

# Update on A.M. Best's Stochastic Based BCAR for U.S. P/C Insurers

Greg Williams Senior Director, A.M. Best Rating Services Property/Casualty Ratings Thomas Mount, ACAS, MAAA, CERA, CCM Senior Director, A.M. Best Rating Services Criteria, Research, & Analytics

06 December 2016

## Agenda



- Overview of feedback from first comment period
- Changes based on feedback
- Applying BCAR Output in Rating Process
- Observations/Analyst Views
- Best's Briefing released November 14, 2016
- Comment process for this update



## **Overview of Feedback**

Update on Stochastic Based BCAR for US PC Insurers

## **Overview of Feedback**



- Majority of feedback on U.S. PC BCAR revolved around the following:
  - 1-Diversification of Catastrophe Risk
  - 2-Model reliability in extreme tail
    - Comments overwhelmingly questioned extreme tail for capital measurement
  - 3-Transparency in capital factors and diversification
    - Companies unable to replicate for in-house modeling of risk
    - What-if testing
  - 4-Interest Rate Risk
    - Correlation of cat event and interest rate movement



## **Changes based on Feedback**

Update on Stochastic Based BCAR for US PC Insurers



## **1-Diversification of Cat Risk**

Update on Stochastic Based BCAR for US PC Insurers

#### March 2016 Proposed Structure



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

## **Diversification of Cat Risk**



- Feedback Catastrophe risk is not correlated to other risk categories
- Response Moving the catastrophe risk (B8) under the square root formula for Net Required Capital

– For most RU's = Pretax Net PML All Perils Per Occur March 2016 proposal:

NRC = 
$$\sqrt{(B1)^2 + (B2)^2 + (B3)^2 + (.5^{1*}B4)^2 + [(.5*B4) + B5]^2 + (B6)^2 + (B7) + (B8)}$$

November 2016 proposal:

Net Required Capital =  $\sqrt{(B1)^2 + (B2)^2 + (B3)^2 + (.5 * B4)^2 + [(.5 * B4) + (B5)]^2 + (B6)^2 + (B8)^2} + (B7)$ 

#### November 2016 Proposed Structure



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**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)<sup>2</sup>] +



## 2-Model Reliability in ExtremeTail

## Model Reliability in Extreme Tail

#### Feedback –

- Comments overwhelmingly questioned extreme tail for capital measurement
  - Consistency, credibility, stability
- ESG, Cat models, other simulated risks
- Limited data internationally
- Response Eliminating the BCARs at 99.8 and 99.9 confidence levels in the analysis of Balance Sheet strength
  - Use the 99.6 plus margins for higher balance sheet assessments
  - However, BCAR at 99.8 confidence level still calculated and discussed within the ERM building block

## US P/C BCAR



#### Change to BCARs <u>Calculated</u>

- March 2016 proposal was:
  - Confidence levels: 95%, 99%, 99.5%, 99.8%, and 99.9%
  - Return periods: 20yr, 100yr, 200yr, 500yr, 1000yr
- November 2016 proposal is:
  - Confidence levels: 95%, 99%, 99.5%, 99.6%, and 99.8%
  - Return periods: 20yr, 100yr, 200yr, 250yr, 500yr

## US P/C BCAR



#### BCARs to be Published

- March 2016 proposal was:
  - Confidence levels: 95%, 99%, 99.5%, 99.8%, and 99.9%
  - Return periods: 20yr, 100yr, 200yr, 500yr, 1000yr
- November 2016 proposal is:
  - Confidence levels: 95%, 99%, 99.5%, 99.6%
  - Return periods: 20yr, 100yr, 200yr, 250yr



# **3-Transparency** & What-if Testing

Update on Stochastic Based BCAR for US PC Insurers

### Transparency & What-if Testing

#### Feedback –

- Company specific simulations limit ability to duplicate capital factors and diversification, and unable to perform what-if testing
  - AMB would need to re-run simulations with new assumptions

#### Response –

- Eliminate individual company stochastic simulations
- Create industry factors that are based on stochastic simulations
- Adjust industry factors for company specifics
- Use matrix multiplication for by-line diversification

M BES

#### **Stochastic Based Factors**



- Impacts
  - Bond Defaults
  - Publicly Traded Common Stocks
  - Credit Risk Reinsurance Recoverables
  - Premium Risk
  - Reserve Risk



#### **Bond Quality & Maturity SRQ question:**

3b.FIXED INCOME	DODTEOLIO ANALY	SIG: Discos complete t	e following Qu	ality and Matu	rity Distribution	of All Bonde (	wned	as of December 3	1 2012 DIa	ooo ohow US Cour	romanta an	line 18, and s	show Paren	ts, Subsidiaries,
and Affiliates o		<u>Amount (\$000)</u>	Book/Adjuste	Risk Facto	ors	VaR 95	ers sh	ould be provided	Required	l Capital	VaR 95	er of bond is	suers asso	ciated with the
donar amount c	t:1 AAA	17,000	ung.	t: 1	AAA	0.00%			t: 1	AAA	0			
	t: 1 AA+	16.000	n	t· 1	ΔΔ+	0.00%		Maturing in	t: 1	AA+	0	Maturing in (	Over	
	t·1 ΔΔ	15,000	iss 1	+. 1	A A	0.00%	ears	5 Years Through	'+• 1	۵۵	0	20 Years	(42)	Iotal
		13,000	(U3) Number	ι. 1	AA	0.00%	U7)	(08) Amount	L. 1		11	(12) Amount	(13) Number	(14) Amount
Rating (or e	t:1 AA-	14,000	of lequere	t: 1	AA-	0.08%	rinber	(\$000)	t: 1	AA-	11	Amount (\$000)	of lesuers	(\$000)
1. AAA	t:1 A+	13,000	of issuers	t: 1	A+	0.25%	sucra	(0000)	t: 1	A+	33	(4000)	OF ISSUELS	(0000)
2. AA+	t:1 A	12,000		t: 1	А	0.33%			t: 1	А	40			
3. AA	t:1 A-	11,000		t: 1	A-	0.42%			t: 1	A-	46			
4. AA- 5 A+	t:1 BBB	+ 10,000		t: 1	BBB+	0.75%			t: 1	BBB+	75			
6. A	t:1 BBB	9,000		t· 1	BBB	0 88%			t: 1	BBB	79			
7. A-	t:1 BBB	- 8,000		t: 1	BBB-	1.16%			t: 1	BBB-	93			
8. BBB+	t:1 BB+	7,000		t· 1	BB+	1 89%			t: 1	BB+	132			
10. BBB-	t:1 BB	6,000		t• 1	BB	2 21%			t: 1	BB	133			
11. BB+	t:1 BB-	5,000		t. 1	BB-	4 35%			t: 1	BB-	218			
12. BB 13. BB-	t:1 B+o	rBorB- 4.000		t. 1	B+orBorB-	6 52%			t: 1	B+orBorB-	261			
14. B+ to B-	t· 1 CCC	s 3,000		L. I		24.200/			t: 1	CCCs	731			
15. CCC+ to CCC-		3 3,000		τ: 1	LLLS	24.38%			+. 1	CCcorCc	F60			
16. CC to C	t:1 CCs	orCs 2,000		t: 1	CCsorCs	28.45%			1.1	CUSUIUS	209			
17. D (in or near def	t:1 Ds	1,000		t: 1	Ds	32.51%			t: 1	Ds	325			
18. U.S. Governmer	t:1 USC	iovts 20,000	XXX	t: 1	USGovts	0.00%	ХХ		t: 1	USGovts	0		XXX	
19. Parents, Subsidi	t:1 PSA	s 0		+• 1	DSAc	100.00%			t: 1	PSAs	<u>0</u>			
20. All Other		- <u>-</u> 173 000		ι. 1	r JAS	100.00%					2.745			
21. TOTAL (LINES T		175,000		44.0 5 41			2002				_,. 13			

"Row 18 Column 14 Total should match IVAIC annual statement Schedule D Part 1A Section 1 Line 1.7 Column 6 (divided by 1000). \*\*Row 19 Column 14 Total should match NAIC annual statement Schedule D Part 1A Section 1 Line 8.7 Column 6 (divided by 1000).

\*\*\*Row 21 Column 14 Total should match NAIC annual statement Schedule D Part 1A Section 1 Line 9.7 Column 6 (divided by 1000).



#### **Bond Quality & Maturity SRQ question:**

3b.FIXED INCOME PORTFOLIO ANALYSIS: Please complete the following Quality and Maturity Distribution of All Bonds Owned as of December 31, 2013. Please show US Governments on line 18, and show Parents, Subsidiaries, and Affiliates on line 19. Dollar amounts should be stated at Book/Adjusted carrying values (in \$000s). Number of Issuers should be provided in whole numbers and represents the number of bond issuers associated with the dollar amount of bonds expiring at that maturity date and rating.

	1								Require	d Capital	VaR 95	
(01)	T	<u>Amou</u>	nt (\$000)	Matur			<u>VaR 95</u>	Maturing in Ov	t: 2	ΑΑΑ	0	
	t: 2	AAA	19,000	ars 3 Years T	t: 2	AAA	0.00%	10 Years Through 2	+. 2		0	tal
	t: 2	AA+	18.000	05) (06)	t: 2	AA+	0.05%	(10)	l: 2	AA+	9	4)
Pating (or equivalent to rating)	+. 2	۸۸	17 000	mber Amour	+. 2	٨٨	0 10%	Amount I	t: 2	AA	17	punt
		~~	17,000	suers (a000	1.2	~~	0.10%	(\$000) 0	t: 2	AA-	38	00)
2. AA+	-t: 2	AA-	16,000		t: 2	AA-	0.24%		t· 2	Δ+	80	
3. AA	t: 2	A+	15,000		t: 2	A+	0.53%		1. D	A.	04	
4. AA-	t: 2	А	14,000		t: 2	А	0.67%		1: Z	A	94	
5. A+	t: 2	A-	13.000		+. 7	٨	0.86%		t: 2	A-	112	
6. A	-++ 2	RERT	12 000		1.2	A-	0.00%		t: 2	BBB+	182	
7. A-			12,000		t: 2	BBB+	1.52%	_	+• 2	BBB	193	
8. BBB+	t: 2	BBB	11,000	$\rightarrow$ $\leftarrow$	t: 2	BBB	1.75%		1.2	DDD	220	
9. BDD	t: 2	BBB-	10,000		t: 2	BBB-	2.29%	-	t: 2	RRR-	229	
10. 000- 11. BB+	t: 2	BB+	9,000		+. 2		2 65%	1	t: 2	BB+	329	
12. BB	t· 2	BB	8 000			DDT	5.05%		t: 2	BB	339	
13. BB-	+. 2	DD	7 000		t: 2	BB	4.24%		t· 2	BB-	570	
14. B+ to B-	- l. Z	DD-	7,000		t: 2	BB-	8.14%			DD D. D. D	745	
15. CCC+ to CCC-	t: 2	B+orBorB-	6,000		t· 2	B+orBorB-	11 91%		t: 2	B+orBorB-	/15	
16. CC to C	_t: 2	CCCs	5,000		+. 2	CCCc	27 1 20/		t: 2	CCCs	1,857	
17. D (in or near default)	- t: 2	CCsorCs	4.000		ι. Ζ	LLLS	37.13%		t: 2	CCsorCs	1.733	
18. U.S. Governments*	+. 2	De	2 000	XX	t: 2	CCsorCs	43.32%		+• 7	De	1 / 95	
19. Parents, Subsidiaries, & Alfiliates		D3	3,000		t: 2	Ds	49.51%		ι. Ζ	03	1,405	
21 TOTAL (Lines 1 through 20)***	t: 2	USGovts	22,000		+· 2	LISGOVTS	0.00%		t: 2	USGovts	0	
*Row 18 Column 14 Total should match NAIC ann	t: 2	PSAs	<u>0</u>	17 Column 6 (div	1.2		100.000/	L	t: 2	PSAs	<u>0</u>	
**Row 19 Column 14 Total should match NAIC ann	u		209,000	8.7 Column 6 (div	t: 2	PSAs	100.00%				7 980	
***Dew 21 Column 14 Total should match NAIC ann			· ·	0.7.0-1		00)					7,500	

\*\*\*Row 21 Column 14 Total should match NAIC annual statement Schedule D Part 1A Section 1 Line 9.7 Column 6 (divided by 1000).



#### **Bond Quality & Maturity SRQ question:**

3b.FIXED INCOME PORTFOLIO ANALYSIS:	Please complete t	he followin	g Quality and	Maturity Distribut	tion of All Bon	ds Owned as o	of Decembe	er 31, 2013. Pleas	se show US C	Sovernments of	n line 18, an	d show Parents, Sul	osidiaries,
dollar amount of bonds expiring at that n	naturity date and r	at Book/Adj rating.		Amo	unt (\$000)	ssuers should			VaR 95	sents the num	Require	ed Capital	VaR 95
(01)	Maturing	in	- t: 4	AAA	23,000	Ver	t: 4	ΑΑΑ	0.00%	Over	t: 4	AAA	0
(0.)	1 Year of L	ess	t: 4	AA+	22,000	5 Years 5	+. 1		0.0070	20 Years	+· Λ		22
	(02)	(03)	t· 4	ΔΔ	21 000	(07)	ι. 4	AAT	0.15%	(11)		AAT	55
	Amount	Number	+. 1	<u>^</u>	20,000	Number	t: 4	AA	0.29%	Number	t: 4	AA	61
Rating (or equivalent to rating)	(\$000)	of Issuers	ι. 4	AA-	20,000	of Issuers	t: 4	AA-	0.57%	of Issuers	t: 4	AA-	114
1. AAA			t: 4	A+	19,000		t: 4	A+	1.12%		t: 4	A+	213
2. AA+			t: 4	А	18,000		+. 1	Δ.	1 200/		+• <i>1</i>	٨	250
<u>.</u> ΔΔ-			t: 4	A-	17.000		ι. 4	A	1.59%		1.4	A •	250
5. A+			+• 1	RBBT	16,000		t: 4	A-	1.73%		t: 4	A-	294
6. A					10,000		t: 4	BBB+	2.97%		't: 4	BBB+	475
7. A-			t: 4	BBB	15,000		t: 4	BBB	3.39%		t: 4	BBB	509
8. BBB+			t: 4	BBB-	14,000		+. 1		1 2 10/		+• 1	BBB-	608
9. BBB			t: 4	BB+	13,000		ι. 4	DDD-	4.34%		1.4		000
10. BBB-			+• 1	RR	12,000		t: 4	BB+	6.77%		t: 4	BB+	880
11. BB+				DD	14,000		t: 4	BB	7.75%		t: 4	BB	930
12. DD			t: 4	BB-	11,000		t·4	BB-	14 18%		't: 4	BB-	1,560
14 B+ to B-			t: 4	B+orBorB-	10,000		L. A	DiarDarD	10.000/		+• /	<b>P</b> +or <b>P</b> or <b>P</b>	1 000
15. CCC+ to CCC-			t: 4	CCCs	9,000		1.4	B+01B01B-	19.90%				1,990
16. CC to C			t· Δ	CCsorCs	8,000		t: 4	CCCs	46.09%		t: 4	CCCs	4,148
17. D (in or near default)			L. 4	De	7,000		t: 4	CCsorCs	53.77%		t: 4	CCsorCs	4,302
18. U.S. Governments*		XXX	l: 4	DS	7,000	XXX	t· Δ	Ds	61 45%	XXX	t: 4	Ds	4.302
19. Parents, Subsidiaries, & Affiliates**			t: 4	USGovts	26,000				01.45/0		·+· /		.,
20. All Other			t: 4	PSAs	0		t: 4	USGOVTS	0.00%		ι. 4	USGOVIS	0
21. TOTAL (Lines 1 through 20)***		Cabadula D			281 000	1000)	t: 4	PSAs	100.00%		t: 4	PSAs	<u>0</u>
Row 10 Column 14 Total should match NAI	c annual statement	Schedule L	·		201,000	1000).							20 667

\*\*Row 19 Column 14 Total should match NAIC annual statement Schedule D Part 1A Section 1 Line 8.7 Column 6 (divided by 1000).

\*\*\*Row 21 Column 14 Total should match NAIC annual statement Schedule D Part 1A Section 1 Line 9.7 Column 6 (divided by 1000).

#### Stochastic Based Factors-Bonds

	Bond Risk Factors												
				Using P	/C Industry'	s Bond Mix							
	Percent of	Current		_									
	Total	BCAR	VaR 95	VaR 99	VaR 99.5	VaR 99.6	VaR 99.8						
NAIC 1	82.2%	1.0%	0.6%	0.9%	1.0%	1.1%	1.2%						
NAIC 2	13.7%	2.0%	3.3%	4.3%	4.6%	4.7%	5.0%						
NAIC 3	2.2%	4.0%	9.9%	11.2%	11.6%	11.7%	12.1%						
NAIC 4	1.4%	4.5%	20.9%	22.3%	22.8%	22.9%	23.4%						
NAIC 5	0.3%	10.0%	42.1%	42.4%	42.6%	42.7%	42.9%						
NAIC 6	0.2%	30.0%	54.2%	54.6%	54.7%	54.8%	54.9%						
Total (ex US Govt)	100.0%	1.3%	1.7%	2.1%	2.3%	2.4%	2.5%						
A CONTRACTOR OF A CONTRACT	NACIONAL DIST.												

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

06 December 2016



#### What-if Testing

**INVESTMENT RISK (Testing)** 

Analyst Adjusted SRQ Amounts

Book Value of Bonds Maturing in:

		1yr < M	3 yrs < M	5 yrs < M	10 yrs < M		
		and	and	and	and		
Bonds by Rating	<u>1 yr or less</u>	<u>M &lt;= 3 yrs</u>	<u>M &lt;= 5 yrs</u>	<u>M &lt;= 10 yrs</u>	<u>M &lt;= 20 yrs</u>	<u>M &gt; 20 yrs</u>	
U.S. Government	100,000	105,000	102,000	90,000	40,000	20,000	NAIC
Global Rating AAA	90,000	95,000	98,000	85,000	30,000	19,000	Class 1 is
Global Rating AA+	80,000	85,000	88,000	80,000	20,000	18,000	
Global Rating AA	70,000	80,000	78,000	75,000	18,000	17,000	made ur
Global Rating AA-	60,000	70,000	68,000	65,000	17,000	16,000	
Global Rating A+	50,000	60,000	58,000	60,000	16,000	15,000	OT AAA
Global Rating A	40,000	50,000	48,000	55,000	15,000	14,000	thru A_
Global Rating A-	30,000	40,000	38,000	45,000	14,000	13,000	tinu A-
Global Rating BBB+	20,000	30,000	28,000	35,000	12,000	12,000	
Global Rating BBB	10,000	20,000	18,000	25,000	10,000	11,000	
Global Rating BBB-	5,000	10,000	15,000	20,000	8,000	10,000	
Global Rating BB+	4,000	8,000	10,000	15,000	7,000	9,000	
Global Rating BB	3,000	6,000	9,000	10,000	6,000	8,000	
Global Rating BB-	2,000	5,000	7,000	8,000	5,000	7,000	
Global Rating B+, B, B-	1,000	4,000	5,000	7,000	4,000	6,000	
Global Rating CCC+, CCC, CCC-	1,000	3,000	3,000	5,000	3,000	5,000	
Global Rating CC to C	1,000	2,000	2,000	3,000	2,000	4,000	
Global Rating D (in/near default)	1,000	1,000	1,000	2,000	1,000	3,000	
Other Non Affiliated (Not Rated)	XXX	XXX	XXX	XXX	XXX	XXX	
Affiliated	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	
Total Bonds	568,000	674,000	676,000	685,000	228,000	207,000	

#### Update on Stochastic Based BCAR for US PC Insurers

#### Stochastic Based Factors-Bonds

#### What-if Testing (cont'd)

	<					<>					<> Change in Required Capital Amount>				
Bonds	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>	VaR 95	<u>VaR 99</u>	VaR 99.5	<u>VaR 99.6</u>	VaR 99.8
U.S. Government	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0
Class 1	0.7	1.0	1.2	1.2	1.4	13,776	21,586	24,814	25,871	29,175	-174,709	-277,272	-319,369	-332,634	-375,538
Class 2	4.2	5.3	5.8	5.9	6.3	12,606	15,994	17,249	17,586	18,794	-83,598	-106,942	-115,840	-118,218	-126,781
Class 3	11.5	13.1	13.6	13.7	14.3	14,891	16,861	17,522	17,726	18,389	-22,263	-24,811	-25,707	-25,980	-26,852
Class 4	23.6	25.0	25.5	25.6	26.0	6,365	6,745	6,873	6,909	7,026	-57,085	-60,712	-61,920	-62,267	-63,348
Class 5	43.8	44.1	44.2	44.2	44.2	14,880	14,979	15,018	15,028	15,028	-10,849	-10,860	-10,863	-10,861	-10,861
Class 6	53.4	53.7	53.9	53.9	54.0	4,803	4,834	4,847	4,850	4,859	4,645	4,676	4,688	4,692	4,701
<u>Affiliated</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	100.0	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total Bonds	2.2	2.7	2.8	2.9	3.1	67,321	80,999	86,323	87,969	93,271	-343,859	-475,922	-529,010	-545,268	-598,679

### Stochastic Based Factors-Stocks

#### Common Stock Beta SRQ Question:

#### I. ASSET SECTION (Continued)

3c.COMMON STOCK PORTFOLIO ANALYSIS: Please enter the "Beta" and the associated "R-Squared" of your company's publicly traded common stock portfolio as of December 31, 2013 (including publicly traded Parent, Subsidiary, and Affiliated common stock). The "Beta" represents the level of movement in the market value of common stocks owned relative to the stock market as a whole over a specified period of time. "R-Squared" measures how reliable the calculated "Beta" is.

The stock portfolio should be separated based upon the country of the exchange in which the stock is traded. If a stock is traded on exchanges in multiple countries, only include it in one of the countries. If the total market value of the common stocks that are traded in a particular country is less than 5% of the rating unit's total publicly traded common stock portfolio market value, then a response for that country is not required.

Please use the Aggregate Method to calculate the portfolio Beta based upon the specified index shown. The Aggregate Method portfolio Beta at year end is determined by a simple linear regression using 52 weeks of time weighted rates of return for the entire portfolio. When using the value of the publicly traded common stock portfolio in the calculation of the Beta, do not include the effects of any hedging on the portfolio. For companies that do not want the administrative expense of calculating the portfolio Beta, please enter a Beta of 1.50 and R-Squared of 1.00 along with the market value of the common stocks in that portfolio.

Publicly Traded Common Stocks				
(01)	(02)	(03)	(04)	(05)
	Market Value			Index
Location of Domestic Exchange	@12/31/2013			Used to Calculate
on which Common Stocks are Traded	(in \$000s)	Beta	R-Squared	Beta & R-Squared
1. United States of America				S&P 500
2. Canada				S&P/TSX Composite
3. United Kingdom				FT All Shares
4. Japan				TOPIX
5. Other (please specify)				Please specify:
6. Other (please specify)				Please specify:
7. Other (please specify)				Please specify:
8. TOTAL (Lines 1 through 7)		XXX	XXX	XXX

#### Stochastic Based Factors-Stocks

#### What-if Testing

	SRQ	SRQ		SRQ	SRQ											
Common	Baseline	Adjusted	Selected	Baseline	Adjusted	Selected	<	C	apital Fac	tors	>	<	Req	uired Capita	l Amount	>
Stocks (Public):	<u>Amount</u>	<u>Amount</u>	<u>Am ount</u>	<u>Beta</u>	<u>Beta</u>	<u>Beta</u>	<u> VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>
United States	1,500,000	3,000,000	3,000,000	1.05	1.02	1.00	25.0	38.0	43.0	44.0	48.0	750,000	1,140,000	1,290,000	1,320,000	1,440,000
Canada	200,000	400,000	400,000	1.10	1.05	1.00	27.0	41.0	46.0	47.0	50.0	108,000	164,000	184,000	188,000	200,000
United Kingdom	200,000	400,000	400,000	0.90	0.95	1.00	26.0	39.0	45.0	46.0	51.0	104,000	156,000	180,000	184,000	204,000
Japan	100,000	200,000	200,000	0.75	0.90	1.00	29.0	43.0	48.0	49.0	54.0	58,000	86,000	96,000	98,000	108,000
Other	<u>0</u>	<u>0</u>	0	1.00	1.00	1.00	<u>25.0</u>	<u>39.0</u>	<u>45.0</u>	<u>46.0</u>	<u>51.0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	2,000,000	4,000,000	4,000,000				25.5	38.7	43.8	44.8	48.8	1,020,000	1,546,000	1,750,000	1,790,000	1,952,000

# Stochastic Based Factors-

- Needed 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
  - No longer reflects concentration risk
    - Concentration risk addressed in Balance Sheet Strength analysis, not in BCAR
  - Still reflects credit quality and duration of recovs
- Take \$recoverables from Sch F and allocate by year and aggregate by ICR
- Multiply \$recovs by rating and year against impairment tables of factors

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				Unaffiliated	Recoverables	Collected by I	-uture 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
Not 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 RecovsUnaffiliaAffiliated Funds HeldUnaffiliaAffiliated LOCs & TrustUnaffilia

Unaffiliated Recovs eld Unaffiliated Funds Held rust Unaffiliated LOCs & Trust



#### **VaR 99 Reinsurer Impairment Factors** Yr4 Yr5 Yr2 Yr3 Yr6 Yr7 Yr8 Yr9 Yr10 Yr1 1.2% 1.6% 1.7% 1.8% 1.9% 1.9% 2.0% 2.1% 1.4% 1.5% aaa 2.7% 1.5% 1.7% 1.8% 2.0% 2.1% 2.3% 2.4% 2.5% 2.8% aa+ 2.2% 1.7% 1.9% 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% aa-2.2% 2.5% 2.8% 3.1% 3.4% 3.7% 4.0% 4.3% 4.6% 4.8% a+ 2.5% 3.0% 3.4% 3.8% 4.2% 4.5% 4.8% 5.1% 5.3% 5.5% а 4.1% 6.9% 2.9% 3.5% 4.6% 5.0% 5.5% 5.9% 6.3% 6.6% a-4.7% 5.4% 6.7% 9.2% 9.7% 3.9% 6.1% 7.4% 8.1% 8.6% bbb+ 6.8% 7.6% 10.2% 12.4% 4.9% 5.9% 8.4% 9.4% 11.0% 11.8% bbb 5.9% 7.3% 8.6% 9.8% 10.9% 11.9% 12.9% 13.7% 14.5% 15.2% bbb-16.3% 17.9% 18.6% 8.8% 10.4% 11.8% 13.1% 14.3% 15.3% 17.1% bb+ 15.0% 16.3% 19.7% 20.6% 22.1% 13.4% 17.6% 18.7% 21.4% bb 11.8% 16.5% 18.1% 21.8% 22.5% 23.1% 23.6% 24.1% bb-14.7% 19.6% 21.0% 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 25.3% 26.0% 27.9% 22.6% 23.6% 24.5% 26.6% 27.1% 27.6% 28.3% b-35.8% 49.0% 47.1% 45.3% 43.6% 41.9% 40.3% 38.8% 37.3% 34.5% ccc+ and lower 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

#### table of credit risk factors – one for each confidence level



	VaR 99						Unaffiliated			
	Reinsuranc	e Recovera	ble Require	ed Capital						
A.M. Best ICR	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10
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)

Update on Stochastic Based BCAR for US PC Insurers

06 December 2016

# Stochastic Based Factors-

	<>											
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 low er	46.8	46.8	46.8	46.8	46.8							
ot 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							

Unaffiliated

#### 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.

Ν



- Create 4 Industry Curves of potential reserve development for each Sch P 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
- Now look at company case incurred LDF volatility relative to industry
- Adjust industry factors for company volatility/stability to get company specific factors
- What-if testing changes to reserves allows factors to respond to changing reserve size



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I	Medium Re	serves	Average Stabili						
	<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				
INTL	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				

<u>Reserve Capital Factors:</u> Represent potential ultimate UNANTICIPATED adverse loss and LAE reserve development (discounted) using VaR metric





- Create 4 Industry Curves of potential UW profit/loss for each Sch P 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
- Now look at company combined ratio relative to breakeven combined ratio
- Adjust industry factors for company profitability to get company specific factors
- What-if testing changes to NPW allows factors to respond to changing premium size







S	Small Premium			Break Even Profitability			
	<u>VaR 95</u>	<u>VaR 99</u>	<u>VaR 99.5</u>	<u>VaR 99.6</u>	<u>VaR 99.8</u>		
НО	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		

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NPW Capital Factors: Represent potential ultimate UW Loss (discounted) using VaR metric



# Stochastic Based Factors-

#### Feedback

- Matrices not positive semi-definite
- Can't duplicate diversification factor
- Can't update diversification if business mix changes
  - Would need to re-run simulations

#### Response

- Updated matrix in stochastic based model to be positive semi-definite
- Use matrix multiplication with weight adjusted stochastic based risk factors
- Allows for What-if testing model responds to changes in mix by line, changes in capital factors, and changes in size

# Stochastic Based Factors-

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

Divided by

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

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

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



## **4-Interest Rate Risk**

Update on Stochastic Based BCAR for US PC Insurers

#### **Interest Rate Risk**



#### Feedback –

 Assumption of a specified confidence level interest rate shock occurring at the same time as equivalent confidence level tail event shock loss is far more remote than confidence level being used

#### Response –

- Only allow the interest rate movement to change at each confidence level
- Keep the shock loss fixed at each confidence level
  - For nat cat exposed companies, most often the 1/100 All Perils pretax per occurrence Gross PML

#### Interest Rate Risk



- Interest Rate Movements
  - Based on ESG simulated 10,000 potential one year changes in interest rates
  - Selected BP rise at each confidence level

	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>	<u>VaR 99.8</u>		
120 BP	170 BP	240 BP	270 BP	280 BP	290 BP		



## Application of BCAR Output in the Rating Process

## BCAR 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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## BCAR in the Rating Process

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

BCARs using VaR 95%, 99%, 99.5%, & 99.6% A.M. Best's Rating Process BCAR using VaR 99.8% **Country Risk** Balance Enterprise Published Rating Lift/ Sheet Operating **Business** Risk Comprehensive Issuer Strength Performance Profile Management Adjustment Drag Credit Rating (+2/-3)(+1/-1) Baseline (+2/-2)(+1/-4)(e.g., bbb+)

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Update on Stochastic Based BCAR for US PC Insurers

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## BCAR in the Rating Process

BCAR is the starting point in the assessment of balance sheet strength

		March 2016 Prop	ing table:			
	Metric	Confidence Level (%)	BCAR	Implied Balance Shee	et Strength	
	VaR	99.9	> 0 at 99.9	Strongest	Strongest	
	VaR	99.8	> 0 at 99.8 & $\leq$ 0 at 99.9	Very Strong	3	
	VaR	99.5	> 0 at 99.5 & $\leq$ 0 at 99.8	Strong		
	VaR	99	> 0 at 99 & ≤ 0 at 99.5	Adequate		
	VaR	95	> 0 at 95 & ≤ 0 at 99	Weak		
	VaR	95	≤ 0 at 95	Very Weak	<b>C</b>	
November 2016 Proposal uses the following table:						
	VaR Confid	lence Level (%) BCA	R	BCAR Assessment	t	
	99.6	> 25	at 99.6	Strongest		
	99.6		at 99.6 & ≤ 25 at 99.6	Very Strong		
	99.5 >		t 99.5 & ≤ 10 at 99.6	Strong		
	99	> 0 a	t 99 & ≤ 0 at 99.5	Adequate		
	95		t 95 & ≤ 0 at 99	Weak		
	95	≤ 0 a	t 95	Very Weak		

Update on Stochastic Based BCAR for US PC Insurers

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## **Observations/Analyst Views**

Update on Stochastic Based BCAR for US PC Insurers



## **Observations/Analyst Views**

#### Impacts on <u>BCAR</u> scores

- Diversification of Catastrophe Risk
  - Positive impact for majority of RUs with cat risk
- Changing to 99.6 confidence level
  - Positive impact for RUs with good cat protection out to 1/250
  - Negative impact for non-cat exposed RUs with low scores in tail
- Changing to stochastic based factors
  - Bond Defaults minimal impact
  - Publicly Traded Common Stocks minimal impact
  - Credit Risk Reinsurance Recoverables positive impact for those RUs that had concentration in reinsurers
  - Premium Risk small impacts up and down
  - Reserve Risk small impacts up and down
  - Correlation (diversification factors) small impacts up and down
- Interest Rate Risk
  - Positive impact in tail for those RUs with large gross PMLs in tail



## **Observations/Analyst Views**

- Impacts on <u>rating process</u>
  - Balance sheet assessment
  - ERM assessment
  - Overall rating



# Best's Briefing released on November 14, 2016

Update on Stochastic Based BCAR for US PC Insurers



## 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
- Adjusted stochastic based BCARs for U.S. PC rating units were emailed to rating contacts on November 30
- <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

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