

Overview of A.M. Best's Stochastic Based Universal BCAR

Thomas Mount, ACAS, MAAA, CERA, CCM Senior Director – Criteria, Research, & Analytics A.M. Best Rating Services Inc.

Mathilde Jakobsen Associate Director - Analytics A.M. Best Europe Rating Services Ltd. George Hansen, FSA, MAAA Director – Criteria, Research, & Analytics A.M. Best Rating Services Inc.

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Agenda



- Overview of BCAR
- Summary of Model Changes
- Treatment of Risks in BCAR
- Applying BCAR Output in Rating Process
- Best's Briefing released November 14, 2016
- Comment process for this update



Overview of BCAR

Overview of BCAR



- Best's Capital Adequacy Ratio (BCAR) is a comprehensive quantitative tool that evaluates many of the risks to the balance sheet simultaneously and generates an overall estimate of the required level of capital to support those risks and compares it with available capital
- BCAR is a key tool in the assessment of balance sheet strength
 - Not the sole determinant of Balance Sheet Strength
 - Not the sole determinant of the rating



Summary of Changes to Universal BCAR

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Summary of Model Changes

- Do not intend to change underlying view of the risks
- Do not intend to change the main risk categories of the model
- Goals are to:
 - Apply stochastic-based risk factors within the model, with factors generated using stochastic simulations from probability curves & ESG
 - Incorporate company specific detailed data from SRQ & financial statements

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Summary of Model Changes

- More sophisticated and faster software available now
 - Simulations / probability curves
 - Correlations / diversification
 - Company specific detail
 - Economic scenario generators (ESGs)
 - A computer model that randomly simulates thousands of possible values for a variety of economic and financial variables over a series of selected timeframes
 - An ESG does not predict a path the economy will follow but instead produces a collection of possible paths including some that have not yet been observed
- No stochastic simulation is done within the BCAR model
 - Uses factors based on simulations
 - Factors adjusted for company specific detail, where possible



New Metric – VaR (Value at Risk)



- 5 scores calculated instead of 1
 - Net Required Capital(NRC) calculated at 95%, 99%, 99.5%, 99.6%, and 99.8% confidence levels
- New Calculation of BCAR
 - Formula change
 - Difference between Available Capital and Net Required Capital, as a ratio to Available Capital
 - Better alignment with risk appetite/tolerance statements

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BCAR Ratio = (Available Capital – Net Required Capital) / Available Capital x 100

Available Capital (AC) **Reported Capital (PHS) Equity Adjustments: Unearned Premiums (DAC)** Assets Loss Reserves Reinsurance Equalization/Contingency Reserves **Debt Adjustments: Surplus Notes Debt Service Requirements Other Adjustments: Future Operating Losses Goodwill & Intangible Assets** Other

Net Required Capital Gross Required Capital (GRC): (B1) Fixed Income Securities (B2) Equity Securities (B3) Interest Rate (B4) Credit (B5) Loss and LAE Reserves (B6) Net Premiums Written (B7) Business Risk (B8) Potential Catastrophe Loss

Covariance Adjustment

Net Required Capital (NRC)*

*NRC= SQRT [$(B1)^{2}+(B2)^{2}+(B3)^{2}+(0.5*B4)^{2}+[(0.5*B4)+B5)]^{2}+(B6)^{2} (+ (B8)^{2}) + B7$

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Example of Impact to Score

Current Calculation		
a. APHS (excl Potential Cat Losses) =	3300 M	
b. Potential Cat Losses =	300 M	
c. <u>Net Required Capital (excl Cat Losses) =</u>	<u>1500</u> M	
BCAR = (a - b) / (c) =	200.0	

Planned Calculation	<u>VaR 95</u>	<u>VaR 99</u>	VaR 99.5	<u>VaR 99.6</u>	VaR 99.8
a. Available Capital (excl Potential Cat Losses) =	3300	3300	3300	3300	3300
c. <u>Net Required Capital (incl Cat Losses) =</u>	<u>1529</u>	<u>2071</u>	<u>2481</u>	<u>2690</u>	3667
BCAR = (a - c) / (a) =	53.7	37.2	24.8	18.5	-11.1

Notes: Available Capital is the same at each confidence level.

Net Required Capital increases as confidence level increases.



Example of Impact to Score

Current PC BCAR Calculation (ratio to NRC)

Potential Scores: Low of 0.0 to Max of 999.9

New PC BCAR Calculation (ratio to Available Capital)

Potential Scores: Low of -999.9 to Max of 100.0

Display of BCAR Scores



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- Catastrophe Risk
- Bond Defaults
- Publicly Traded Common Stocks
- Other Asset Classes
- Interest Rate Risk
- Credit Risk Reinsurance Recoverables
- Reserve Risk
- Premium Risk



Treatment of Risks in Universal BCAR

Catastrophe Risk



- Update natural catastrophe approach
 - Total all perils
 - Per Occurrence
 - Net of reinsurance only
 - Includes reinstatement premium
 - Pre-Tax
 - Measured at various VaR levels
 - Included as Net Required Capital component
 - Assumed to be independent of other risk categories
- Will continue stress test

• Terrorism and other stress tests remain

Investment Risks



- Fixed Income Securities Default Risk
 - Bonds
 - Mortgage Loans
 - Preferred Stocks
- Equities Market Value Volatility
 - Publicly Traded Common Stocks
 - Real Estate
 - Hedge Funds
- <u>Affiliated and Private investments</u> receive 100% risk charge



- Bonds Default Risk
 - Based on ESG
 - Updated **bond default** risk factors
 - Reflect maturity of company's bond portfolio (SRQ)
 - Reflect asset quality of company's bond portfolio (SRQ)
 - Only defaults occurring in first 10 years are considered
 - Offset default with recovery on defaults (vary by rating)
 - Net defaulted amounts are present valued



Bond Quality & Maturity SRQ question:

Please complete the following quality and maturity distribution of all bonds owned as of 31 December 2015. Amounts should be at statement value 000s.

	M<=1 yr	1yr <m<=3yrs< th=""><th>3yrs<m<=5yrs< th=""><th>5yrs<m<=10yrs< th=""><th>10yr<m<=20yrs< th=""><th>M>20yrs</th><th>Total</th></m<=20yrs<></th></m<=10yrs<></th></m<=5yrs<></th></m<=3yrs<>	3yrs <m<=5yrs< th=""><th>5yrs<m<=10yrs< th=""><th>10yr<m<=20yrs< th=""><th>M>20yrs</th><th>Total</th></m<=20yrs<></th></m<=10yrs<></th></m<=5yrs<>	5yrs <m<=10yrs< th=""><th>10yr<m<=20yrs< th=""><th>M>20yrs</th><th>Total</th></m<=20yrs<></th></m<=10yrs<>	10yr <m<=20yrs< th=""><th>M>20yrs</th><th>Total</th></m<=20yrs<>	M>20yrs	Total
Bonds: Global Rating AAA Sovereigns	20,000	22,000	26,000	23,000	19,000	15,000	125,000
Global Rating AAA Other	17,000	19,000	23,000	18,000	15,000	12,000	104,000
Global Rating AA+	16,000	18,000	22,000	17,000	14,000	11,000	98,000
Global Rating AA	15,000	17,000	21,000	16,000	13,000	10,000	92,000
Global Rating AA-	14,000	16,000	20,000	15,000	12,000	9,000	86,000
Global Rating A+	13,000	15,000	19,000	14,000	11,000	8,000	80,000
Global Rating A	12,000	14,000	18,000	13,000	10,000	7,000	74,000
Global Rating A-	11,000	13,000	17,000	12,000	9,000	6,000	68,000
Global Rating BBB+	10,000	12,000	16,000	11,000	8,000	5,000	62,000
Global Rating BBB	9,000	11,000	15,000	10,000	7,000	4,000	56,000
Global Rating BBB-	8,000	10,000	14,000	9,000	6,000	3,000	50,000
Global Rating BB+, BB, BB-	18,000	24,000	36,000	22,000	5,000	2,000	107,000
Global Rating B+, B, B-	4,000	6,000	10,000	8,000	4,000	1,000	33,000
Global Rating CCC, CC, C	5,000	9,000	17,000	7,000	3,000	1,000	42,000
Global Rating D (in/near default)	1,000	3,000	7,000	2,000	1,000	1,000	15,000
Non Rated	0	0	0	0 0	0	0	0
Affiliated	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total	173,000	209,000	281,000	197,000	137,000	95,000	1,092,000



Bond Risk Factor Table – Var 95 – Country Investment Class I:

	VaR 95					CIC-I
	Bond Default F	Risk Factors				
	1 yr or less	1yr < M <= 3 yrs	3 yrs < M <= 5 yrs	5 yrs < M <= 10 yrs	10 yrs < M <= 20 yrs	M > 20 yrs
Global Rating AAA Sovereigns	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Global Rating AAA Other	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
Global Rating AA+	0.0%	0.0%	0.1%	0.3%	0.3%	0.3%
Global Rating AA	0.0%	0.1%	0.3%	0.5%	0.5%	0.5%
Global Rating AA-	0.1%	0.2%	0.5%	0.8%	0.9%	0.9%
Global Rating A+	0.2%	0.5%	1.0%	1.5%	1.6%	1.6%
Global Rating A	0.3%	0.7%	1.3%	1.8%	2.0%	2.0%
Global Rating A-	0.4%	0.9%	1.6%	2.2%	2.4%	2.4%
Global Rating BBB+	0.8%	1.5%	2.7%	3.8%	4.1%	4.1%
Global Rating BBB	0.9%	1.8%	3.1%	4.3%	4.6%	4.6%
Global Rating BBB-	1.2%	2.3%	3.9%	5.4%	5.8%	5.8%
Global Rating BB+, BB, BB-	2.2%	4.2%	7.4%	10.7%	11.6%	11.6%
Global Rating B+, B, B-	6.5%	11.9%	19.9%	27.7%	28.9%	28.9%
Global Rating CCC, CC, C	26.4%	40.2%	49.9%	47.7%	44.6%	44.6%
Global Rating D (in/near default)	32.5%	49.5%	61.5%	58.7%	54.8%	54.8%
Non Rated	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Affiliated	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Other	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%



Required Capital by Bond Quality & Maturity:

	V - D 05					
	VaR 95					
	Bond Required	Capital				
Bonds by Rating	1 yr or less	1yr < M <= 3 yrs	3 yrs < M <= 5 yrs	5 yrs < M <= 10 yrs	10 yrs < M <= 20 yrs	M > 20 yrs
Global Rating AAA Sovereigns	0	0	0	0	0	0
Global Rating AAA Other	0	0	0	6	8	6
Global Rating AA+	0	9	30	45	42	33
Global Rating AA	1	16	56	77	71	54
Global Rating AA-	12	38	103	123	109	81
Global Rating A+	32	79	191	208	178	129
Global Rating A	39	94	226	235	196	137
Global Rating A-	46	112	265	265	214	143
Global Rating BBB+	75	182	433	421	330	206
Global Rating BBB	79	193	463	433	325	186
Global Rating BBB-	93	229	553	487	347	173
Global Rating BB+, BB, BB-	397	1,017	2,650	2,357	581	232
Global Rating B+, B, B-	261	715	1,990	2,213	1,157	289
Global Rating CCC, CC, C	1,321	3,620	8,488	3,341	1,337	446
Global Rating D (in/near default)	325	1,485	4,302	1,175	548	548
Non Rated	0	0	0	0	0	0
Affiliated	0	0	0	0	0	0
Other	0	0	0	0	0	0



	VaR 95	VaR 99	VaR 99.5	VaR 99.6	VaR 99.8
	Total	Total	Total	Total	Total
	Asset Risk				
Bonds at 12/31/15	Factor	Factor	Factor	Factor	Factor
1 Global Rating AAA Sovereigns	0.0%	0.0%	0.0%	0.0%	0.0%
2 Global Rating AAA Other	0.0%	0.1%	0.2%	0.2%	0.3%
3 Global Rating AA+	0.2%	0.4%	0.5%	0.5%	0.6%
4 Global Rating AA	0.3%	0.6%	0.8%	0.8%	0.9%
5 Global Rating AA-	0.5%	0.9%	1.1%	1.1%	1.3%
6 Global Rating A+	1.0%	1.5%	1.7%	1.7%	1.9%
7 Global Rating A	1.3%	1.8%	2.0%	2.0%	2.2%
8 Global Rating A-	1.5%	2.1%	2.3%	2.4%	2.6%
9 Global Rating BBB+	2.7%	3.5%	3.8%	3.8%	4.1%
10 Global Rating BBB	3.0%	3.8%	4.2%	4.3%	4.6%
11 Global Rating BBB-	3.8%	4.6%	5.0%	5.1%	5.4%
12 Global Rating BB+, BB, BB-	6.8%	7.9%	8.3%	8.4%	8.8%
13 Global Rating B+, B, B-	20.1%	21.4%	21.9%	22.0%	22.4%
14 Global Rating CCC, CC, C	44.2%	44.7%	44.9%	44.9%	45.1%
15 Global Rating D (in/near default)	55.9%	56.5%	56.7%	56.8%	57.0%
16 Non Rated	50.0%	50.0%	50.0%	50.0%	50.0%
17 Affiliated	100.0%	100.0%	100.0%	100.0%	100.0%
18 Other	100.0%	100.0%	100.0%	100.0%	100.0%
19 Total Bonds	4.6%	5.0%	5.2%	5.3%	5.5%

Repeat Process for VaR 99, VaR 99.5, VaR 99.6, VaR 99.8

15 December 2016

Investment Risks – Common Stocks

- <u>Common Stocks Market Value Volatility</u>
 - Based on ESG
 - Updated publicly traded common stock risk factors
 - Reflect volatility of stock market (stochastic portion Global Equity Index)
 - Can adjust to reflect volatility of company's portfolio (Beta)
 - Credibility of company Beta based on degree of fit (R-squared)
 - Using 1 year time period

		Industry Baseline Risk Factors (CIC-I)					
	Universal						
	BCAR	<u>VaR 95</u>	VaR 99	VaR 99.5	VaR 99.6	VaR 99.8	
Publicly Traded							
Common Stock	15.0%	25.0%	39.0%	45.0%	46.0%	51.0%	

Preferred Stocks – Default Risk

- Use Bond default risk factors when
 - Debt like features
 - Ability and willingness to hold to maturity
- Use common stock risk factors when
 - Actively trading preferred stocks
 - Unable to hold to maturity (exposure to shock events)

Mortgage Loans – Default Risk

- Updated Mortgage Loans risk factors
 - Based on industry study of commercial mortgage loans
 - Selected baseline risk factor based on lower quality loans and used real estate tail to get to factors for higher confidence levels
 - Companies can share greater details of portfolio for potential reduction in factors

	Current Universal		Industry B	aseline Ris	k Factors (CIC-I)
	BCAR	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>
Mortgage Loans	5.0%	3.3%	4.9%	5.4%	5.6%	6.2%

<u>Real Estate – Market Value Volatility</u>

- Updated Real Estate risk factors
 - Based on real estate index in ESG
 - Use same factors for Company Occupied and Investment real estate
 - Using 1 year time period

	Current		Industry Baseline Risk Factors (CIC-I)				
	Universal						
	BCAR	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>	
Company Occupied Real Estate	10.0%	12.0%	17.5%	19.5%	20.2%	22.5%	
Investment Real Estate	15.0%	12.0%	17.5%	19.5%	20.2%	22.5%	

<u>Hedge Funds – Market Value Volatility</u>

- Update Other Invested Assets risk factors
 - Reviewed volatility in over 30 different hedge fund indices in ESG
 - Selected baseline risk factors = 1.10 times common stock risk factors
 - Companies can share greater details of portfolio for potential reduction in factors
 - Using 1 year time period

	Current Universal		Industry B	aseline Ris	k Factors (CIC-I)	
	BCAR	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>	
Other Invested Assets (Unaffiliated)	20.0%	27.5%	42.9%	49.5%	50.6%	56.1%	

Interest Rate Risk



Interest Rate Risk

- Risk of having to sell fixed income assets when market values are lower
- Exposure to a rise in interest rates over next one year
- Liquidity risk during the upcoming year
- Risk is driven by sudden shock event
 - Non-Life Usually natural catastrophe, or man-made, could be economic
 - Life economic/human behavior

Interest Rate Risk (Non-Life)

Interest Rate Movements

- Based on ESG
- Simulated 10,000 potential one year changes in interest rates
- Reflects duration of company's fixed income asset portfolio
- Reflects liquidity need using Greater of 10% of liquid assets or estimated shock loss
 - for cat exposed = 1-in-100 Gross PML All Perils Per Occurrence
 - Shock loss kept constant across all Vars, Interest rates rise

Proposed One Year Rise in Interest Rate							
<u>Current</u>	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	VaR 99.8		
120 BP	170 BP	240 BP	270 BP	280 BP	290 BP		

Interest Rate Risk (Life)



- Interest Rate Movements
 - External models developed using industry representative assumptions
 - Discounted cash flow approach using 1,000 scenario subset (from 10,000 ESG scenarios) over 30 year period
 - Key Annuity risk drivers
 - ✓ Surrender Charge protection
 - At issue, 3 years into surrender charge period and no surrender charge factors developed
 - ✓ With and Without Market Value adjustments
 - ✓ Payout period (SPIA, Structured Settlements, Other)
 - ✓ Factors developed for matched portfolios, +1/-1 year mismatched portfolios (asset duration one year longer than liabilities, one year shorter than liabilities)
 - Structured settlement factors developed for matched portfolio, assets shorter than liabilities by one year, assets shorter than liabilities by 2 years

Credit Risk-Reins Recoverable

- Created credit risk factors by ICR and year recov to be collected, for each confidence level (5 tables)
- Ran simulations of impairments for a portfolio of 20 reinsurers for each ICR at year 1, year 5 and year 10
 - Use AMBest insurer cumulative impairment rates for each reinsurer in portfolio
 - Indicated factors are net of 50% recov and PV'd
 - Does not reflect concentration risk
 - Concentration risk addressed in Balance Sheet Strength analysis, not in BCAR
- Recoverables allocated by year for each ICR
- Multiply recovs by rating and year against impairment tables of factors

Credit Risk-Reins Recoverables

Reinsurance Recoverables Credit Quality - SRQ question:

Please provide details of reinsurers' share of technical provisions separately for non affiliates and affiliates as at year-end 2015 by current credit rating. List any collateral provided for those ceded amounts.

Issuer	Amount due	Collateral from non affiliates		Amount due	Collateral from affiliates	
Credit	from non	Funds held	LOCs/trusts	from affiliates	Funds held	LOCs/trusts
Rating	affiliates					
aaa	4,500	0	0	0	0	0
aa+	4,250	0	0	0	0	0
aa	3,950	0	0	0	0	0
aa-	3,950	0	0	0	0	0
a+	4,000	0	0	0	0	0
а	4,200	0	0	0	0	0
a-	4,400	0	0	0	0	0
bbb+	3,000	0	0	0	0	0
bbb	2,800	0	0	0	0	0
bbb-	2,550	0	0	0	0	0
bb+	2,300	0	0	0	0	0
bb and bb-	3,925	0	0	0	0	0
b+, b, b-	4,300	0	0	0	0	0
<= CCC++	325	0	0	0	0	0
Non Rated	1,550	0	0	0	0	0
Total	50,000	0	0	0	0	0



Reinsurance Recoverables allocated by year:

Unaffiliated Recoverables Collected by Future Year

										YR 10	
A.M. Best ICR	<u>YR 1</u>	<u>YR 2</u>	<u>YR 3</u>	<u>YR 4</u>	<u>YR 5</u>	<u>YR 6</u>	<u>YR 7</u>	<u>YR 8</u>	<u>YR 9</u>	and Later	<u>Total</u>
aaa	1,350	1,800	675	450	225	0	0	0	0	0	4,500
aa+	1,275	1,700	638	425	213	0	0	0	0	0	4,250
aa	1,185	1,580	593	395	198	0	0	0	0	0	3,950
aa-	1,185	1,580	593	395	198	0	0	0	0	0	3,950
a+	1,200	1,600	600	400	200	0	0	0	0	0	4,000
а	1,260	1,680	630	420	210	0	0	0	0	0	4,200
a-	1,320	1,760	660	440	220	0	0	0	0	0	4,400
bbb+	900	1,200	450	300	150	0	0	0	0	0	3,000
bbb	840	1,120	420	280	140	0	0	0	0	0	2,800
bbb-	765	1,020	383	255	128	0	0	0	0	0	2,550
bb+	690	920	345	230	115	0	0	0	0	0	2,300
bb	623	830	311	208	104	0	0	0	0	0	2,075
bb-	555	740	278	185	93	0	0	0	0	0	1,850
b+	495	660	248	165	83	0	0	0	0	0	1,650
b	428	570	214	143	71	0	0	0	0	0	1,425
b-	368	490	184	123	61	0	0	0	0	0	1,225
ccc+ and lower	98	130	49	33	16	0	0	0	0	0	325
ot Rated by A. M. Best	465	620	233	155	78	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1,550</u>
Total Recoverables	15,000	20,000	7,500	5,000	2,500	0	0	0	0	0	50,000

table of recoverables - one each for: Affiliated Recovs Affiliated Funds Held Affiliated LOCs & Trust

Unaffiliated Recovs Unaffiliated Funds Held Unaffiliated LOCs & Trust

N



VaR 99

Reinsurer Impairment Factors

	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10
aaa	1.2%	1.4%	1.5%	1.6%	1.7%	1.8%	1.9%	1.9%	2.0%	2.1%
aa+	1.5%	1.7%	1.8%	2.0%	2.1%	2.3%	2.4%	2.5%	2.7%	2.8%
aa	1.7%	1.9%	2.2%	2.3%	2.5%	2.7%	2.9%	3.1%	3.3%	3.4%
aa-	2.0%	2.2%	2.5%	2.7%	2.9%	3.2%	3.5%	3.7%	3.9%	4.1%
a+	2.2%	2.5%	2.8%	3.1%	3.4%	3.7%	4.0%	4.3%	4.6%	4.8%
а	2.5%	3.0%	3.4%	3.8%	4.2%	4.5%	4.8%	5.1%	5.3%	5.5%
a-	2.9%	3.5%	4.1%	4.6%	5.0%	5.5%	5.9%	6.3%	6.6%	6.9%
bbb+	3.9%	4.7%	5.4%	6.1%	6.7%	7.4%	8.1%	8.6%	9.2%	9.7%
bbb	4.9%	5.9%	6.8%	7.6%	8.4%	9.4%	10.2%	11.0%	11.8%	12.4%
bbb-	5.9%	7.3%	8.6%	9.8%	10.9%	11.9%	12.9%	13.7%	14.5%	15.2%
bb+	8.8%	10.4%	11.8%	13.1%	14.3%	15.3%	16.3%	17.1%	17.9%	18.6%
bb	11.8%	13.4%	15.0%	16.3%	17.6%	18.7%	19.7%	20.6%	21.4%	22.1%
bb-	14.7%	16.5%	18.1%	19.6%	21.0%	21.8%	22.5%	23.1%	23.6%	24.1%
b+	17.7%	19.1%	20.4%	21.6%	22.6%	23.4%	24.0%	24.6%	25.1%	25.5%
b	20.6%	21.7%	22.7%	23.5%	24.3%	25.0%	25.6%	26.1%	26.5%	26.9%
b-	22.6%	23.6%	24.5%	25.3%	26.0%	26.6%	27.1%	27.6%	27.9%	28.3%
ccc+ and low er	49.0%	47.1%	45.3%	43.6%	41.9%	40.3%	38.8%	37.3%	35.8%	34.5%
Not Rated by A. M. Best	49.0%	47.1%	45.3%	43.6%	41.9%	40.3%	38.8%	37.3%	35.8%	34.5%

table of credit risk factors – one for each confidence level

Credit Risk-Reins Recoverables

	VaR 99						Unaffiliated			
	Reinsuranc	e Recovera	able Require	ed Capital						
A.M. Best ICR	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr 10
aaa	17	24	10	7	4	0	0	0	0	0
aa+	19	28	12	8	4	0	0	0	0	0
aa	20	31	13	9	5	0	0	0	0	0
aa-	23	35	15	11	6	0	0	0	0	0
a+	27	41	17	12	7	0	0	0	0	0
а	31	50	21	16	9	0	0	0	0	0
a-	39	62	27	20	11	0	0	0	0	0
bbb+	35	57	24	18	10	0	0	0	0	0
bbb	41	66	29	21	12	0	0	0	0	0
bbb-	45	75	33	25	14	0	0	0	0	0
bb+	61	95	41	30	16	0	0	0	0	0
bb	73	112	47	34	18	0	0	0	0	0
bb-	82	122	50	36	19	0	0	0	0	0
b+	87	126	50	36	19	0	0	0	0	0
b	88	124	48	34	17	0	0	0	0	0
b-	83	115	45	31	16	0	0	0	0	0
ccc+ and low er	48	61	22	14	7	0	0	0	0	0
Not Rated by A. M. Best	228	292	105	68	32	0	0	0	0	0

Required Capital = table of recovs times table of credit risk factors (one for each confidence level)

Credit Risk-Reins Recoverables

Unaffiliated

	<>						
A.M. Best ICR	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>		
aaa	0.4	1.4	1.9	2.0	2.3		
aa+	0.6	1.7	2.2	2.3	2.8		
aa	0.8	2.0	2.5	2.7	3.2		
aa-	1.1	2.3	2.9	3.1	3.8		
a+	1.5	2.6	3.5	3.7	4.4		
а	1.8	3.0	4.1	4.4	5.2		
a-	2.4	3.6	4.8	5.2	6.4		
bbb+	3.3	4.8	6.0	6.4	7.6		
bbb	4.2	6.0	7.2	7.7	9.1		
bbb-	5.6	7.5	9.4	9.8	11.3		
bb+	7.8	10.6	12.5	12.9	14.3		
bb	10.9	13.7	15.5	16.0	17.4		
bb-	13.9	16.7	18.6	19.1	20.5		
b+	16.5	19.3	21.2	21.6	23.0		
b	19.0	21.8	23.7	24.2	25.6		
b-	20.9	23.7	25.6	26.0	27.4		
ccc+ and lower	46.8	46.8	46.8	46.8	46.8		
Not Rated by A. M. Best	<u>46.8</u>	<u>46.8</u>	<u>46.8</u>	<u>46.8</u>	<u>46.8</u>		
Total Recoverables	6.1	7.7	8.7	9.0	9.9		

Sum up required capital by ICR to get overall credit risk factor by ICR at each confidence level. Sum up all ICRs required capital to get overall credit risk factors.

Reserve Risk – Non-Life



- Risk of <u>unanticipated</u> adverse development on net loss & loss-adjustment expense (LAE) reserves
- <u>Reserve Risk Factors</u>
 - Created 4 probability curves of potential reserve development for each line of business – based on size of reserve
 - Industry baseline factors correspond to the confidence levels on the curves
 - Company size of reserve determines industry baseline factors for that line of business
 - Can adjust industry factors for company volatility/stability to get company specific factors
- Adjustment to required capital for Excessive Growth remains

Reserve Risk – Non-Life





Overview of Stochastic Based Universal BCAR

15 December 2016

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Reserve Risk – Non-Life

Ν	ledium Re	serves	Average Stability				
	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>		
HO	0.242	0.364	0.412	0.426	0.475		
PAL	0.169	0.250	0.281	0.291	0.320		
CAL	0.194	0.289	0.326	0.338	0.373		
WC	0.223	0.334	0.377	0.390	0.430		
CMP	0.239	0.360	0.406	0.422	0.467		
MPL OCC	0.299	0.456	0.520	0.540	0.599		
MPL CM	0.251	0.381	0.432	0.448	0.497		
SP Liab	0.200	0.299	0.338	0.350	0.386		
OL OCC	0.283	0.430	0.487	0.507	0.560		
OL CM	0.288	0.438	0.497	0.516	0.573		
PROD OC	0.365	0.558	0.634	0.658	0.733		
PROD CM	0.289	0.441	0.501	0.519	0.578		
Prop	0.243	0.366	0.415	0.430	0.475		
PHYS	0.188	0.279	0.314	0.325	0.357		
F&S	0.252	0.381	0.433	0.448	0.496		
OTHER	0.206	0.307	0.346	0.359	0.396		
NTL	0.239	0.359	0.406	0.422	0.465		
REIN A	0.256	0.387	0.440	0.456	0.507		
REIN B	0.332	0.508	0.577	0.599	0.667		
REIN C	0.274	0.417	0.474	0.491	0.545		
WTY	0.188	0.279	0.314	0.326	0.358		

Reserve Risk - Mortality



- Mortality risk factors applied to sum at risk (face amount) less reserves, net of reinsurance
- Factors determined by line of business (individual life, group life)
- Factors determined for four net amount at risk bands (similar to previous model)
- Recent SOA mortality study used to build gender, age, smoking class population (individual, group/credit)
- Internal simulation performed using 10,000 scenarios
- Statement data used to determine average policy sizes by NAR
- Analyst can apply factor to reflect "local" mortality experience

Reserve Risk Mortality



	Ordinary Life Insurance						
Net Amount at Risk	VAR 95	VAR 99	VAR 99.5	VAR 99.6	Current		
0-500 Million	0.0022	0.0034	0.0036	0.0037	0.0015		
500 Million-5 Billion	0.0009	0.0014	0.0015	0.0016	0.0010		
5 Billion-25 billion	0.0005	0.0008	0.0009	0.0011	0.0008		
> 25 Billion	0.0002	0.0005	0.0005	0.0006	0.0006		
	Gro	oup/Cre	dit Life I	Insuran	се		
Net Amount at Risk	VAR 95	VAR 99	VAR 99.5	VAR 99.6	Current		
0-500 Million	0.0021	0.0029	0.0030	0.0031	0.0012		
500 Million-5 Billion	0.0003	0.0005	0.0008	0.0009	0.0008		
5 Billion-25 billion	0.0002	0.0004	0.0005	0.0006	0.0006		
> 25 Billion	0.0001	0.0002	0.0003	0.0004	0.0005		

Reserve Risk- Longevity



- Longevity risk factors based on level of mortality improvement in reserves held
 - Risk charges for Pension Plan reserves (UK in particular) are higher due to little or no mortality improvement assumed in reserves
 - Risk factors are lower for Immediate and Deferred annuity reserves reflecting mortality improvement
 - Emerging mortality trends may be reviewed in determining risk charges

Reserve Risk - Morbidity



- Reserve adequacy (reserves held relative to claims incurred) analyzed over 10 year period
- Loss curve built for each reserve category in annual statements and for each of four size categories:very small, small, medium, large (industry curves)
- Industry factors (determined for each VaR level) may be adjusted for each company's reserve development

Premium Risk – Non-Life



- Risk that pricing of business written next year will be inadequate
 - Potential for Underwriting Loss on one more year's worth of business
 - This is the one-year look forward in terms of adding additional exposure
 - Current year's NWP used as proxy for next year
- Premium Risk Factors
 - Created 4 probability curves of potential UW profit/loss for each line of business – based on size of NPW
 - Industry baseline factors correspond to the confidence levels on the curves
 - Company size of NPW determines industry baseline factors for that line of business
 - Can adjust industry factors for company profitability to get company specific factors
- Adjustment to required capital for Excessive Growth remains

Premium Risk – Non-Life





Premium Risk – Non-Life



S	Small Pren	nium	Break Even Profitabilit				
	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>		
HO	0.281	0.427	0.485	0.503	0.559		
PAL	0.239	0.359	0.406	0.421	0.464		
CAL	0.248	0.374	0.425	0.440	0.490		
WC	0.270	0.409	0.464	0.483	0.536		
CMP	0.267	0.406	0.461	0.478	0.532		
MPL OCC	0.324	0.500	0.569	0.594	0.663		
MPL CM	0.307	0.471	0.537	0.557	0.620		
SP Liab	0.266	0.405	0.460	0.479	0.533		
OL OCC	0.286	0.438	0.498	0.518	0.578		
OL CM	0.311	0.477	0.543	0.564	0.630		
PROD OC	0.335	0.517	0.589	0.612	0.682		
PROD CM	0.315	0.485	0.553	0.573	0.639		
Prop	0.266	0.404	0.459	0.476	0.530		
PHYS	0.212	0.318	0.359	0.374	0.412		
F&S	0.266	0.404	0.459	0.477	0.531		
OTHER	0.257	0.390	0.443	0.459	0.509		
INTL	0.267	0.406	0.461	0.478	0.533		
REIN A	0.282	0.431	0.489	0.507	0.564		
REIN B	0.300	0.461	0.525	0.544	0.605		
REIN C	0.261	0.400	0.455	0.474	0.528		
WTY	0.221	0.332	0.376	0.389	0.431		

Premium Risk - Morbidity



- Short-Tailed Lines of Business-Premium based
 - Profitability analyzed over 10 year period
 - Loss curve built for each line of business and for each of four size categories:very small, small, medium, large (industry curves)
 - Industry factors (determined for each VaR level) may be adjusted for each company's profitability

Premium Risk - Morbidity



- Long-Tailed Lines of Business (LTC,LTD)-Premium based
 - Long-Term Care
 - External models developed using industry level experience from business priced in early 2000's
 - Risk factors determined by reviewing profitability of run-off block 15+ years forward (statutory losses emerge around this period and going forward)
 - Factors based on amounts needed to cover present value of future losses, adjusted for assumed target surplus held

Premium Risk - Morbidity



- Long-Tailed Lines of Business (LTC,LTD)-Premium based
 - Long Term Disability
 - Inforce population developed based on industry data
 - Population includes age, gender, disability coverage period (benefit period to age 65 and lifetime)
 - Disability incidence simulated for 10,000 scenarios using internal simulation model (similar to mortality risk modeling)
 - Factors determined based on amounts needed to cover future disability claims relative to cumulative premiums for each VaR level
 - For most cells, claims exceed premiums around 15 years from model start date

Reserve & Premium Risks

New calculation for line of business diversification uses correlation matrices

$$Diversification \ Factor = SQRT\{ [w_1\sigma_1 \dots w_n\sigma_n] \times \begin{bmatrix} 1 & \cdots & \rho_{1n} \\ \vdots & \ddots & \vdots \\ \rho_{n1} & \cdots & 1 \end{bmatrix} \times \begin{bmatrix} w_1\sigma_1 \\ \vdots \\ w_n\sigma_n \end{bmatrix} \}$$

Divided by

 $SUM[w_1\sigma_1 \dots w_n\sigma_n]$

Where weights (w) are % of total business in that line and the σ are the company risk factors by line

Correlation matrices vary by size of company's total NPW or total Reserves



Application of BCAR Output in the Rating Process

- BCAR is a key tool in the assessment of balance sheet strength
 - Not the sole determinant of Balance Sheet Strength
 - Not the sole determinant of the rating
- BCAR is also being used in ERM assessment
 - Identify companies with tail risk
 - Promote discussions of how companies identify, monitor, manage, measure, and protect policyholders from that risk

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- Balance Sheet Strength Assessment
- Enterprise Risk Management (ERM)

BCARs using VaR 95%, 99%, 99.5%, & 99.6%



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Overview of Stochastic Based Universal BCAR



BCAR is the starting point in the assessment of <u>balance sheet strength</u>

VaR Confidence Level (%)	BCAR	BCAR Assessment
99.6	> 25 at 99.6	Strongest
99.6	> 10 at 99.6 & ≤ 25 at 99.6	Very Strong
99.5	> 0 at 99.5 & ≤ 10 at 99.6	Strong
99	> 0 at 99 & ≤ 0 at 99.5	Adequate
95	> 0 at 95 & ≤ 0 at 99	Weak
95	≤ 0 at 95	Very Weak

- For starting point in Balance Sheet Strength:
- Using the 4 BCARs below, compare BCAR at confidence level to guidelines in table



M BES

- Key for rating unit evaluation
- BCAR run at the rating unit
- Confidence level results generate initial assessment

Metric	Confidence Level (%)	BCAR	Implied Consolidated Balance Sheet Strength
VaR	99.6	Greater than 25	Strongest
VaR 📕	99.6	Greater than 10	Very Strong = Initial indication
VaR	99.5	Greater than zero	Strong
VaR	99	Greater than zero	Adequate
VaR	95	Greater than zero	Weak
VaR	95	Less than or = zero	Very Weak

The key characteristics described for each assessment category are ideal scenarios and are not intended to be prescriptive.

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Holding Company Impact Assessment





Balance Sheet Strength Assessment



Combined Balance Sheet Strength Assessment (Lead Rating Unit & Holding Company)

	Holding Company										
Ŀ.		Positive	Neutral	Negative	Very Negative						
Uni	Strongest	Strongest	Strongest	Very Strong	Adequate						
ing	Very Strong	Strongest	Very Strong	Strong	Weak						
Rat	Strong	Very Strong	Strong	Adequate	Very Weak						
ead	Adequate	Strong	Adequate	Weak	Very Weak						
	Weak	Adequate	Weak	Very Weak	Very Weak						
	Very Weak	Weak	Very Weak	Very Weak	Very Weak						

The Baseline Assessment



Overall Balance Sheet Strength Assessment

			Count	ry Risk Tier		
ent)		CRT-1	CRT-2	CRT-3	CRT-4	CRT-5
nce Sheet Assessme Holding Company)	Strongest	a+/a	a+/a	a/a-	a-/bbb+	bbb+/bbb
	Very Strong	a/a-	a/a-	a-/bbb+	bbb+/bbb	bbb/bbb-
	Strong	a-/bbb+	a-/bbb+	bbb+/bbb/bbb-	bbb/bbb- /bb+	bbb-/bb+/bb
ed Bala Ig Unit/	Adequate	bbb+/bbb/ bbb-	bbb+/bbb/ bbb-	bbb-/bb+/bb	bb+/bb/bb-	bb-/b+/b
mbine (Ratin _i	Weak	bb+/bb/bb-	bb+/bb/ bb-	bb-/b+/b	b+/b/b-	b/b-/ccc+
S	Very Weak	b+ and below	b+ and below	be adjusted for Operating Comprehensive adjustmen Issuer Credit Rating.	Performance, Busine nt, and Lift/Drag to g	ess Profile, ERM, et to the Published
Overview of 9	Stochastic Based Univ	Versal BCAR	15 D	ecember 2016		63



Best's Briefing released on November 14, 2016

Overview of Stochastic Based Universal BCAR



November 2016 Briefing

- Notification of
 - Update to Draft BCRM
 - Update to Draft U.S PC BCAR
 - Initial Draft of U.S./Canada LH BCAR
 - Initial Draft of Universal BCAR
- Request responses to specific questions
- Explain comment process



November 2016 Briefing

- Request responses to specific questions
 - 1) Treatment of taxes within a capital model framework in both normal and stress scenarios
 - 2) Any important elements of ERM missing from process
 - 3) Proxies to use when modeled PMLs are unavailable
 - 4) Key difference between company's Internal Capital Model vs BCAR
 - 5) Use of portfolio Beta in capturing Equity (market value) risk
 - 6) Treatment of Country Risk



Comment process for this update



Comment Process

- Updated Draft BCRM and BCAR criteria were put on our website for comment on November 14
 - Separate process for
 - Questions
 - Comments & Responses to Briefing
- <u>Questions</u> on BCRM, BCAR criteria, BCAR output, or potential impact on ratings
 - Email or call your rating analyst
 - Confidential



Comment Process

- <u>Comments</u> on BCRM, BCAR criteria and <u>Responses</u> to the questions in the Nov. 14, 2016 Best's Briefing
 - Email to methodology.commentary@ambest.com
 - Comment period ends March 1, 2017
 - Comments and Responses
 - Assumed to be <u>public</u> unless anonymity is specifically requested
 - Those requesting anonymity will be aggregated, summarized, and published in summarized format without reference to author/sender
 - Regulators may request comments and responses as received
 - Reviewed for
 - Any additional clarification needed?
 - Change to criteria needed?
 - Relevant to criteria review?

Thank You!



Comments & Responses to Briefing

Send email to: methodology.commentary@ambest.com