Portfolio Adjustments to the C1 Factors for Corporate Bonds

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Agenda

- Purpose of Portfolio Adjustments

- Current Portfolio Adjustments

- Conceptual Methodology for Developing Adjustments

- Considerations for IRBC

- Next Steps for C1WG

Background on the Portfolio Adjustment Factor

- ■ Ensure that the statistical safety level for the C1 component is met.
    - ■ Base C1 factors are set at the 92nd percentile over a 10-year time horizon for individual bonds
    - ■ Statistical safety target for the C1 component for an individual insurer's bond portfolio is the 96th percentile over a 10-year time horizon
    - ■ The goal of the portfolio adjustment (PA) is to scale the base factors up or down, such that the 96th percentile target is achieved
    - ■ The adjustment for the 10 largest holdings reflects concentration risk and has no bearing on the statistical safety level; the top 10 adjustment is unrelated to the PA

- ■ In practice, for an individual insurer,
    - ■ More issuers in the bond portfolio narrow the loss distribution, justifying a lower C1 requirement
    - ■ A wider distribution of the issuer amount widens the loss distribution, justifying a higher C1 requirement

Current PA Factor for Portfolio Size

	Issuers	Factor
Up to	50	2.5
Next	50	1.3
Next	300	1.0
Over	400	0.9

Current Size Adjustment Factor

Number of Issuers

- In current LRBC formula, "size adjustment factor" is the PA factor
- Apply as sliding scale to derive weighted average factor
- Example 500 Issuers: 1.16 = (50*2.5+50*1.3+300*1.0+100*0.9)/500
- Wtg average size adjustment factor times average base factor is portfolio C1
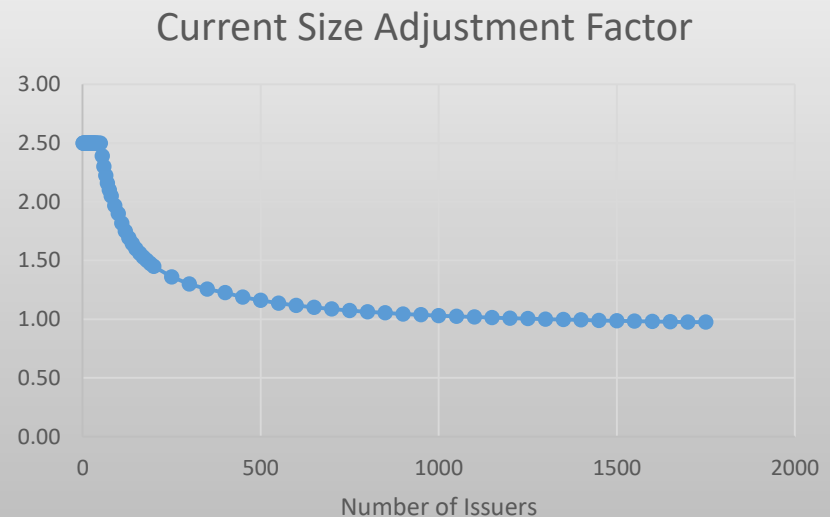
Observations: Current Portfolio Adjustment

- Only based on the number of issuers within a portfolio

- Overstates the diversification benefit for small portfolios and understates for large portfolios

- Therefore, C1 bond requirements are understated for small portfolios and overstated for large portfolios

Updating the PA: C1WG Working Construct

- Update the portfolio factors for number of issuers (PA Alternative 1)

- Evaluate a new PA measure designed to capture the variation in invested amount by issuer in addition to number of issuers (PA Alternative 2) *(details to follow)*

- Meanwhile, retain the "top 10" adjustment to account for concentration risk

Portfolio Adjustment Factors: Overview of Methodology

- Followed a similar approach to the development of the current "Size Adjustment Factor" to update the PA

- Calculated the C1 component for 677 insurers' bond portfolios from the NAIC data

- Set the Target C1 as the C1 amount at the 96th percentile for each of the 677 bond portfolios
  - Expanded original work that modeled a limited number of portfolios to consider every life company portfolio
  - Based updated adjustment factors on data from 677 companies
 - Used same company and issuer data used in base factor development

Portfolio Adjustment Factors: Overview of Methodology (cont.)

- Determine a methodology to adjust the average base factors (up or down) creating an Adjusted C1 that matches the Target C1

- Methodology is evaluated by the fit achieved: how close is the Adjusted C1 to the C1 target across all insurers?
  - Ideally the fit is perfect and the Adjusted C1% for each company equals the Target C1% for that company (i.e., the difference is zero)
  - Best fit minimizes error, defined as the average of the differences between the Adjusted C1% to the Target C1%

- The PA factor scales the base factors, such that the 96th percentile target is achieved and has better fit by company
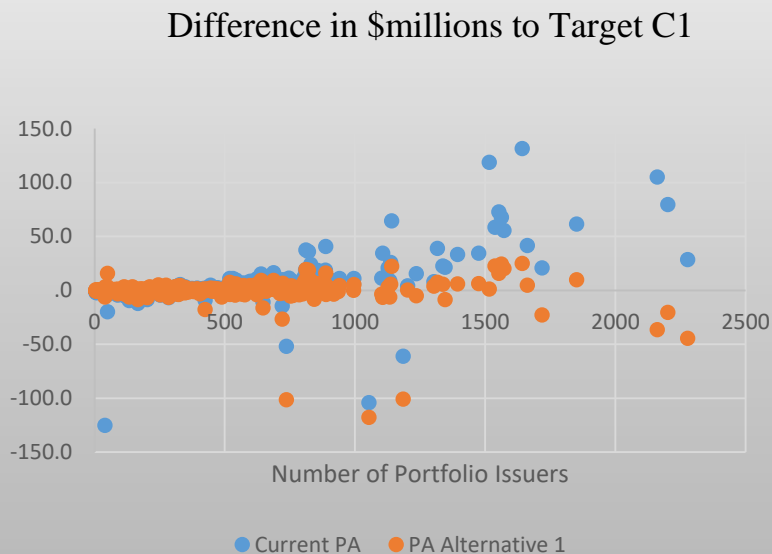
PA Alternative One: Number of Issuers Only

	Issuers	Factor
Up to	7	7.55
Next	33	3.70
Next	160	0.85
Next	550	0.80
Over	750	0.75

- Apply as per sliding scale of current formula
- Example 500 Issuers Factor = 1.10
- Factor times average base factor is portfolio C1

Updated Number of Issuer Factor
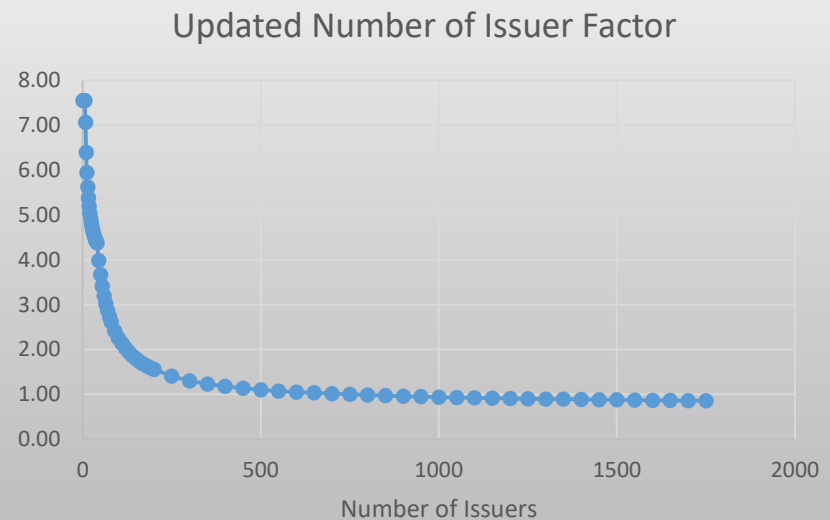
Current PA vs. Updated PA Alternative 1 (number of issuers only)

Difference in $millions to Target C1

Number of Portfolio Issuers

● Current PA　● PA Alternative 1

■ PA Alternative 1 corrects for bias of less than target C1 for portfolios with less than 50 issuers and bias of more than target C1 for portfolios with high number of issuers.

■ Companies with greater issuer amount variation, as measured by Coefficient of Variation (CV) are more likely to be target outliers relative to the target for C1.

PA Alternative Two: # Issuers and Issuer Amount Distribution

PA factor = Average Issuers Factor + CV Factor

Issuers & CV

	Number of Issuers	Factor
Up to	7	7.350
Next	33	2.850
Next	160	0.325
Next	500	0.130
Over	700	0

Plus

CV

More Than	Up To	Factor
0.00	0.45	0
0.45	0.65	0.400
0.65	0.85	0.550
0.85	1.20	0.650
1.20	1.55	0.750
1.55	2.00	0.800
2.00	3.00	0.850
3.00		1.500

Issuer and CV PA Factor

Number of Issuers

— CV Low   — CV Mid   — CV High
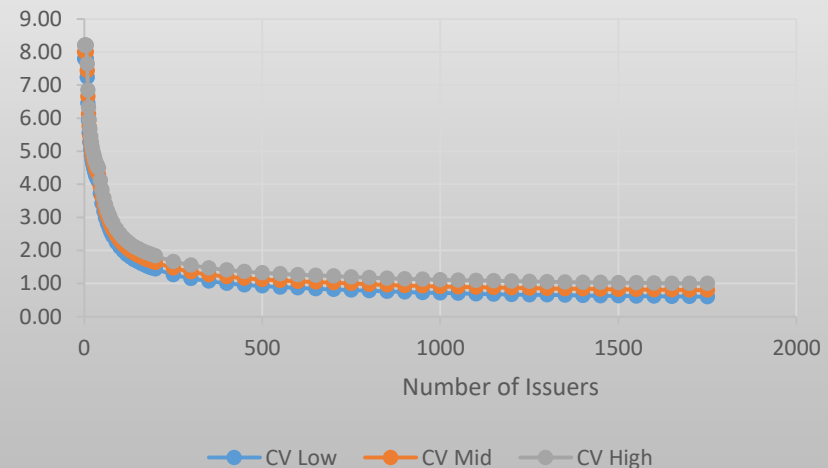
PA Alternative Two:
Number of Issuers Plus CV

Difference in $millions to Target C1
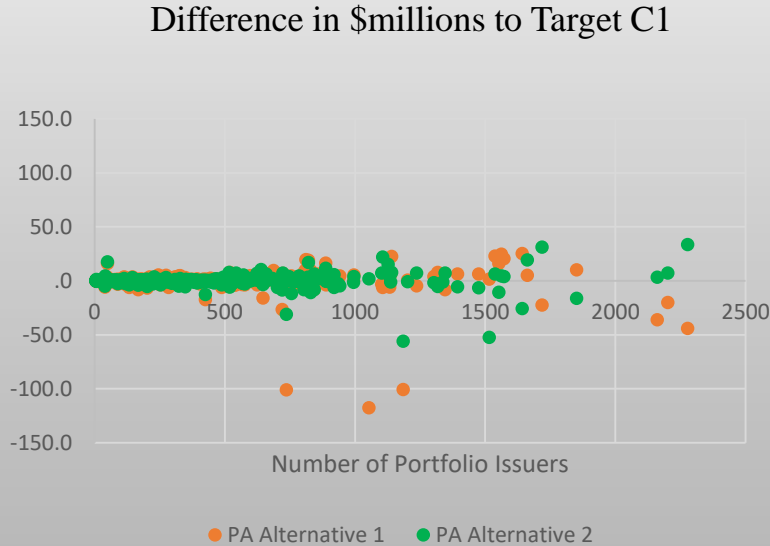
- Alt 2 tightens the range of difference for companies with under 1300 issuers

- Results mixed 1500-2000 issuers, some closer to 0, some change from minus to plus, other from plus to minus

- Over 2000 issuers, two of three results better, one switches sign

Calculating PA Alternative Two

- Portfolio Unadjusted C1 = 1.20%, Target C1 = 1.07%

- Portfolio has 843 Issuers,
  - PA based on the # issuers is 0.31 (from table for PA2)

- Portfolio has CV of 0.61
  - PA based on CV has CV Factor = 0.40

- Adjustment factor = Average Issuers Factor + CV Factor   = 0.31 + 0.40 = 0.71

- Adjusted C1 = 1.20% * 0.71 = 0.86%

- Error = (Target – Adjusted) = 0.22%

PA Alternative One vs. Two

- Developed two variations of potential PAs by minimizing overall differences of C1 target to individual results

- Ideal average differences error is zero

	Current PA	Alt PA1	Alt PA2
Average Differences Error	0.25%	0.10%	0.07%
C1$ bil – Target C1$ bil	1.4	-0.1	0

Next Steps

- Get IRBC Feedback
    - Number of issuers only
    - Number of issuers and CV
- Finalize model and documentation of PAs
- Recommend to IRBC

Questions

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Appendix

Details on Coefficient of Variation (CV)

Issuer Amount Distribution

- Consider Risk of 2 portfolios of $100 million

- Port 1: 10 issuers of $10 million each

- Port 2: 1 issuer of $91 million, 9 issuers of $1 million

- Is the risk the same?

Issuer Amount Distribution

- Can be measured by the Coefficient of Variation (CV)
  - The CV is a measure of spread that describes the amount of variability relative to the mean.
  - The CV is an alternative to standard deviation and a better statistical measure when comparing distributions of different sizes.
  - CV equals the standard deviation divided by average of issuer amounts held by a company

- Data is anticipated to be available from identical data source used to calculate top ten concentration factor for bonds