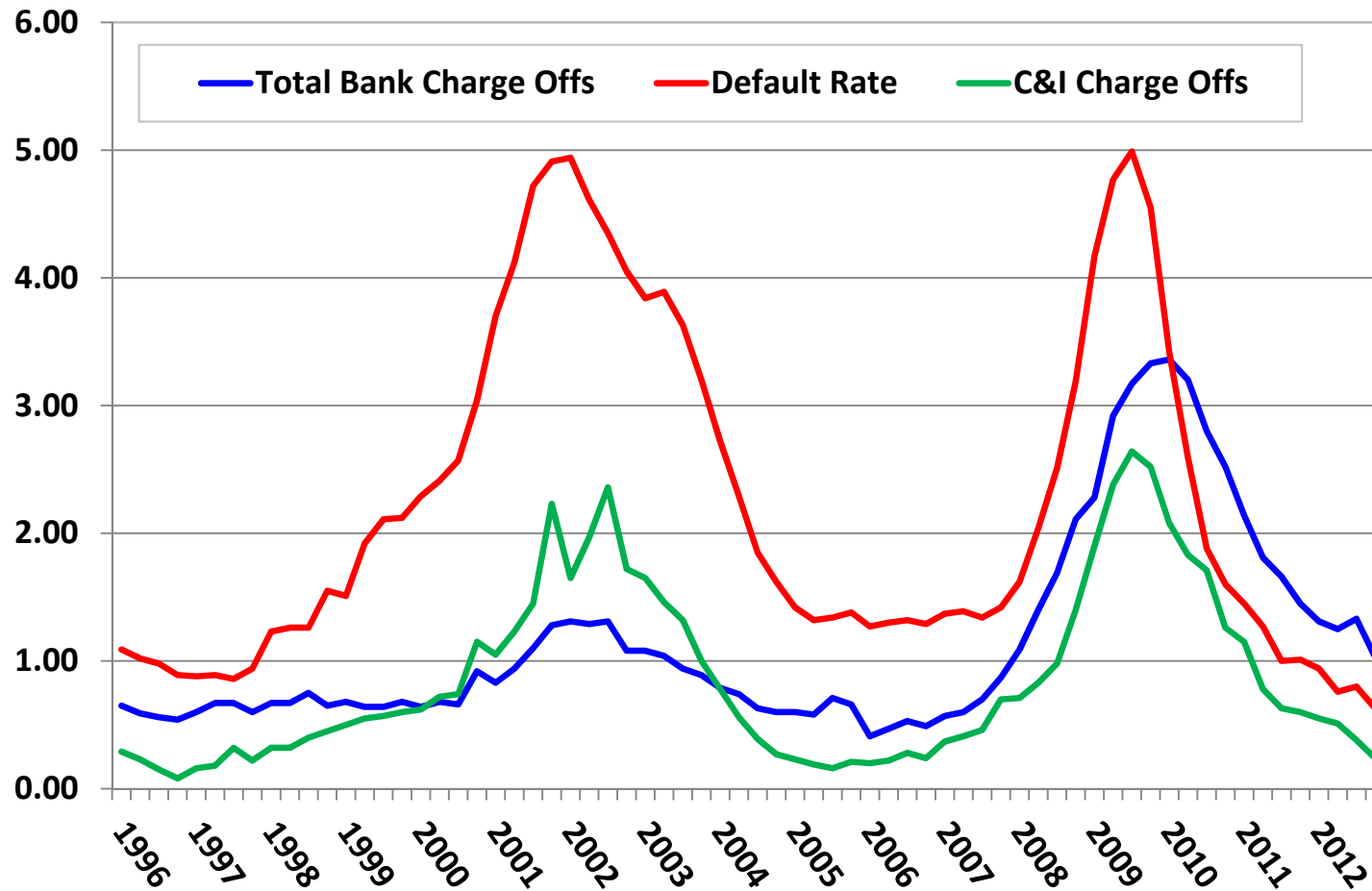**Gross Private Domestic Investment vs Personal Consumption Expenditures (~85% of GDP)**
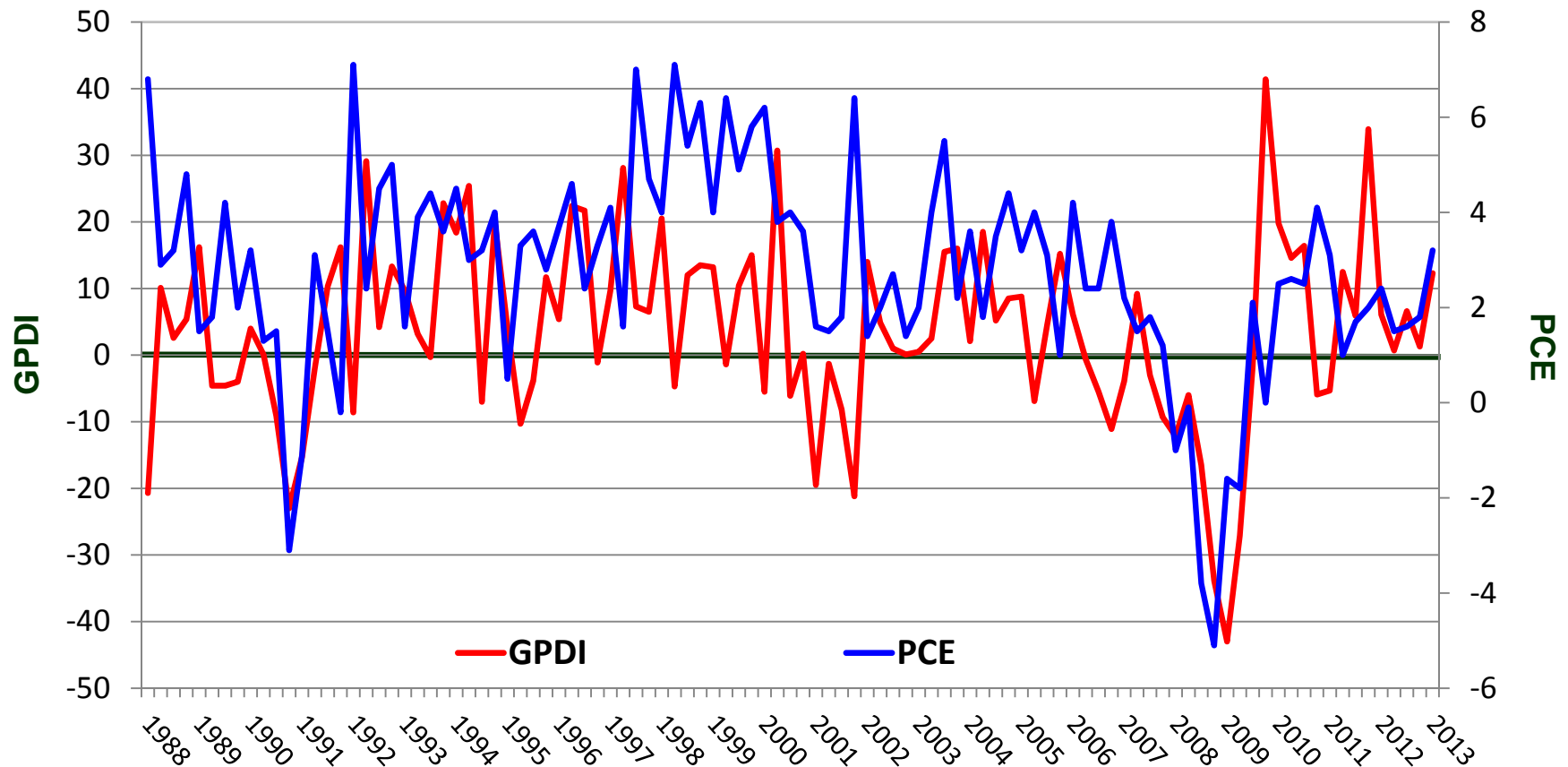
Conclusion: *Retail and Commercial Cycles Differ*

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

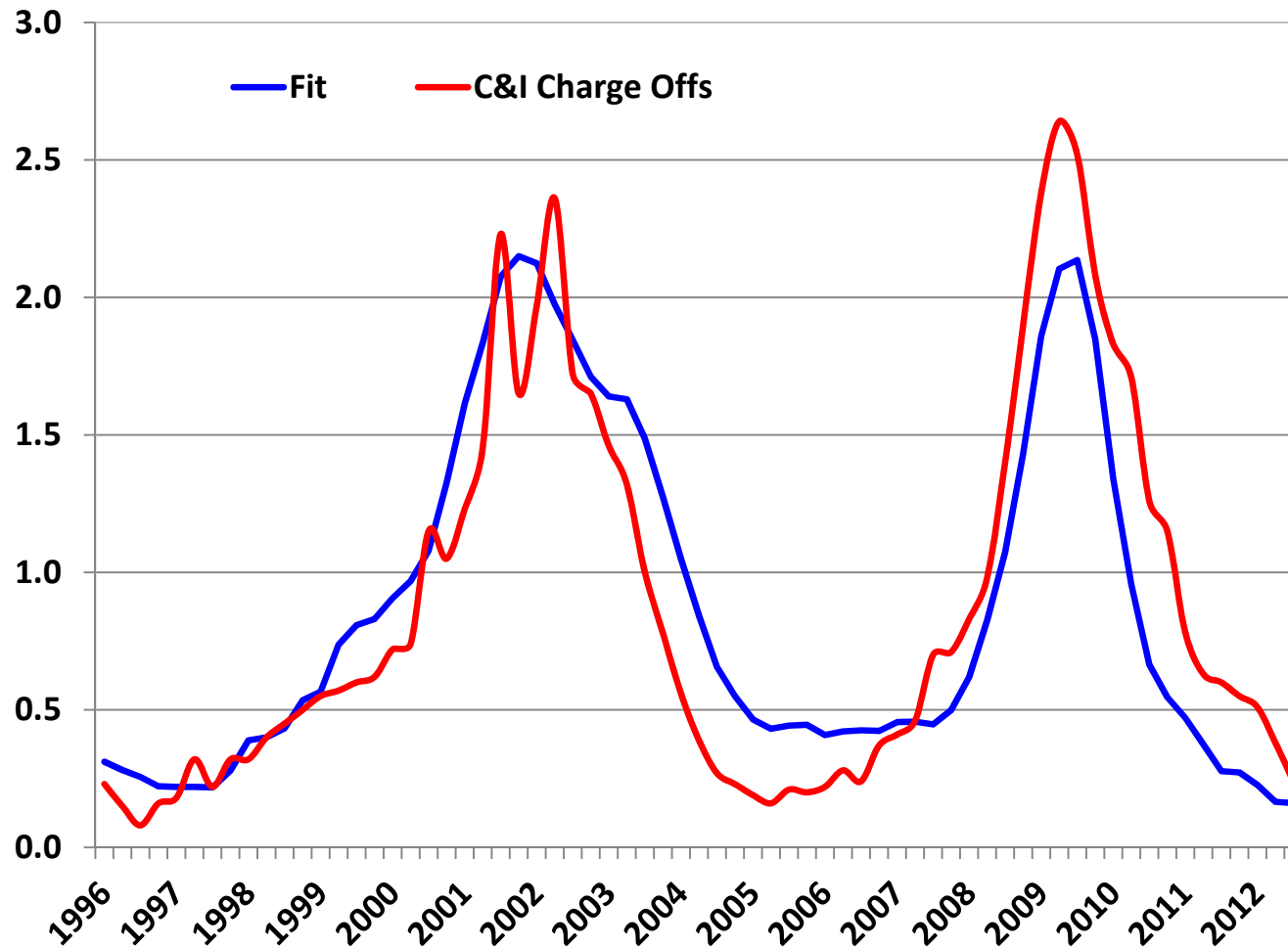Residual standard error: 0.3074 on 64 degrees of freedom
Multiple R-Squared: 0.8095   Adjusted R-squared: 0.8036
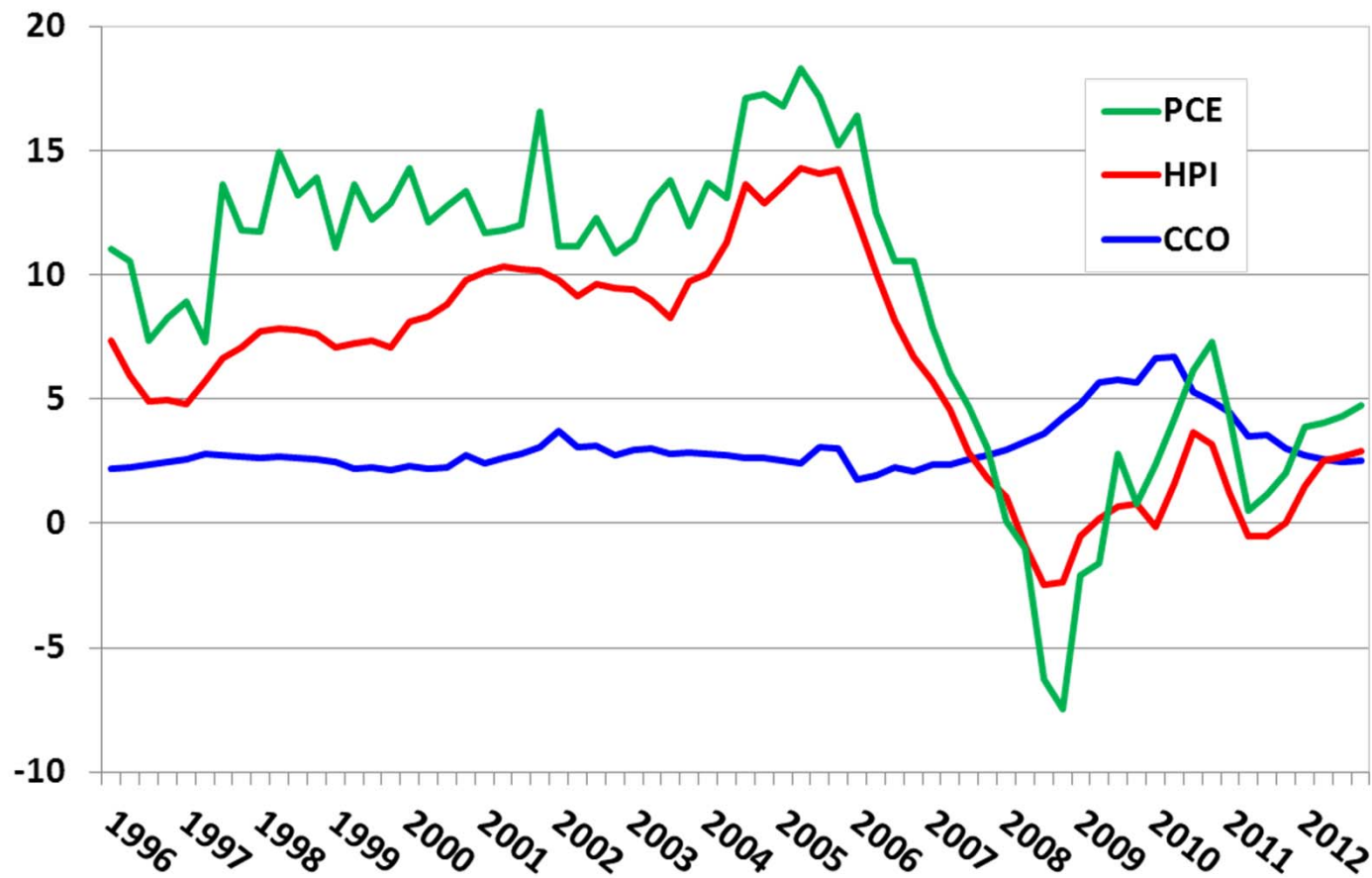F-statistic: 136 on 2 and 64 degrees of freedom, the p-value is 0

C&I charge offs vs regression fit based on default rates only (1996-2012)

C&I Charge Offs (top 100 Banks) vs Regression Fit Using Default Rate Only

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
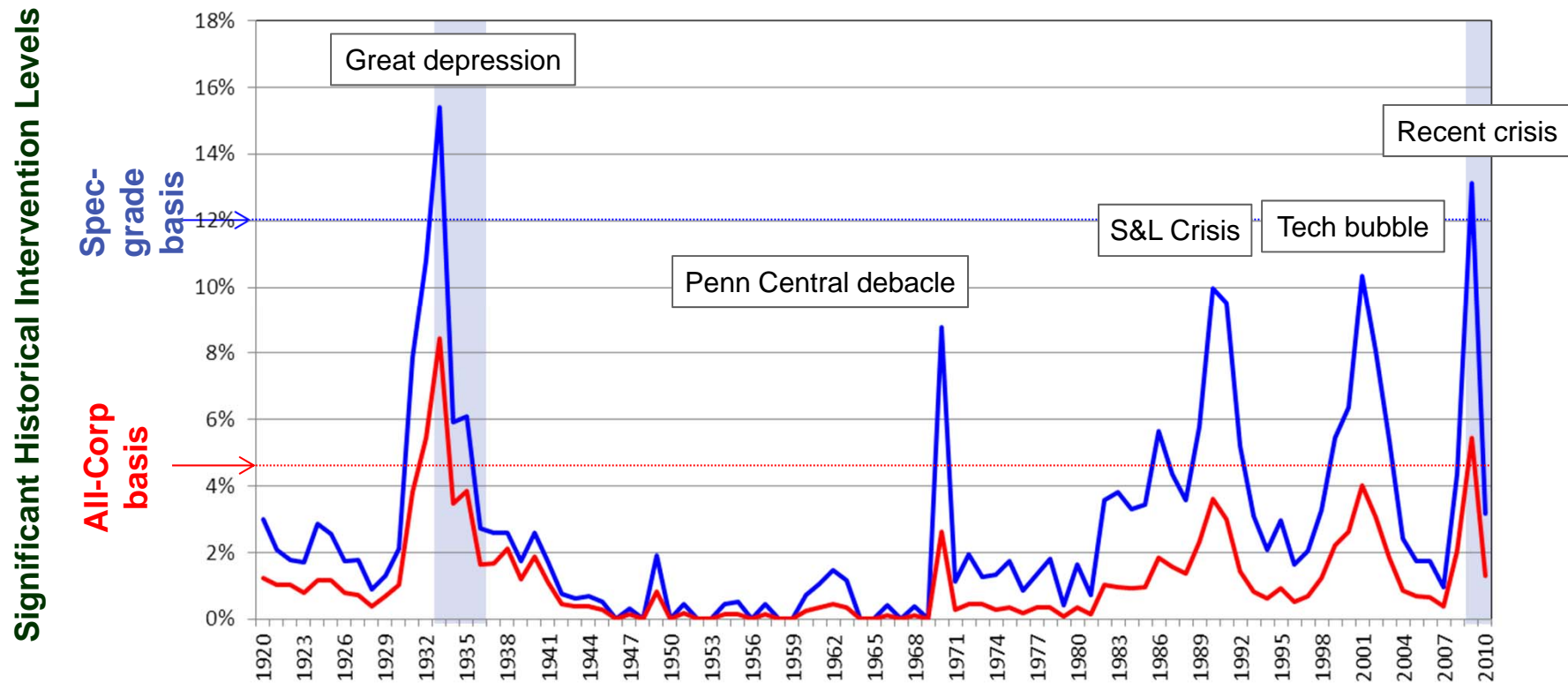**Multiple R-Squared: 0.7216**   Adjusted R-squared: 0.7027
F-statistic: 38.23 on 4 and 59 degrees of freedom, the p-value is 8.882e-016

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Consumer charge offs vs regression fit based on PCE & HPI (1996-2012)
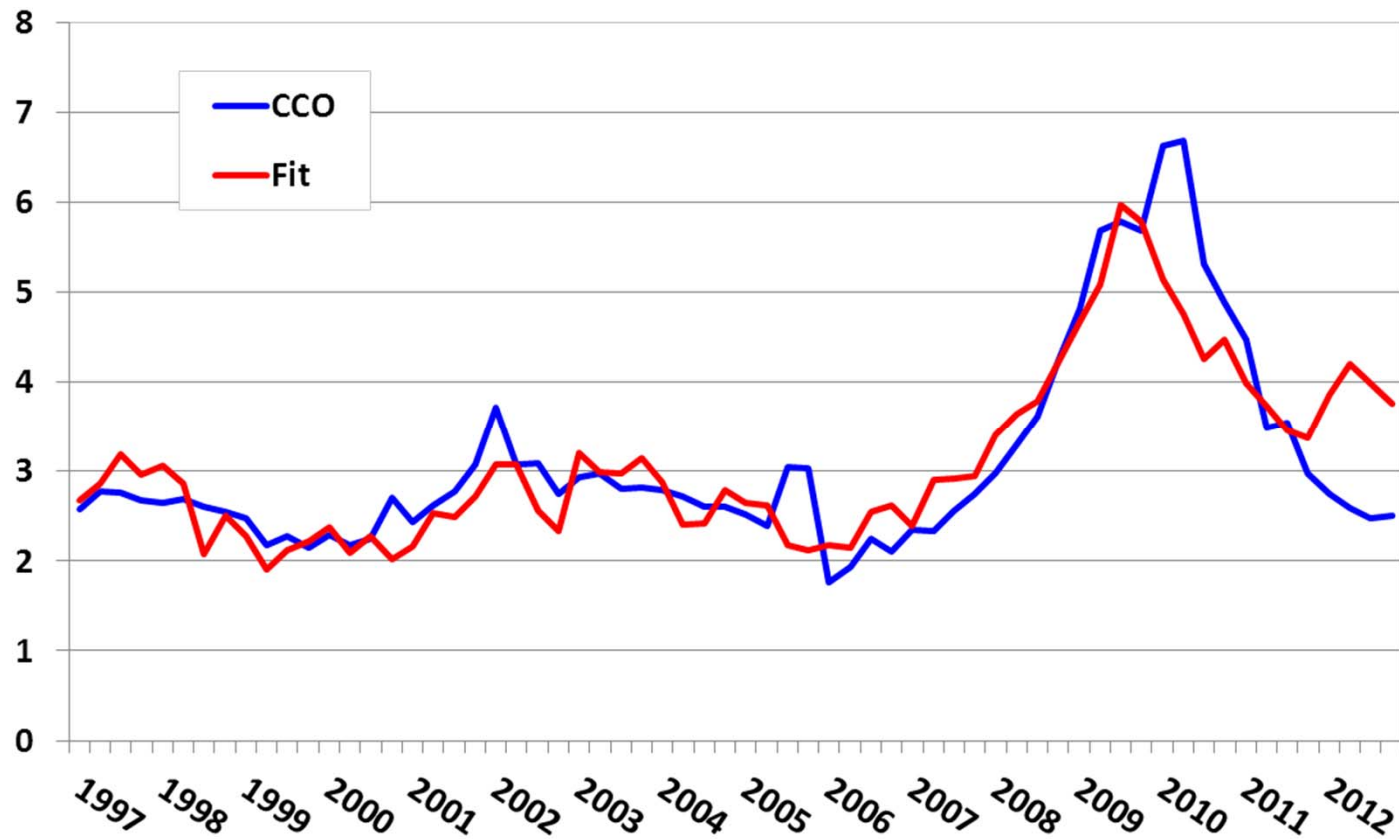
Commercial default rates provide good empirical bases for predicting government intervention thresholds and buffer tolerances
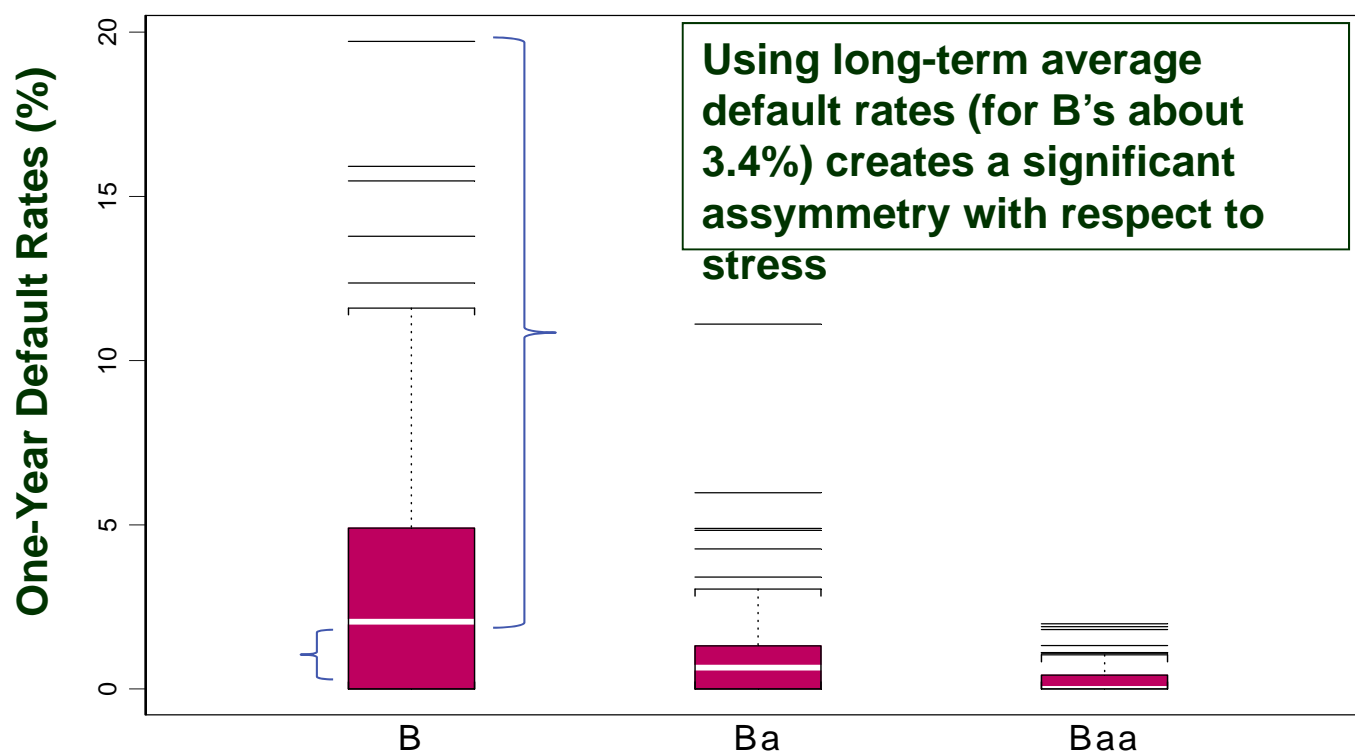
Moody's Default Rates

Significant Historical Intervention Levels

Spec-grade basis

All-Corp basis

Great depression

Recent crisis

S&L Crisis

Tech bubble

Penn Central debacle

That's 90 years! Each cycle had different economic antecedents.
Note: thresholds for serious gov't intervention are basis-independent

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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)

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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 assymmetry 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
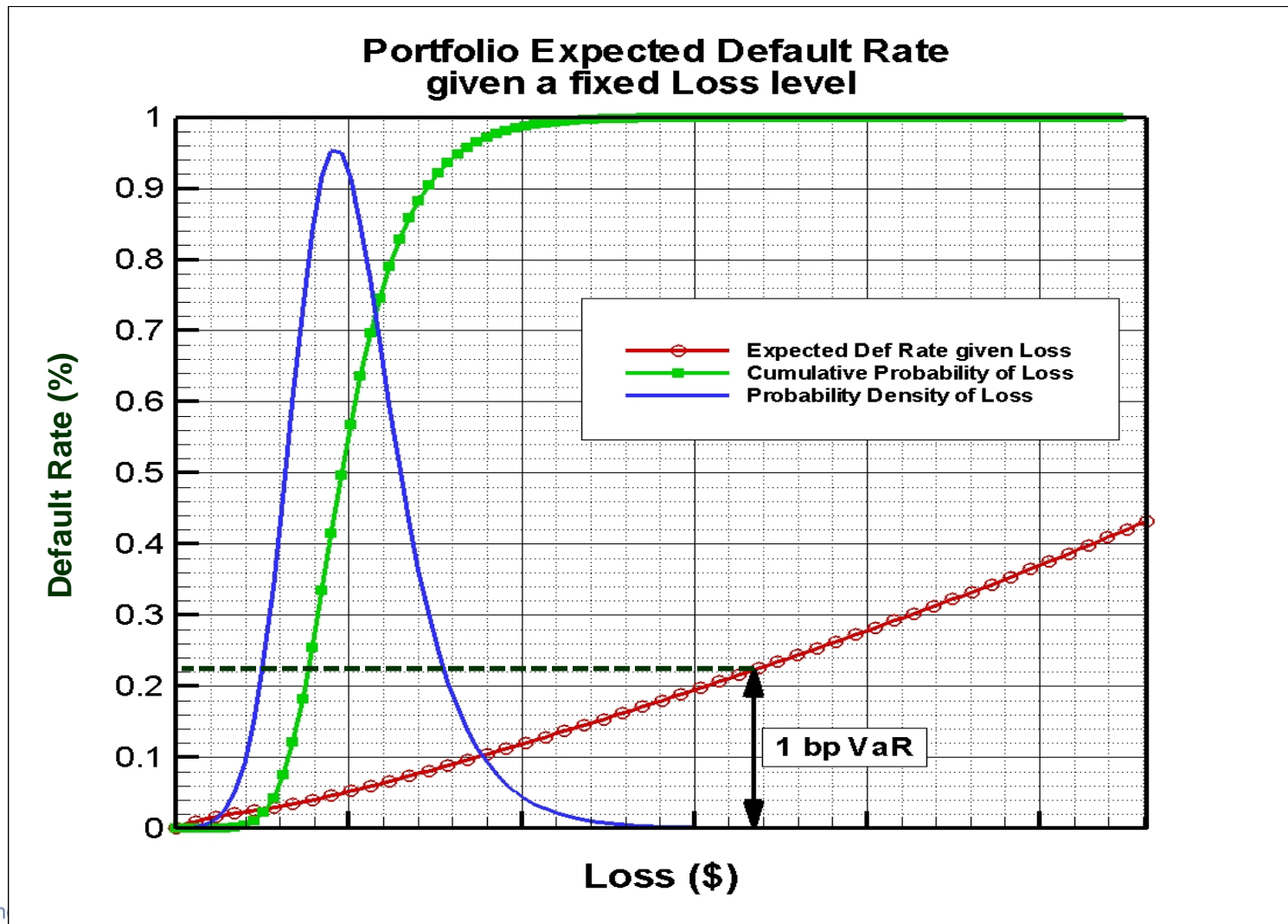
Moody's Default Rates
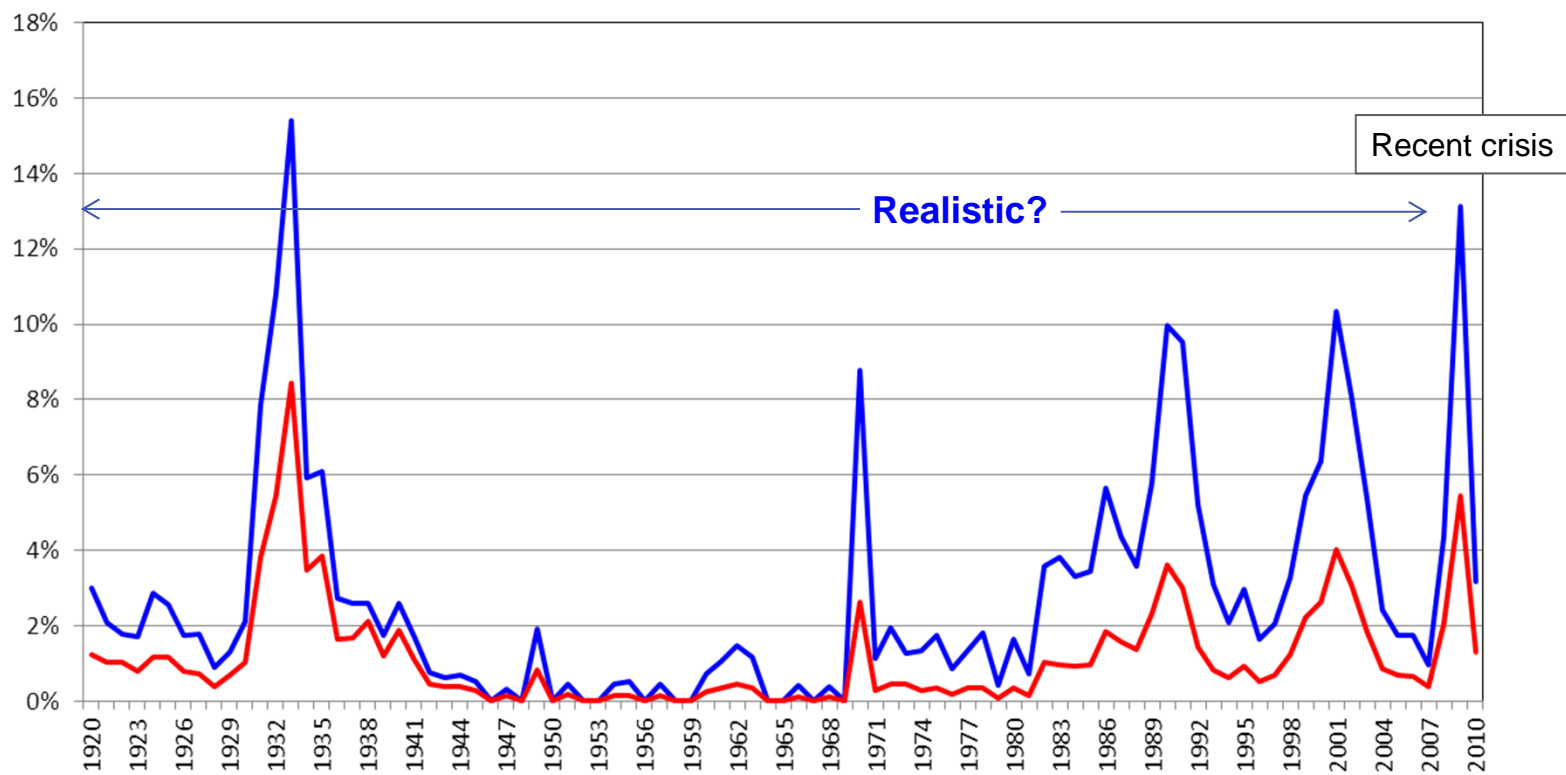
The Spec-grade default rate may not be a good proxy - for diversified FIs 13% was probably not reached in the last cycle. Valid internal default rate data is a requirement for credible Ecap modeling.

The relationship between approximate default rate and loss quantile is a _critical_ to understanding stress tests and managing economic capital

Portfolio Expected Default Rate given a fixed Loss level

Legend:
- Expected Def Rate given Loss
- Cumulative Probability of Loss
- Probability Density of Loss

1 bp VaR

Default Rate (%)

Loss ($)

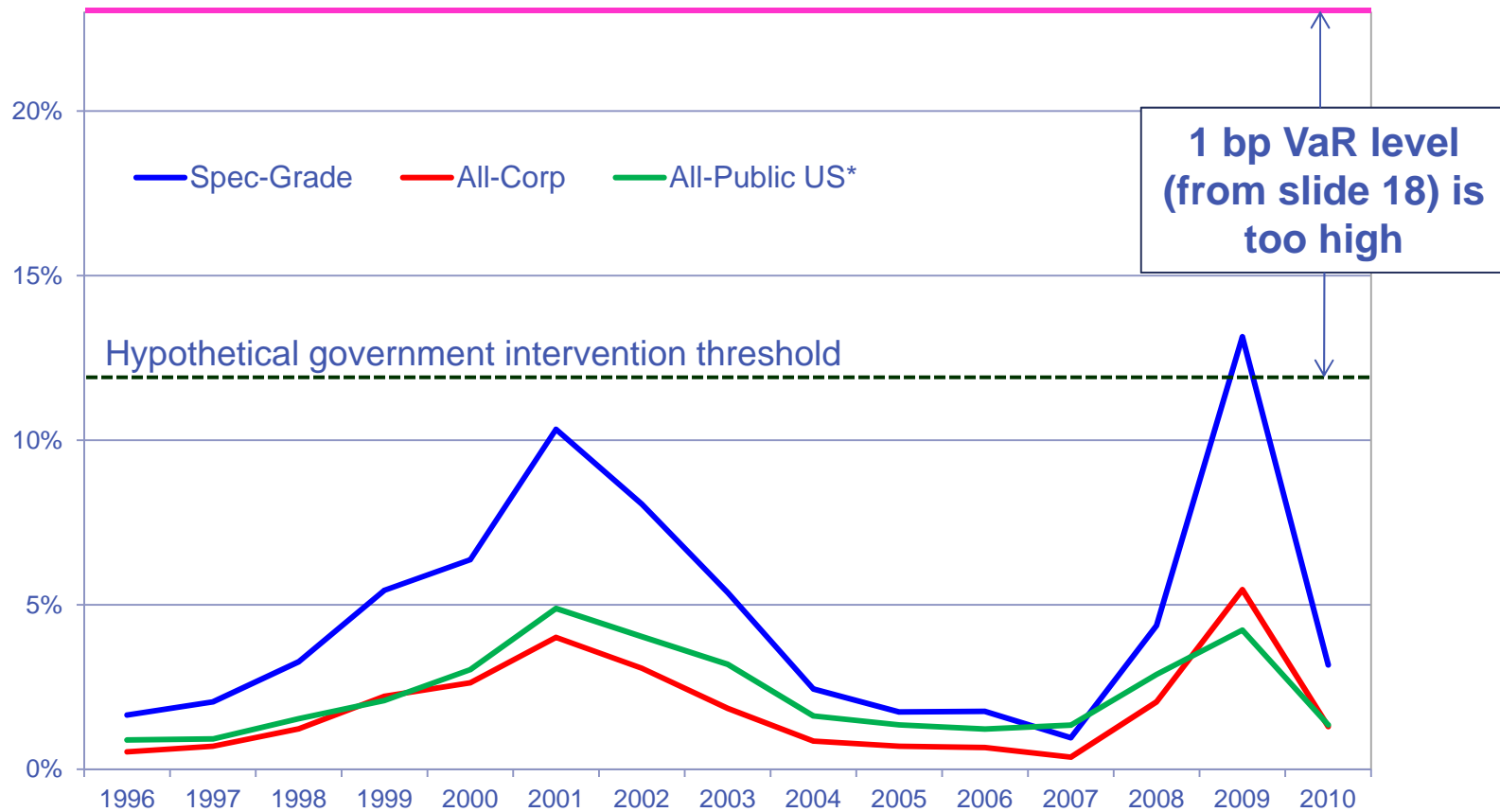# Tail analysis establishes realism/credibility

In this example, for a roughly spec-grade portfolio, the Moody's Spec-Grade default rate seems to make sense
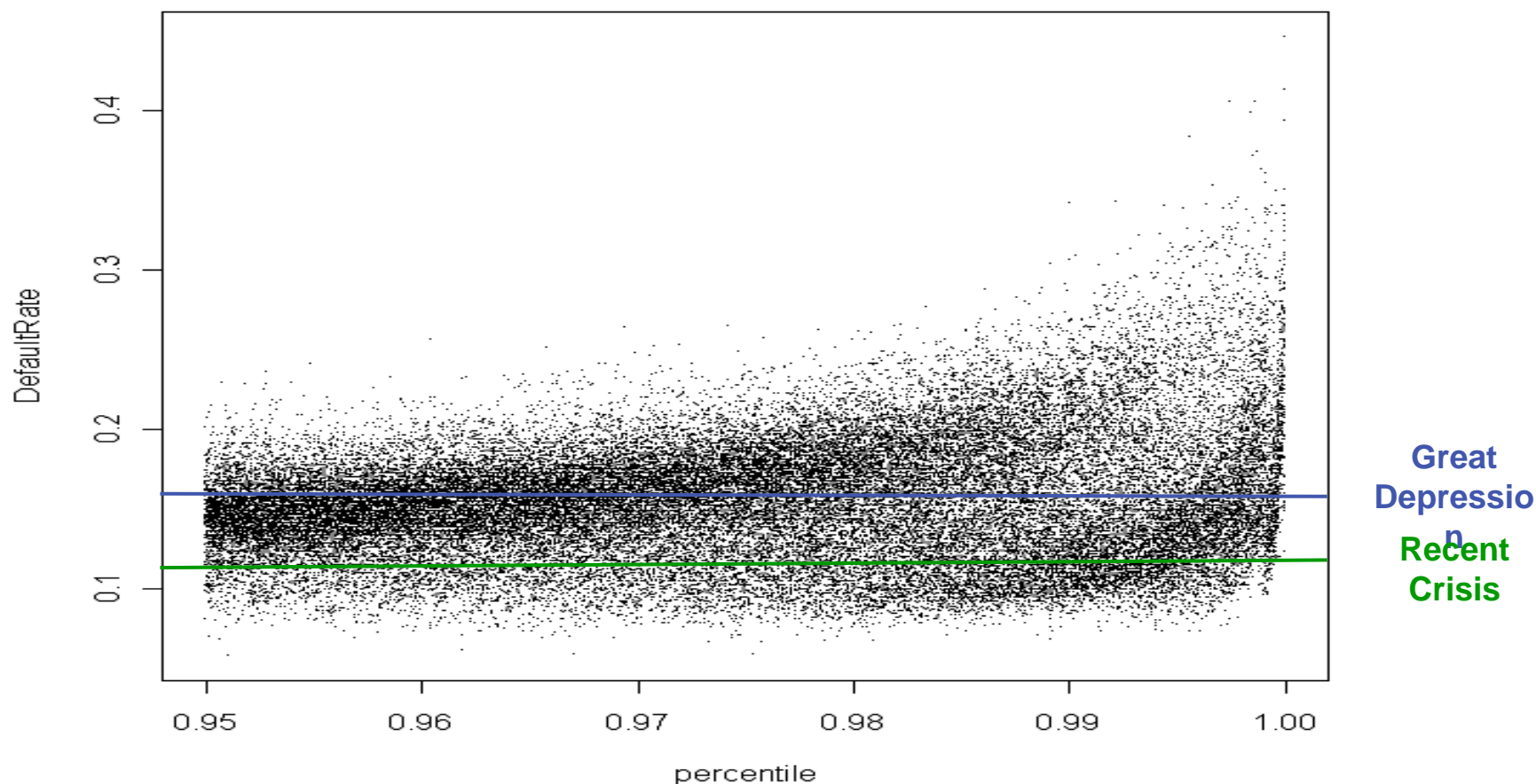
How much capital should be held against this portfolio? A number based on a quantile above 95% is probably too high. *Agency rating reference point not needed*, 1 in 10,000 analogy not needed.

Tail characteristics must be reasonably related to government policy thresholds and FI management objectives

1 bp VaR level (from slide 18) is too high

Spec-Grade   All-Corp   All-Public US*

Hypothetical government intervention threshold

20%

15%

10%

5%

0%

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

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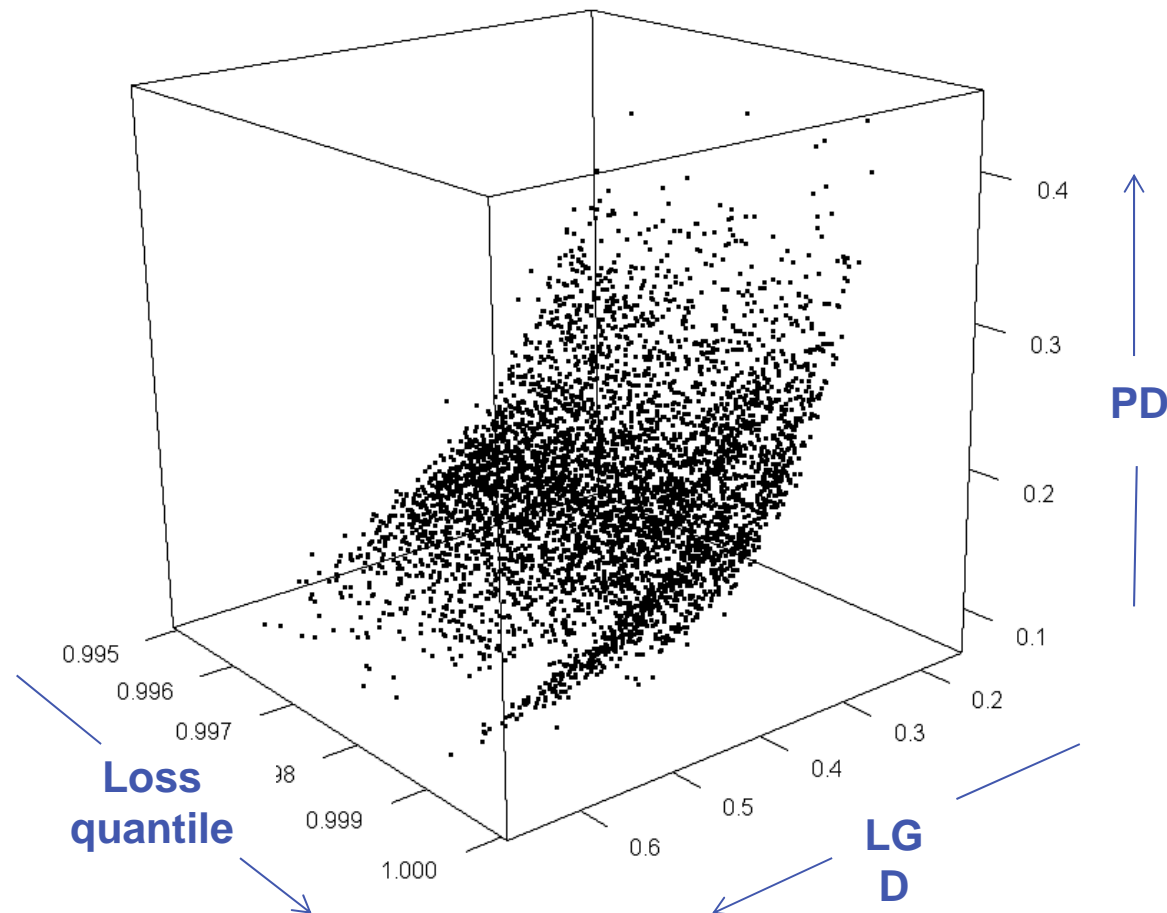
FIs need to convincingly describe all relevant tail dynamics or model-based Ecap calculations should not be taken seriously

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 <u>defined in default rate terms</u> 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