Utilization, Exogenous Balance Paths and Risk

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The views expressed here are mine and not those of the Federal Reserve System
Motivating Question

If balances are determined exogenously from credit risk, how should we calculate the appropriate loss rate to apply to those balances?
Summary

• Conventional approach to loss aggregation

• Less conventional; more realistic

• Utilization rate = risk factor
Assumptions

• “PD * LGD * EAD” model of expected loss at the loan level

• Portfolio balance paths are modeled exogenously to credit risk
**Conventional Approach**

- Credit modeling team calculates a portfolio loss rate
  
  \[ PLR_t = \frac{\sum_i (PD_{i,t} \times LGD_{i,t} \times EAD_{i,t})}{\sum_i EAD_{i,t}} \]

  - \( PLR = \text{"Portfolio Loss Rate"} \)

- Another team projects portfolio balances
  
  \[ PB_t = OB_{t_0} \times BG_{t_0,t} \]

  - \( PB = \text{"Portfolio Balance"}; \ OB = \text{"Outstanding Balance"}; \ BG = \text{"Balance Growth"} \)

- Aggregate to get “conventional approach” losses
  
  \[ CPL_{t}^{CA} = PLR_t \times PB_t \]

  - \( CPL = \text{"Portfolio Loss Conditional on Balance Path, Conventional Approach"} \)
Step Back

• Balance paths are deceptively complex.

• We know something about defaulting and maturing balances. Room for cleverness.

• Unlikely to know about conditional changes in originations and utilization separately

• In that case, assume a constant utilization rate
Constant Utilization Rate: Implications I

- **EAD scales** with the balance path
- For concreteness, suppose we have conditional LEQ, then

\[ EAD_{i,t} = OB_{i,t_0} + LEQ_t \times (CB_{i,t_0} - OB_{i,t_0}) \]

\[ \text{CB=“Committed Balance”} \]

- Since portfolio balance growth is assumed exogenous, each loan’s balances scale identically

\[ EAD_t | BG_{t_0,t} = CEAD_{i,t} \]

\[ = OB_{i,t_0} \times BG_{t_0,t} + LEQ_t \times (CB_{i,t_0} \times BG_{t_0,t} - OB_{i,t_0} \times BG_{t_0,t}) \]

\[ = BG_{t_0,t} \times \left( OB_{i,t_0} + LEQ_t \times (CB_{i,t_0} - OB_{i,t_0}) \right) \]

\[ = EAD_{i,t} \times BG_{t_0,t} \]

\[ \text{CEAD=“EAD Conditional on Balance Path”} \]
Constant Utilization Rate: Implications II

• **Portfolio losses scale** with the balance path

• Plugging in the conditional EAD from previous slide...

\[
EL_{i,t} | BG_{t_0,t} = CEL_{i,t} = PD_{i,t} * LGD_{i,t} * CEAD_{i,t} \\
= PD_{i,t} * LGD_{i,t} * EAD_{i,t} * BG_{t_0,t}
\]

  – EL=“Expected Loss”; CEL=“Expected Loss Conditional on Balance Path”

• And, again, since balance growth is constant across the portfolio, i.e. balances are exogenous

\[
CPL_{t}^{LC} = \sum_{i} (PD_{i,t} * LGD_{i,t} * EAD_{i,t} * BG_{t_0,t}) \\
= BG_{t_0,t} * \sum_{i} (PD_{i,t} * LGD_{i,t} * EAD_{i,t})
\]

  – CPL=“Portfolio Loss Conditional on Balance Path, Less Conventional”
Constant Utilization Rate: Implications III

- Loss rate is a function of outstanding

\[
CPL_t^{LC} = BG_{t_0,t} \times \sum_i (PD_{i,t} \times LGD_{i,t} \times EAD_{i,t})
\]

\[
= \frac{\sum_i (PD_{i,t} \times LGD_{i,t} \times EAD_{i,t})}{OB_{t_0}} \times (OB_{t_0} \times BG_{t_0,t})
\]

\[
= \left( \frac{\sum_i EAD_{i,t}}{OB_{t_0}} \right) \times \left( \frac{\sum_i (PD_{i,t} \times LGD_{i,t} \times EAD_{i,t})}{\sum_i EAD_{i,t}} \right) \times (OB_{t_0} \times BG_{t_0,t})
\]

\[
= \left( \frac{\sum_i EAD_{i,t}}{OB_{t_0}} \right) \times CPL_t^{CA}
\]
Constant Utilization Rate ➔
Utilization Rate = Risk Factor

- Difference between $CPL_t^{CA}$ and $CPL_t^{LC}$ is the ratio of portfolio EAD to outstanding...

\[
\left( \frac{\sum_i EAD_{i,t}}{OB_{t_0}} \right) = \left( \frac{\sum_i OB_{i,t_0} + LEQ_t \cdot (CB_{i,t_0} - OB_{i,t_0})}{OB_{t_0}} \right)
\]

\[
= 1 + \left[ LEQ_t \cdot \left( \frac{CB_{t_0}}{OB_{t_0}} \right) - 1 \right] > 1
\]

- Everything else equal, **portfolios with lower utilization rates are more risky** from a stress testing perspective