Stress testing credit risk and interest rate risk for commercial lending portfolios

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Agenda

- Credit risk and interest rate risk for corporates and commercial real estate loans.
- What historical time series tell us and what are can be in the model.
- Can our models capture behaviors that have not been observed in the history.
Credit and interest rate risks are correlated

- Credit risk and interest rate risk for corporates and commercial real estate loans
  - When interest rate increases, a firm must generate higher return to remain profitable and to avoid insolvency or default.
  - Interest rate levels depend on the macroeconomic environments and policy.
  - We are interested in the credit quality of the firms that are constituents of the bank’s lending portfolios.

- For stress test purposes can historical data provide a good base of modelling
  - Commercial loans and commercial real estate loans.
  - Expected loss often measured by components of PD, LGD and EAD.
  - Historical data either not long enough history or lack of default data.

  - Even if have sufficient historical data the assumptions behind data may not be clear or repeatable.
What historical time series tell us

- 10 year treasury rates represents long term interest rates, relatively long history
  - Modelling losses usually not use the whole time series but most recent time periods.
  - Current trend may at a different stage of interest rates longer trend.
What historical time series tells us

- Short term, mid-term and long term interest rates are highly correlated
  - They often move toward similar direction.
  - Short term rates have relatively higher volatility.
What historical time series tells us

- Corporate rates move at the similar direction with interest rates
  - Will have similar issues as where we are at the interest rate cycle.
What historical time series tells us

- The differences between 10-year treasury rates and corporate yields often used as indication of credit risk (less of liquidity and others factors)
  - Most recent financial crisis at the peak of recent historical period since 1953.
  - Current stage of such credit risk is at higher side of the history.
What historical time series tells us

- Interest rates, credit spreads and commercial real estate delinquencies
  - Clearly the credit spreads not accurately explain the CRE loss rates.
  - Large lags observed for commercial real estate delinquency rates.

Shaded areas indicate US recessions - 2014 research.stlouisfed.org
Modelling challenges: CRE

- For CRE portfolios, the interest rates can be captured via macro variables that matter to real estate properties:
  - Loan-to-value ratio.
  - Debt service coverage ratio.
  - Net operating incomes.
  - Capitalization rates, etc.

- Methodologies can be:
  - Leverage Basel through-the-cycle models with inputs calibrated to scenario specific model parameters to capture property specific characteristics.
  - Regression models at aggregated levels.
  - Combined with property allocations given loss rates.
For commercial and industrials, the loss rate are normally calibrated by components of PD, LGD, and EAD

- Unlike CRE, the regression model usually shown the interest rates are a non-significant driver statistically.
- The data series are usually not long enough to capture different interest rate cycles, or simply cannot response to the increase of interest rates in the projection.

- To signifying the interest rate, the coefficients can be measured at different confidence level to increase the weights which are statistically meaningful.
- Unit sensitivities obtained in historical model calibration to be applied in the loss rate projection, more like sensitivities used in market risk.
Modelling challenges: C&I

- Interest rates with lagged default rates

**Default Rate vs. 10 Year Treasury**

- No Lag Correlation = 0.12
- 1Q Lag Correlation = 0.18
- 2Q Lag Correlation = 0.27
- 3Q Lag Correlation = 0.36
- 4Q Lag Correlation = 0.45
- Default rate

**Default Rate vs. 5 Year Treasury**

- No Lag Correlation = 0.05
- 1Q Lag Correlation = 0.12
- 2Q Lag Correlation = 0.2
- 3Q Lag Correlation = 0.29
- 4Q Lag Correlation = 0.38
- Default rate
Modelling challenges: C&I

- Interest rate coefficient sensitivities with confidence levels with a different sector
Interest rates of the world: non-U.S.

- Long-term interest rates:
  - Can interest rate a measure of sovereign risks?
  - What would be the risk free rates?

Source: ECB