



# Stress Testing/Provisioning Models for Commercial Real Estate Loans

Nancy Wallace

Haas School of Business -- UC Berkeley

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# Outstanding Concerns with Current Stress Testing Strategies

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- x Importance of Data Quality and Data Management Systems
  - Integrity of contract descriptors, performance measures, and historical access.
  - Accounting for soft information or changes in internal business strategies (risk appetite).
  - Resources to develop and validate models – modelling fundamentals (RE price dynamics , drift, volatility, and correlation)
- x Benefits of Diversified Modeling Strategies
  - Structural models are needed for new products and long horizons.
  - Reduced-form and Hybrids may have poor out-of-sample power.
  - Structural and Hybrids maintain optimizing framework of agents.
- x Pro-cyclical Effects of Provisioning and Liquidity Spirals
  - Implications for dynamic provisioning – FASB versus SEC.

# Data Quality and Integrated Data Access are the Foundation of Stress Testing

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- x CRE loans are highly heterogeneous and are hard to fully characterize with available data fields:
  - Lack of standardized loan-level fields for balance sheet loans.
  - Heterogeneity in vender specific fields for securitized loans.
  - Problems with identifying cross-collateralization and cross-selling.
  - Limitations with data for embedded options: extensions, prepayment/defeasance/yield maintenance, delinquency, renegotiations, and default.
- x Data warehousing strategies often limit “real-time” access to validated historical data.
  - Integrity of CRE data and line-of-business access – who has control of the data.
  - Problems with resource constraints and strategic risk management integration.

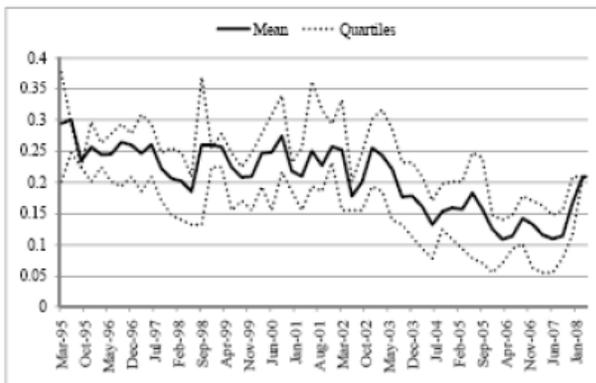
# Within-Firm Modeling Integrity

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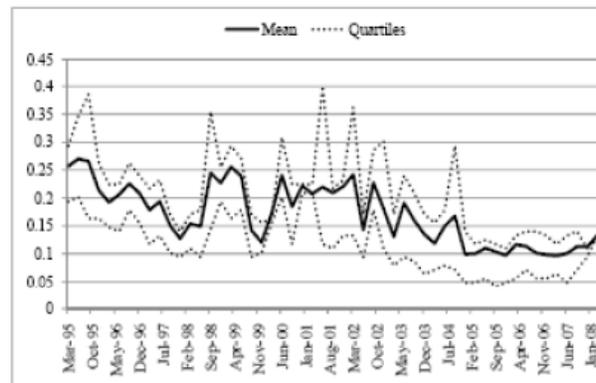
- x Maintaining transparency and inter-temporal consistency in stress-testing models
  - Consistency in CRE underwriting models, stress testing/provisioning models, and pricing models within the firm.
    - » What do underwriting spreads imply about volatility bets??
  - Transparency in modeling key drivers of simulations:
    - » Interest rate dynamics.
    - » Commercial real estate asset price dynamics
    - » Other macro-fundamentals.
  - Role of risk manager in documenting modeling strategy, record of model modifications, and model validation.

# Commercial Real Estate Loan Spreads

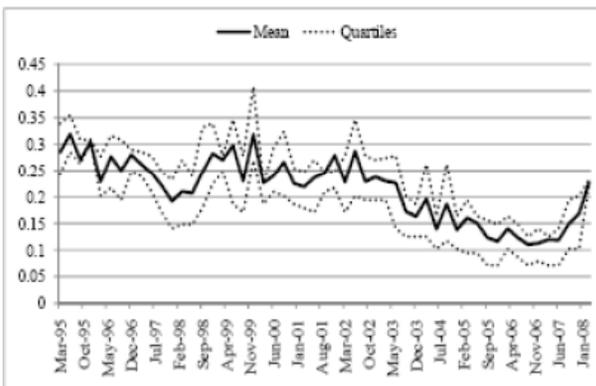
## Embed Implied CRE Volatility



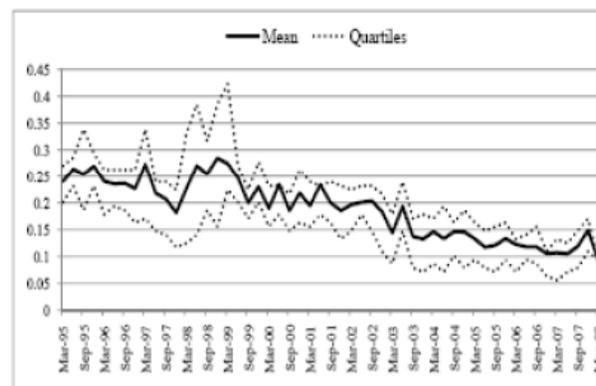
(a) Industrial



(b) Multifamily



(c) Office



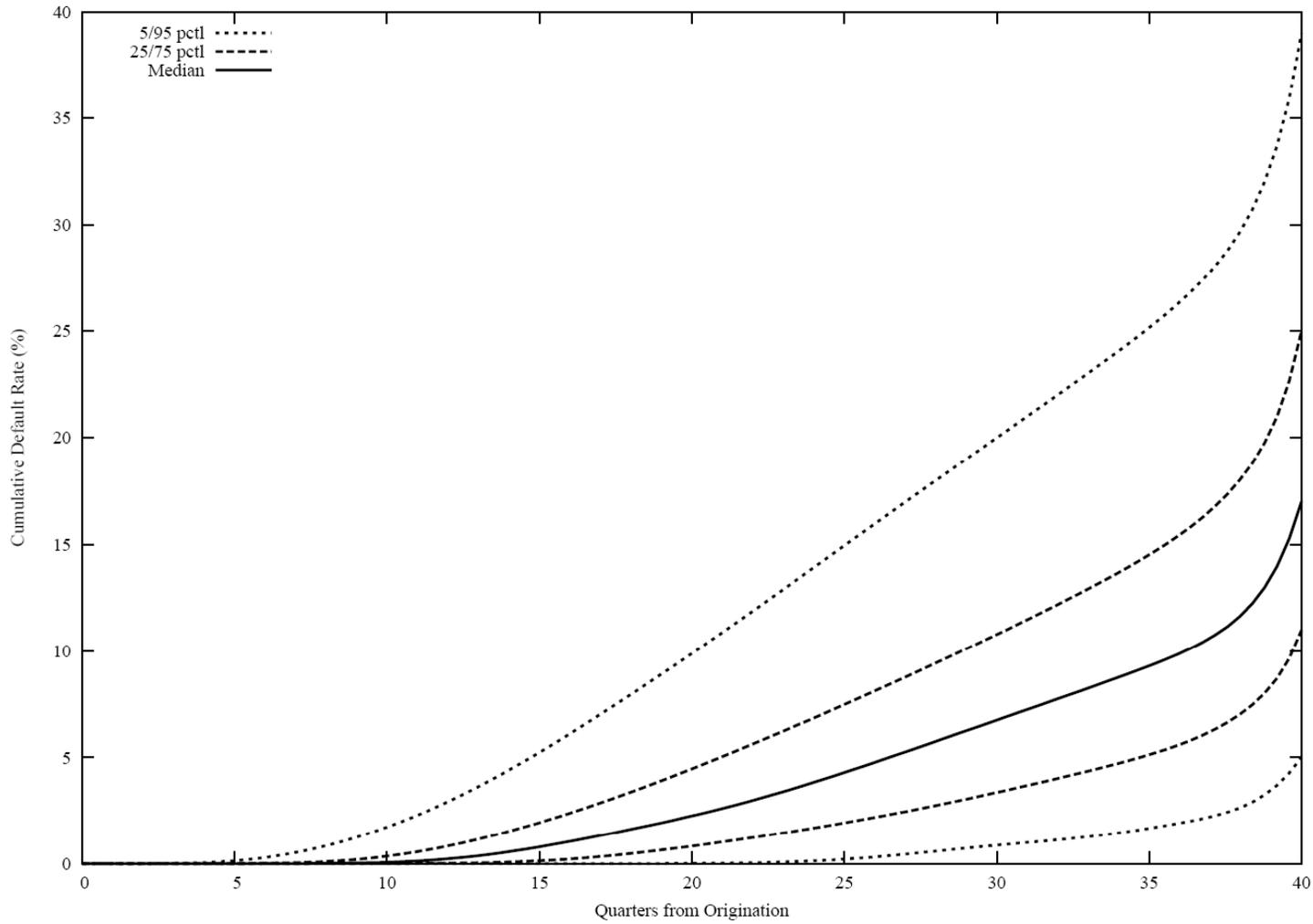
(d) Retail

# Advantages of Mixed Modeling Strategies

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- x Currently there is an over-reliance on reduced-form hazard models in stress testing.
  - Often estimable even though historical data does not span outcomes of interest (e.g. high interest rates/low asset prices; low interest rates/low asset prices; etc).
  - Reduced form models poorly control for correlation and volatility (both systematic and idiosyncratic) in coefficient estimation.
  - Challenges estimating reduced form models with path dependence in outcomes (ordered logits for outcome sequences).
- x Structural and hybrid models are informative for new products, new risk strategies, accounting for volatility and correlation in underlying fundamentals, accounting for full contract structure.

# Implied Volatilities Generate Cumulative Default Expectations – A Structural Model

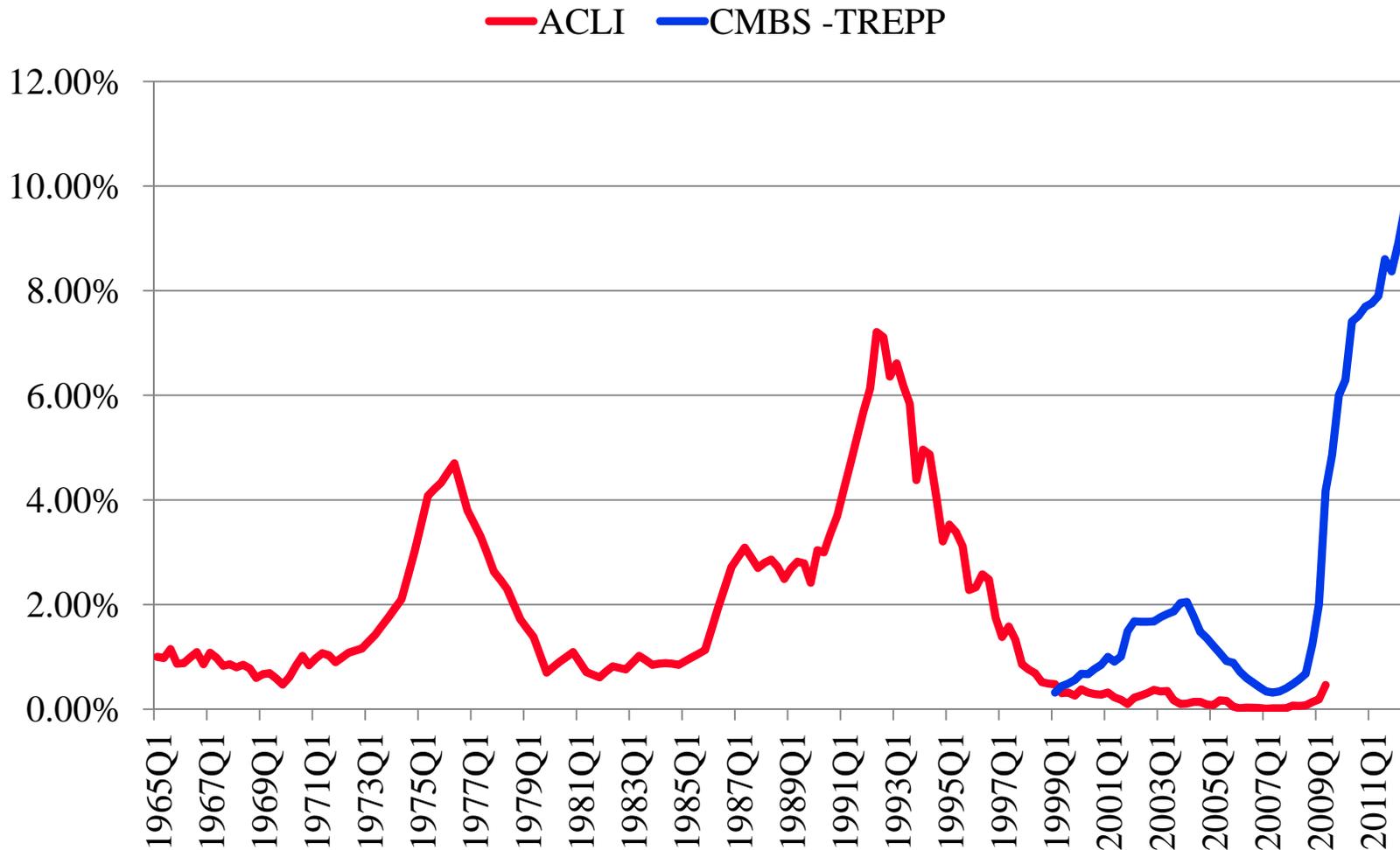


# Cyclicality in CRE Performance?

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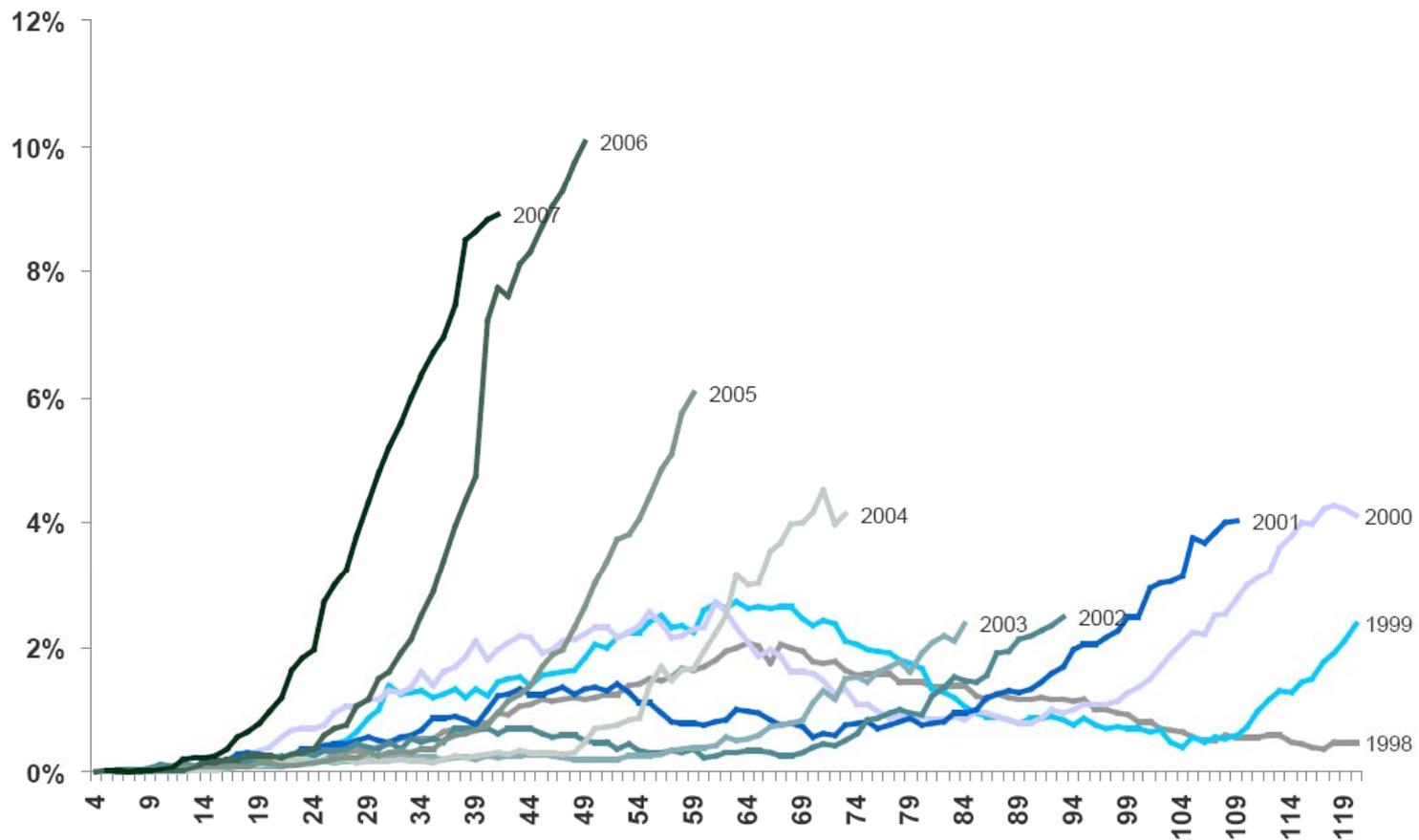
- x Empirical evidence of 20 year cycle in CRE performance.
- x Possible reasons may include:
  - The balloon structure of CRE loans may induce risk exposure over business cycles – a “timing risk” of capital gains.
  - As a factor input, CRE is susceptible to business cycle effects.
- x Significant need for better data sets and more research!!

# Cyclical Structure of CRE Loans 60+ Day Delinquency Performance



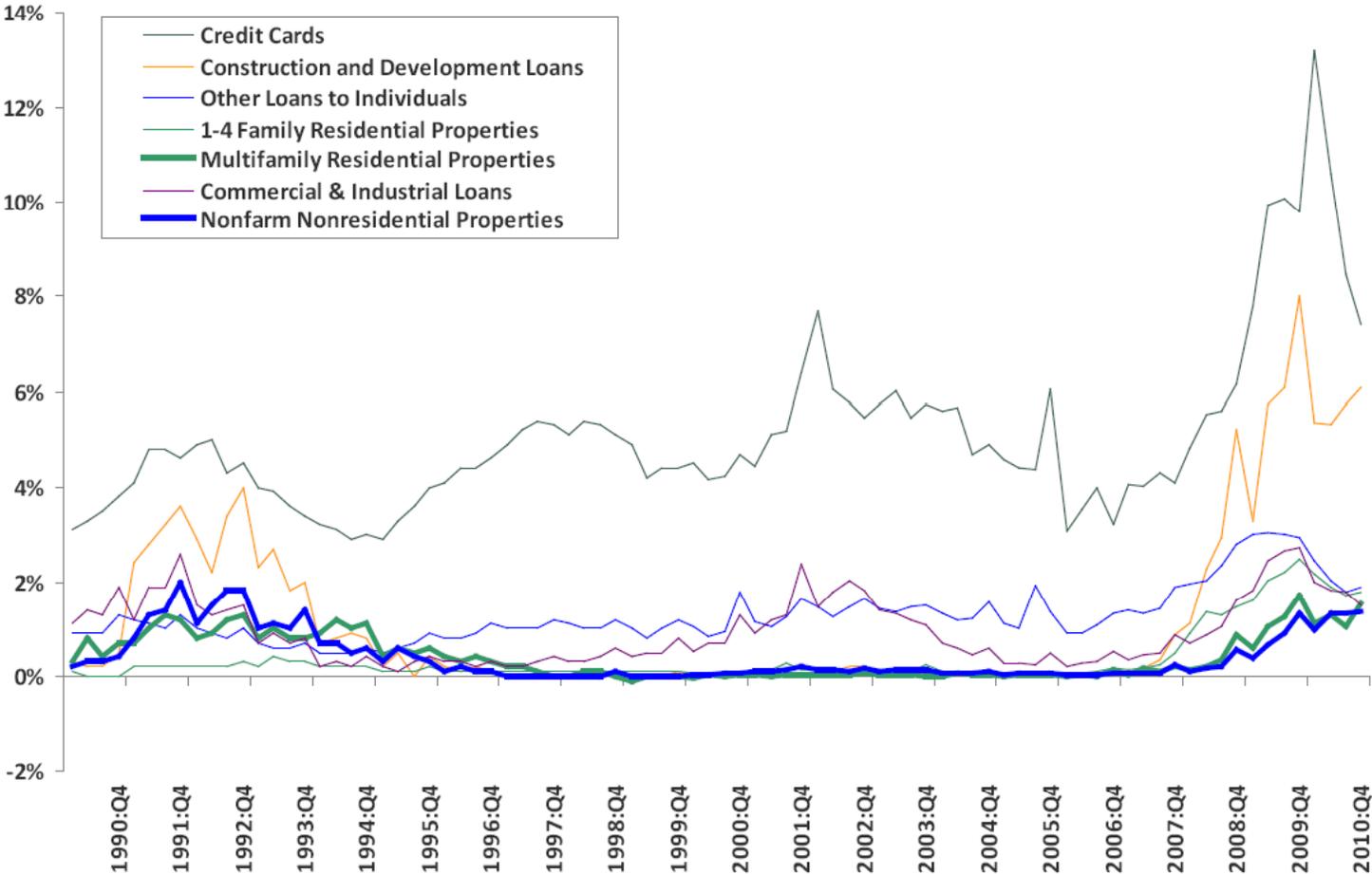
# 60+ Day Delinquency Rate by Year of Origination and Loan Age

60+ Day Delinquency Rate, by Year of Origination and Loan Age (months), as of March 2011



# Banks and Thrifts: Annualized Charge-off Rates of Bank Loans

**BANKS & THRIFTS: Annualized charge-off rates of bank loans**



# Pro-cyclicality Effects: GAAP Rules FAS 5 and FAS 114 versus SEC Staff Accounting Bulletin, 99

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- x FAS 5 and FAS 114 (requirement to provision for losses that are “probable and estimable”):
  - **FAS 5:** account for historical losses with discretion on length of history, discretion to overweight recent performance, and/or use migration analysis and models.
  - **FAS 114:** model distinctions between doubtful, substandard, and short-term delinquency of loans; loan-by-loan or pool basis.
- x SEC SAB 99: GAAP does not allow the creation of reserve accounts where the only motive is to smooth income.
  - **“Cookie jar” reserves:** Smooth income reporting through unrealistically high estimates of future liabilities for loan losses.

# Could Dynamic CRE Provisioning Be Used to Dampen Pro-cyclicality?

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- x Set provisioning relative to long-run mean or median performance of cyclical asset classes (e.g. Long-run CRE implied volatility)
  - A rule-based rather than a discretionary system.
  - Establish minimum provisioning requirements for cyclical asset classes, these minima would be public and transparent.
  - Modeling task to establish system-wide rules (e.g. long-run means and confidence intervals).
- x Banco de España is the only central bank to have established such a system (2000 to present)
  - Requires asset specific provisioning with business cycle effects.
  - BdE claims the system has been very useful over the crisis in enforcing margins.