Updates to AIR's U.S. Multiple Peril Crop Insurance (MPCI) Model

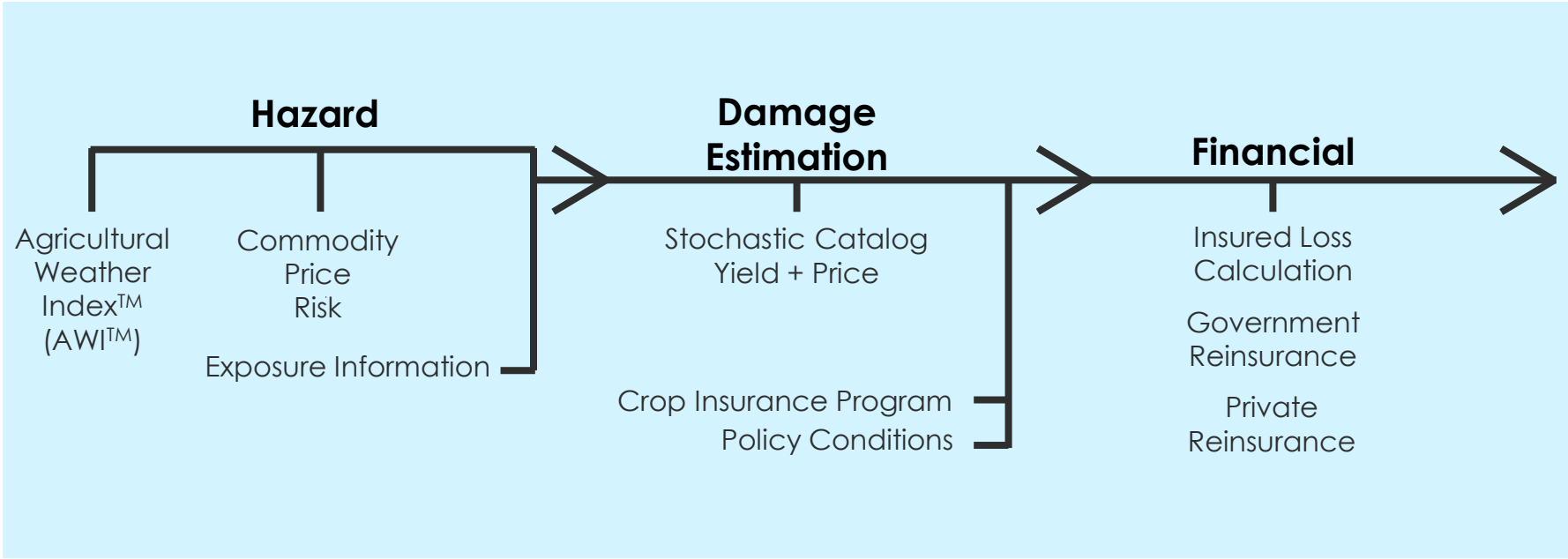
Julia Borman, Ph.D.
Katie Ward, ARe

©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

AIR Catastrophe Modeling Framework



©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Research Updates

Hazard Component

- Observed experience
- Pasture, rangeland, and forage
- Almond

Summary of Business Data

- Exposure information
- Crop insurance program
- Policy conditions

Insured Loss Calculations

- Premium rates
- Price volatility

©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Hazard Component

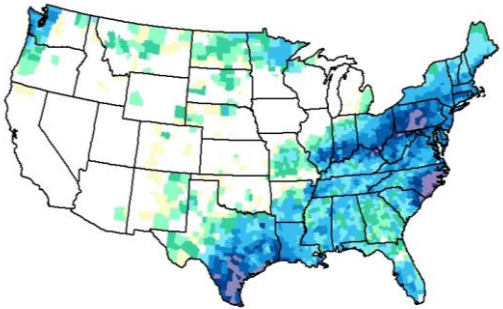
©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

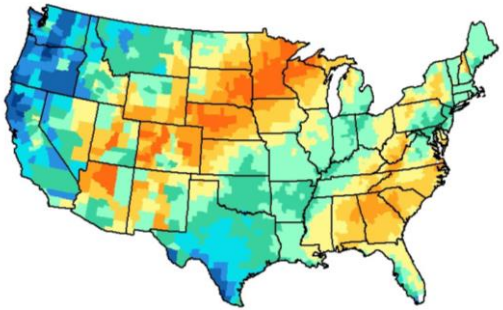
AIR

More Observed Experience

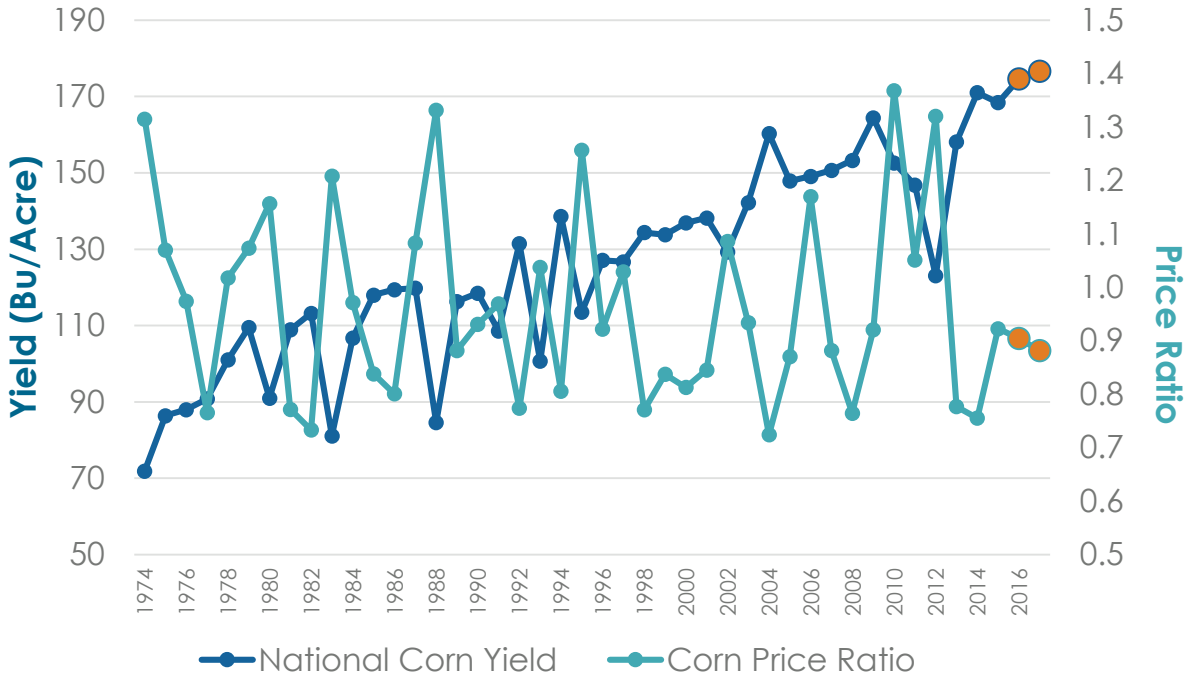
Daily Precipitation



Daily Temperature



Additional Yield and Price Data

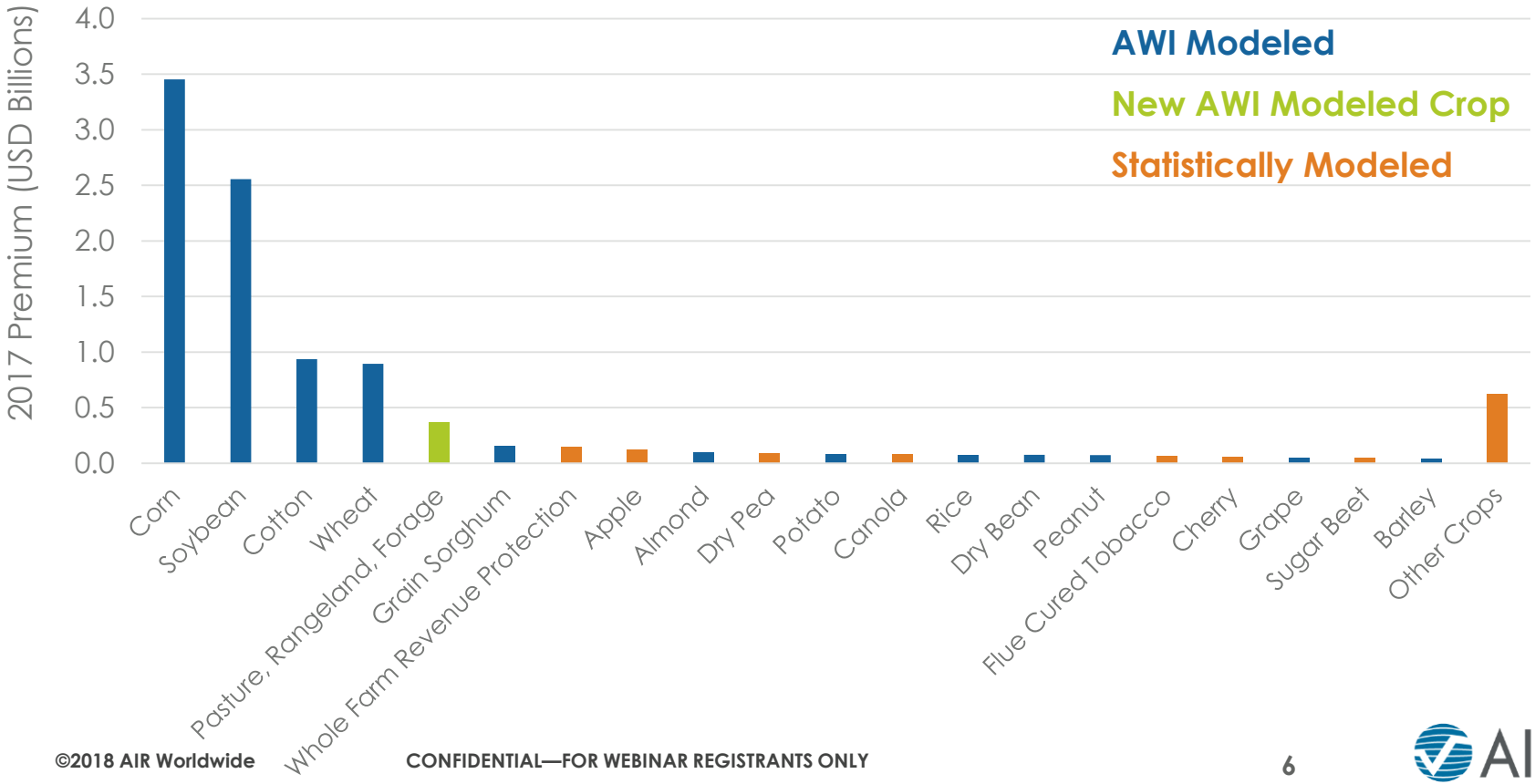


©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

AWI Model for Pasture, Rangeland, and Forage (PRF)



©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Pasture, Rangeland, and Forage (PRF)

Rating of PRF

- Previous: Rainfall Index (RI) and Vegetative Index (VI)
- Updated: Only RI policies

©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Redesigned Almond AWI

- Brought in county level yield data from California state reports
- Looks at early stage growth factors (pollination) as main driver of yield success
- Now modeled at county resolution

©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Summary of Business Data

©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Summary of Business Data

- Previous
  - County/Crop/Plan/Coverage Level
- Updated
  - County/Crop/Plan/Coverage Level/Type/Practice/Unit
  - First released in 2017 by RMA
- Updated program and policy information
  - Brings policy mix to 2017 levels
  - Reflects preference changes for plans, coverage levels, and crops

©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Insured Loss Calculations

©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

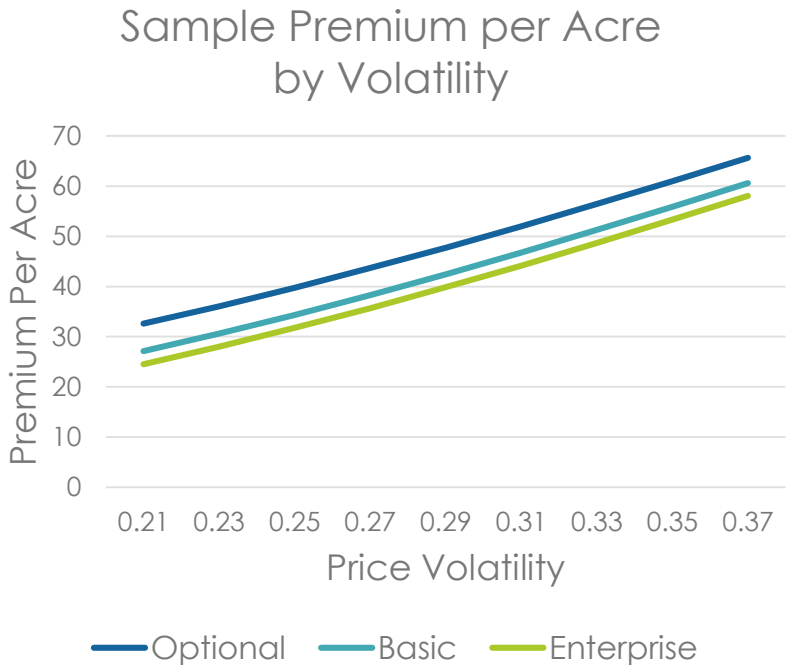
Premium Rates

- Premium rates are adjusted by the RMA every year
- Previous
  - Underlying model rates to 2016 levels
- **Updated**
  - Underlying model rates to 2018 levels

©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Improved Modeling of Relationship between Premium and Volatility

- As price volatility increases, so do premium rates
- Updated
  - Policy level resolution
  - Includes data from RMA Actuarial Data Master



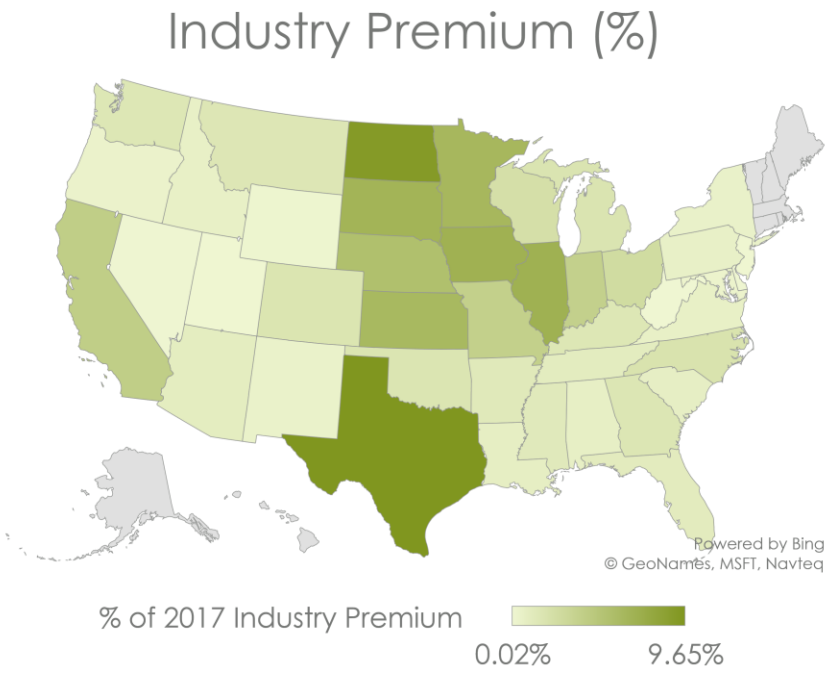
©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

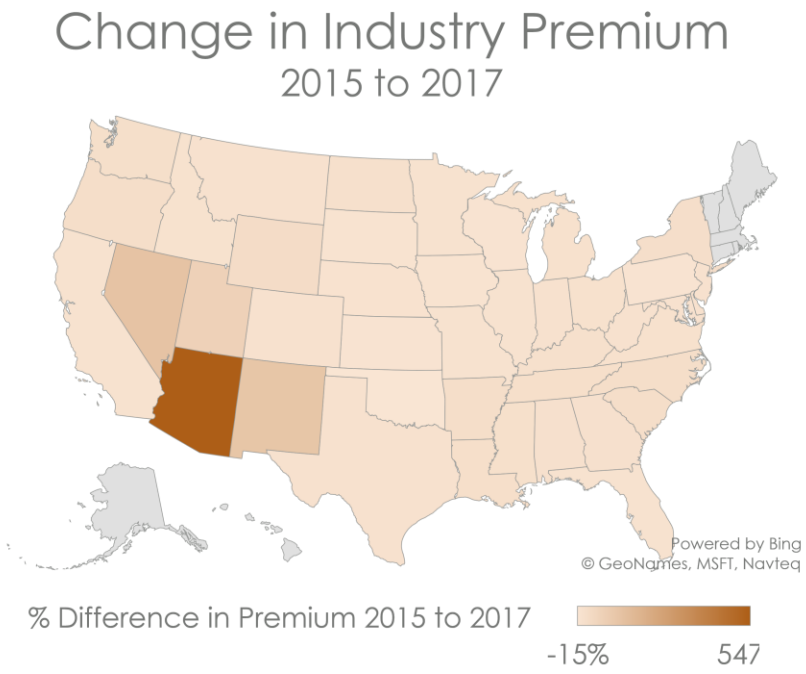
Model Outputs

©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

On Which States Will We Focus This Discussion?

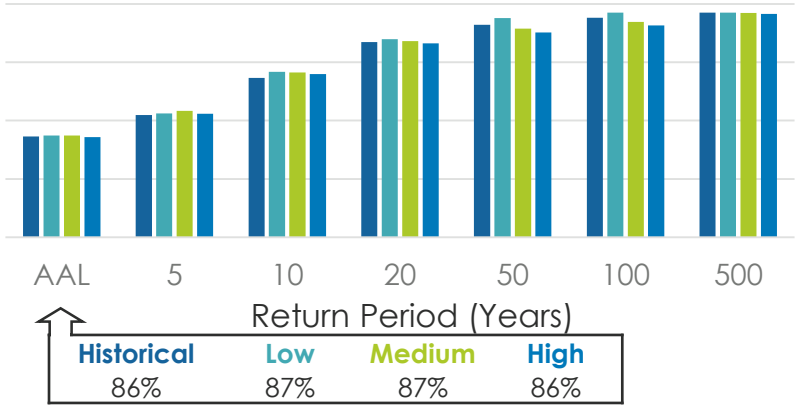




©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

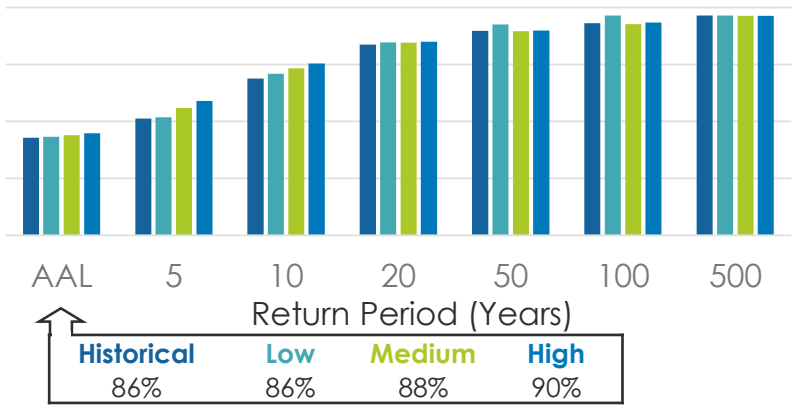
Iowa

Exceedance Probability: Previous



Historical	Low	Medium	High
86%	87%	87%	86%

Exceedance Probability: Updated



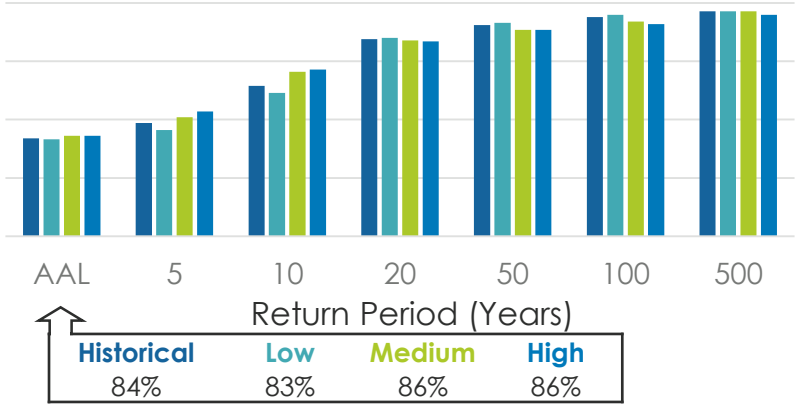
Historical	Low	Medium	High
86%	86%	88%	90%

Changes from Previous to Updated	AAL	5	10	20	50	100	500
Historical	-0.8%	-2.2%	0.6%	-0.2%	-1.5%	-1.0%	0.0%
Low	-1.0%	-2.4%	0.0%	-0.2%	-1.6%	0.0%	0.0%
Medium	0.9%	3.1%	3.6%	0.5%	0.0%	0.2%	0.2%
High	4.0%	10.1%	7.3%	2.2%	2.3%	2.8%	0.7%

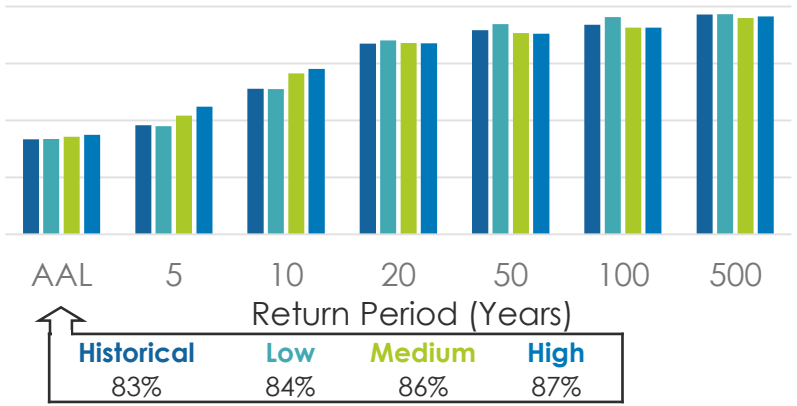
©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Illinois

Exceedance Probability: Previous



Exceedance Probability: Updated



Changes from Previous to Updated	AAL	5	10	20	50	100	500
Historical	-0.8%	-0.8%	-0.9%	-0.8%	-1.0%	-2.1%	0.0%
Low	1.3%	4.6%	3.7%	0.1%	0.6%	0.4%	0.0%
Medium	0.0%	1.8%	0.0%	-0.4%	-0.5%	-1.6%	-1.7%
High	1.3%	4.7%	1.2%	0.3%	-0.4%	-0.1%	0.4%

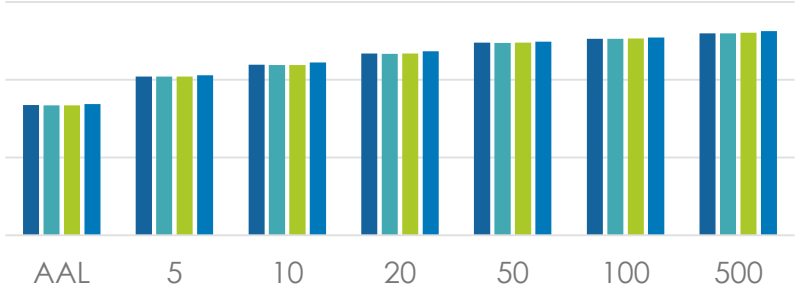
©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

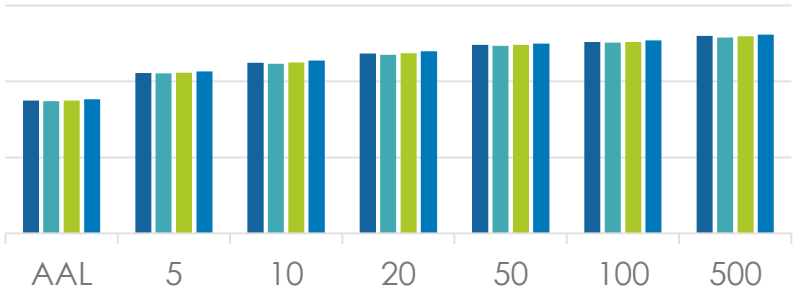
Texas

Exceedance Probability: Previous



Historical	Low	Medium	High
84%	84%	84%	84%

Exceedance Probability: Updated



Historical	Low	Medium	High
87%	87%	87%	88%

Changes from Previous to Updated	AAL	5	10	20	50	100	500
Historical	4.2%	3.3%	2.3%	1.3%	0.1%	-0.4%	-0.1%
Low	4.0%	3.0%	1.8%	0.6%	-0.3%	-0.7%	-0.7%
Medium	4.5%	3.5%	2.6%	1.4%	0.3%	-0.5%	-0.5%
High	4.4%	3.4%	2.2%	1.2%	0.4%	-0.1%	-0.5%

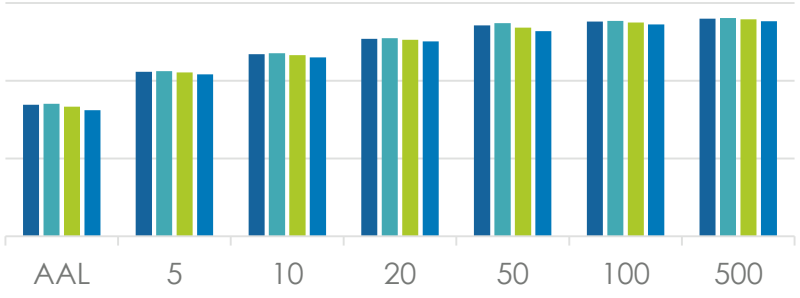
©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

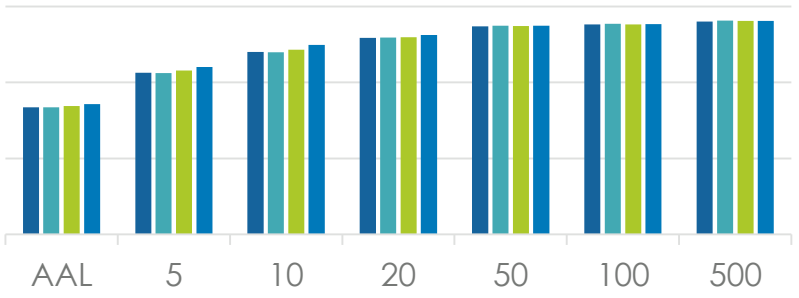
North Dakota

Exceedance Probability: Previous



Historical	Low	Medium	High
85%	85%	83%	81%

Exceedance Probability: Updated



Historical	Low	Medium	High
84%	84%	84%	86%

Changes from Previous to Updated	AAL	5	10	20	50	100	500
Historical	-1.1%	0.6%	2.5%	1.8%	0.9%	0.0%	0.1%
Low	-2.1%	0.1%	1.8%	1.6%	0.2%	0.1%	0.1%
Medium	1.2%	2.4%	4.2%	2.5%	2.1%	0.5%	0.6%
High	5.4%	5.4%	7.8%	4.4%	3.9%	1.6%	1.6%

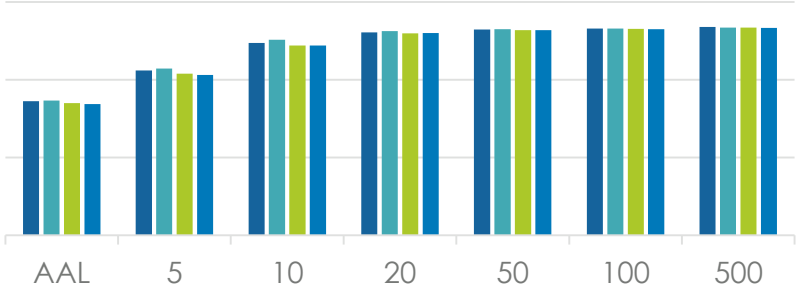
©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

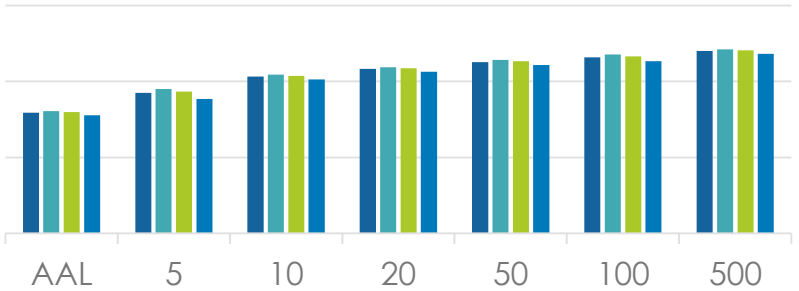
Arizona

Exceedance Probability: Previous



Historical	Low	Medium	High
86%	87%	85%	84%

Exceedance Probability: Updated



Historical	Low	Medium	High
79%	80%	80%	78%

Changes from Previous to Updated	AAL	5	10	20	50	100	500
Historical	-8.8%	-14.6%	-19.7%	-20.5%	-17.5%	-14.8%	-11.6%
Low	-7.7%	-12.9%	-20.4%	-20.2%	-16.1%	-13.1%	-10.4%
Medium	-6.6%	-11.4%	-17.7%	-19.5%	-16.5%	-13.9%	-11.0%
High	-8.4%	-16.4%	-20.3%	-22.2%	-19.2%	-17.1%	-12.8%

©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

Update Summary

Hazard Component

- Observed experience
- Pasture, rangeland, and forage
- Almond

Summary of Business Data

- Exposure information
- Crop insurance program
- Policy conditions

Insured Loss Calculations

- Premium rates
- Price volatility

©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

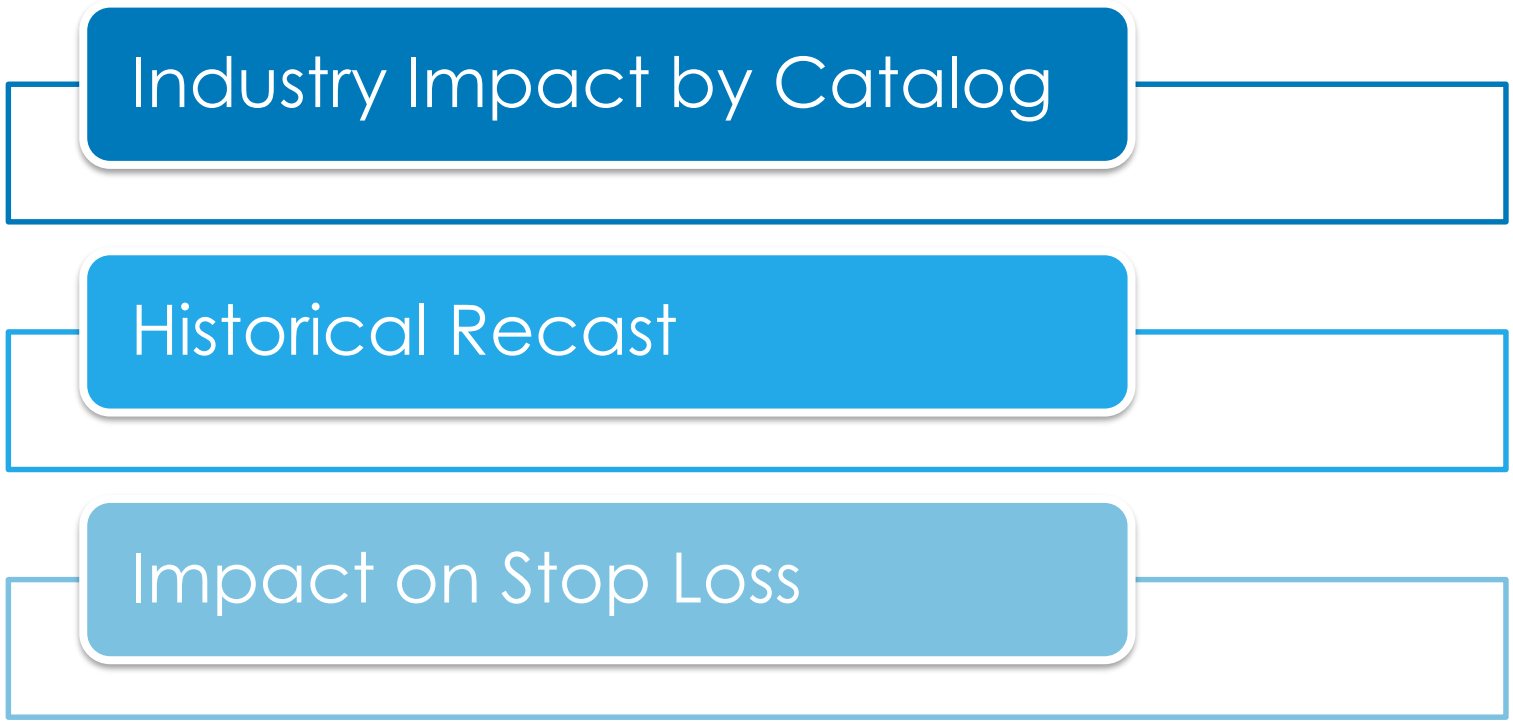
Impact of Model Update on CATRADER® Results

©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

CATRADER Results



©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Industry Impact by Catalog

©2018 AIR Worldwide

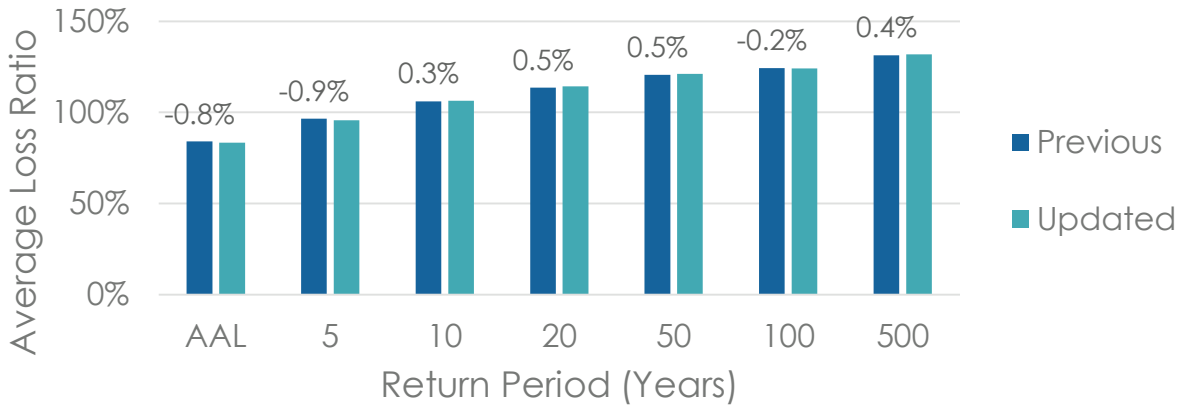
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

Historical Volatility Post-SRA EP Curve

Post-SRA Loss Ratio

- Previous: 84.0%
- Updated: 83.3%



©2018 AIR Worldwide

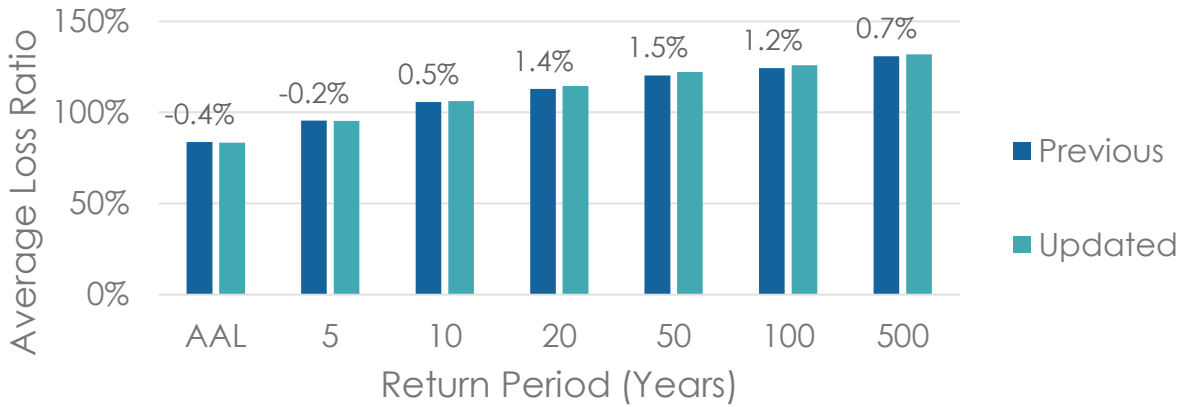
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

Low Volatility Post-SRA EP Curve

Post-SRA Loss Ratio

- Previous: 83.7%
- Updated: 83.4%



©2018 AIR Worldwide

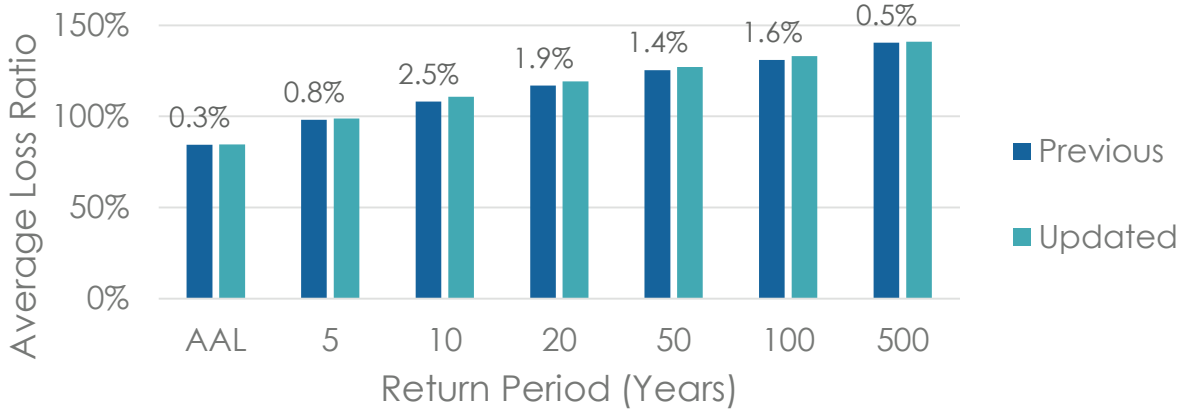
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

Medium Volatility Post-SRA EP Curve

Post-SRA Loss Ratio

- Previous: 84.4%
- Updated: 84.6%



©2018 AIR Worldwide

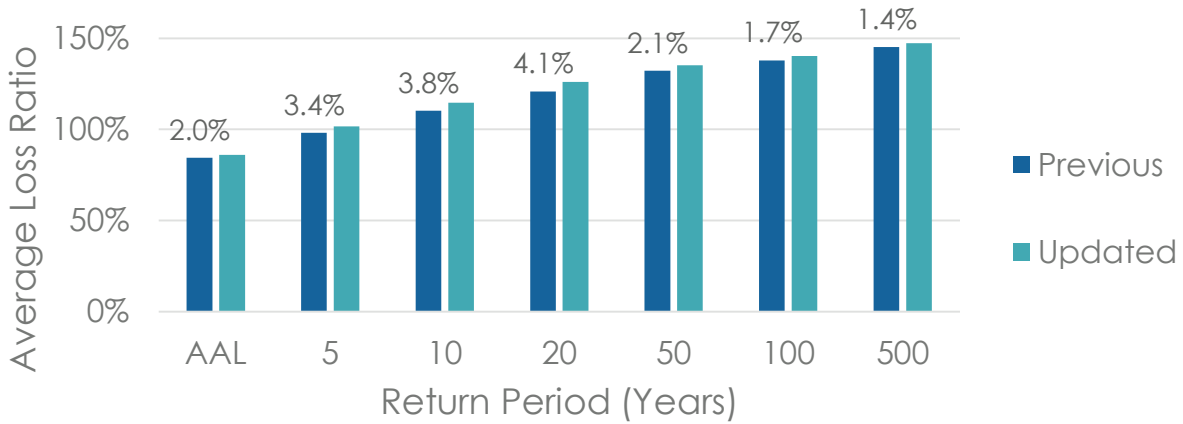
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

High Volatility Post-SRA EP Curve

Post-SRA Loss Ratio

- Previous: 84.4%
- Updated: 86.1%



©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

Historical Recast

©2018 AIR Worldwide

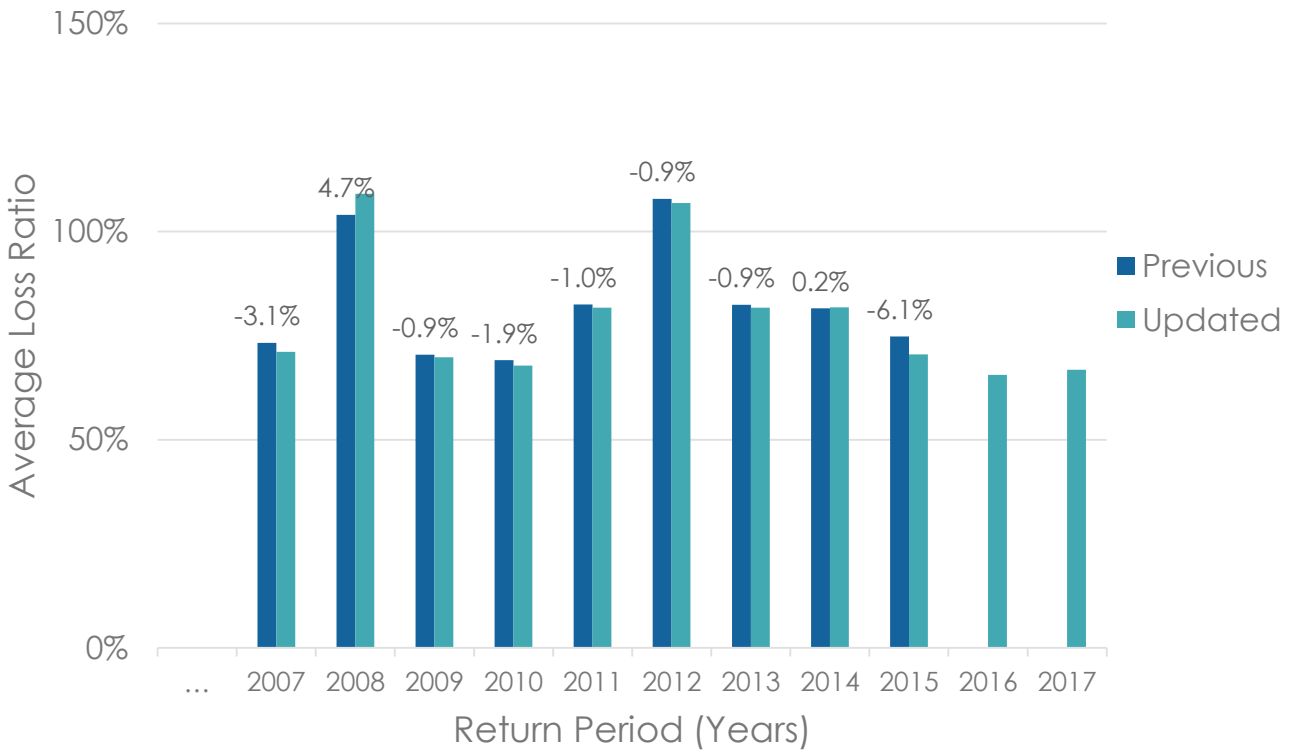
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

Historical Recast: Historical Volatility Industry Impact

New Historical Years
- 2016
- 2017

Historical Recast Average Net Loss Ratio Change
- Previous: 82.2%
- Updated: 80.7%



©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Impact on Stop Loss

©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

Impact of Model Update on Reinsurance Layer Loss Costs

Volatility Catalog

Company A: Concentrated in Midwest			
25% xs 125%	**Previous**	**Updated**	**% Change**
Historical	3.15%	3.05%	-3.5%
Low	3.60%	3.78%	4.9%
Medium	3.87%	4.55%	14.9%
High	4.73%	6.50%	27.2%

Volatility Catalog

Company B: Nationwide Footprint			
25% xs 125%	**Previous**	**Updated**	**% Change**
Historical	0.10%	0.11%	6.2%
Low	0.08%	0.12%	27.5%
Medium	0.53%	0.68%	21.0%
High	1.34%	1.86%	27.8%

©2018 AIR Worldwide
CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

Premium Rates for 2019

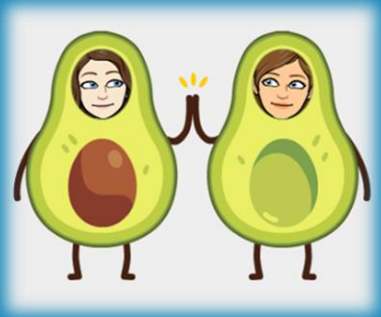
Expect details early 2019

©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY

AIR

Thank You



©2018 AIR Worldwide

CONFIDENTIAL—FOR WEBINAR REGISTRANTS ONLY