

H₂O

WORLD
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Harnessing AI to Create a Trillion Dollar Asset Class

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2017

Outline

1. My background and what led to using H2O at Ledger Investing
2. Ledger History – a tech company from the valley
3. Our Mission
 1. Mental model to walk away with
4. Ledger Solutions for the Insurance Value Chain
5. H2O Powered Stochastic Loss Reserving
 - a. Primer on SLR
 - b. Loss Development EDA
 - c. ML approaches
 - d. Performance
 - e. How these results are used

My background and success with H2O

Broad Institute of M

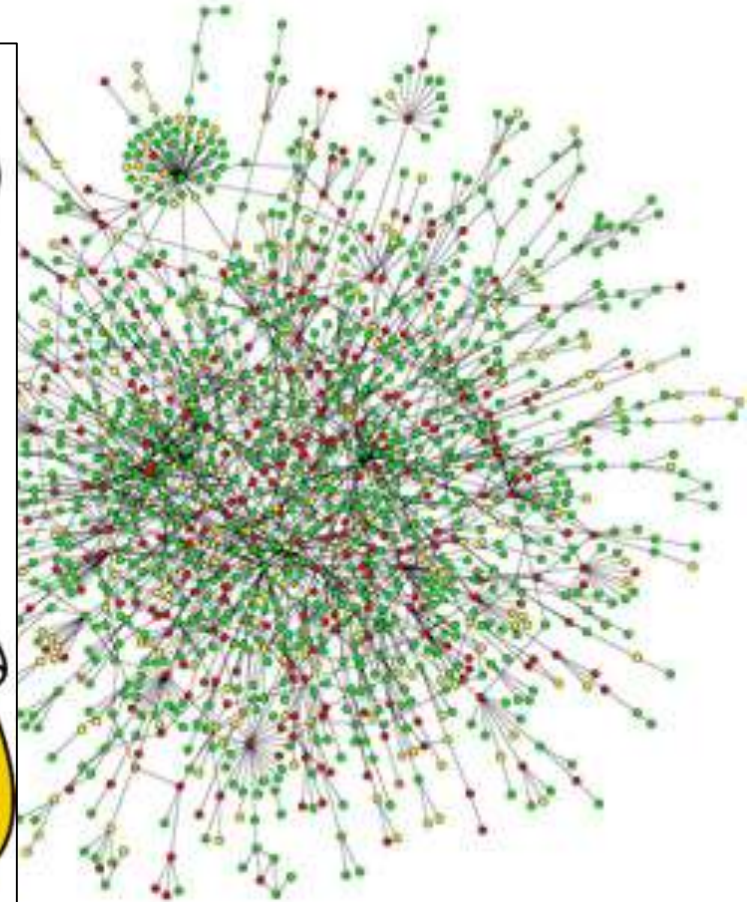
Using ML on function
networks

Patents

**Method and system for a
networks**

WO 2016118513 A1

<https://www.google.com/patents/WO2016118513A1?cl=en>



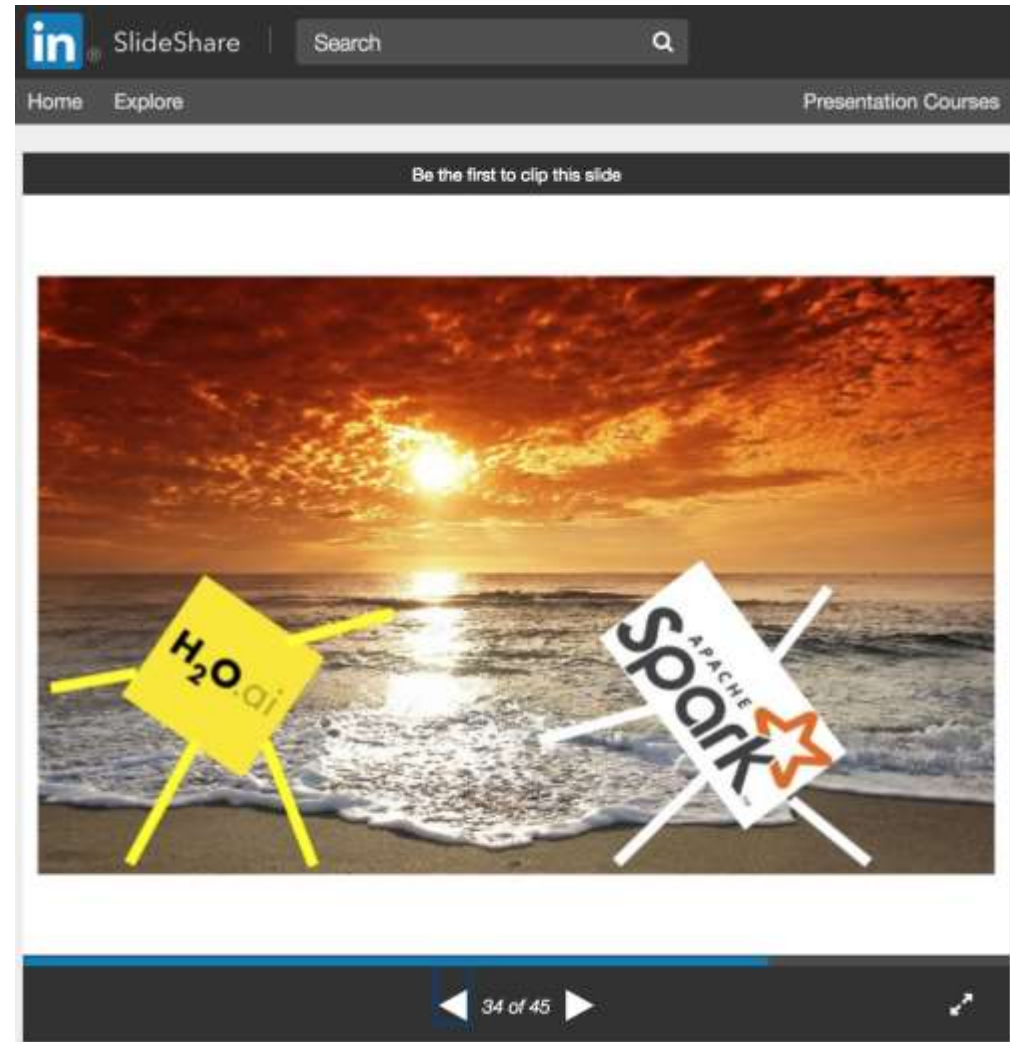
network diagram shown here represents a map
of protein-protein interactions in a yeast
(*Saccharomyces cerevisiae*) cell (Image by
Hawoong Jeong, KAIST, Korea).

My background and success with H2O



<https://www.slideshare.net/SparkSummit/spark-summit-eu-talk-by-johnathan-mercero>

H2O & Spark Love Story at Spark Summit



Continuing this success at Ledger Investing



ledger Investing

Ledger Investing



Ledger Investing – Founders



Julien Brissonneau



Aymeric Rabot

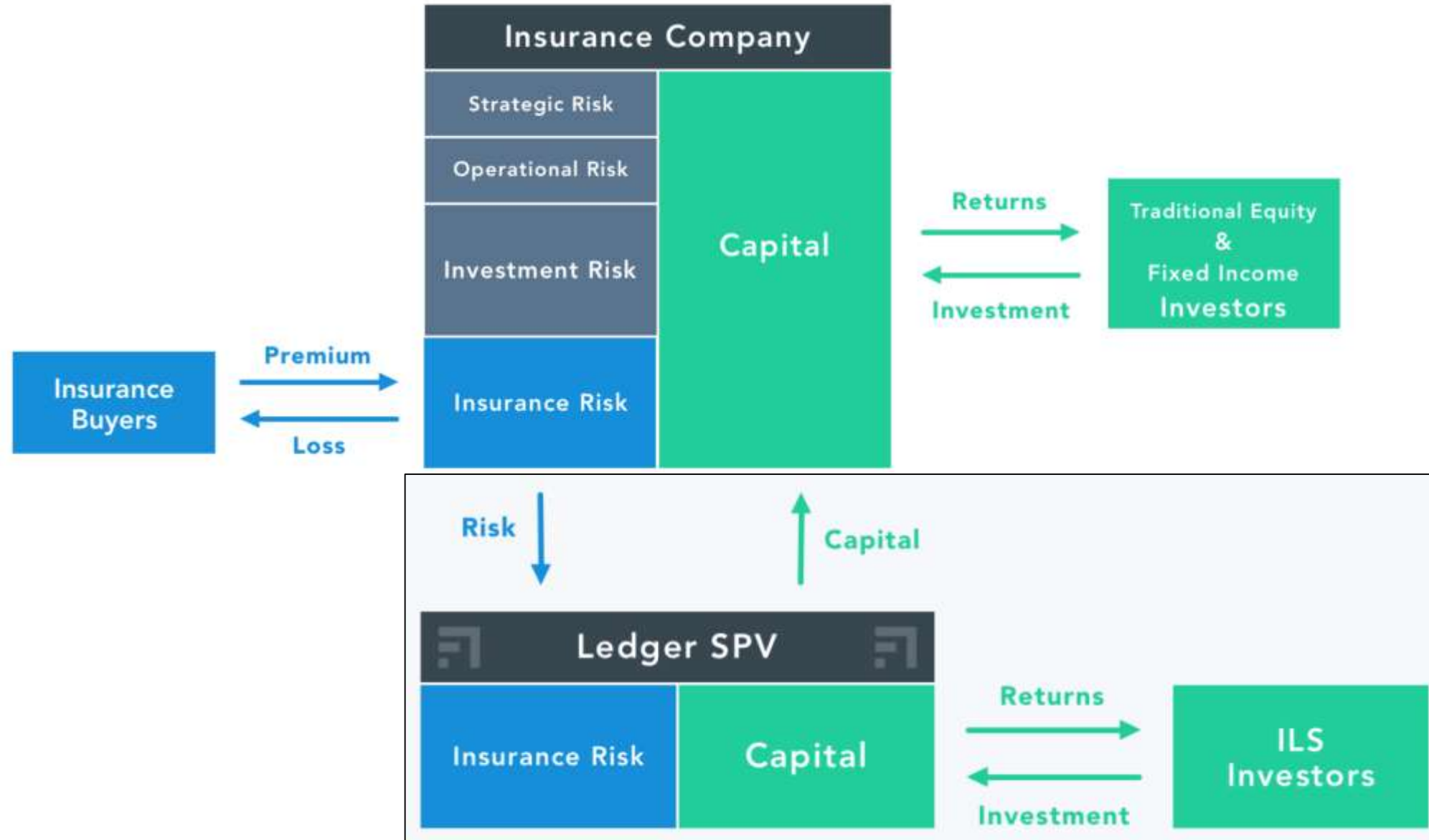
Ledger Investing – Meeting Samir Shah



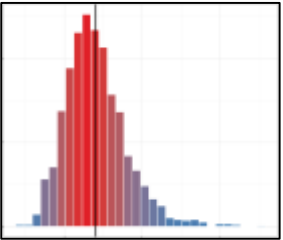
Samir Shah, CEO



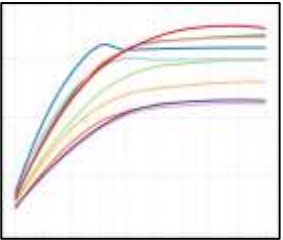
Insurance Value Chain Transformation



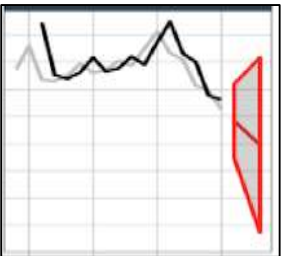
Ledger Solutions



Risk Modeling **H₂O**



Stochastic Loss Reserving **H₂O**



Securitization

H2O Powered Stochastic Loss Reserving (SLR)

- a. Primer on SLR
- b. Industry Loss Development EDA
- c. ML approaches
- d. Performance
- e. How these results are used

Primer on SLR

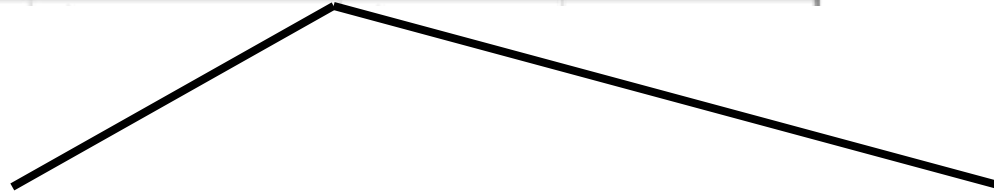
Premiums and Losses for Insurer ABC 1989-1998

Insurer ABC - Filing Year 1998 (Commerical Auto)				
Accident Year	AY Index	Net Premiums (M)	Losses (M)	Ultimate Loss Ratio
1989	9	\$ 34,652	\$ 34,201	99%
1990	8	\$ 34,694	\$ 28,358	82%
1991	7	\$ 30,197	\$ 21,129	70%
1992	6	\$ 25,121	\$ 16,846	67%
1993	5	\$ 26,912	\$ 14,744	55%
1994	4	\$ 26,729	\$ 16,914	63%
1995	3	\$ 24,561	\$ 18,141	74%
1996	2	\$ 28,475	\$ 16,376	58%
1997	1	\$ 23,687	\$ 17,304	73%
1998	0	\$ 22,443	\$ 15,938	71%

Primer on SLR

Premiums and Losses for Insurer ABC 1989-1998

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Insurer ABC - Filing Year 1998 (Commerical Auto)								
Accident Year	AY Index	Net Premiums (M)	Lag1Lag2Lag3			...	Losses (M)	Ultimate Loss Ratio
1989	9	\$ 34,652	\$ 5,871	\$ 14,666	\$ 22,827	\$ 34,201	99%

Primer on SLR

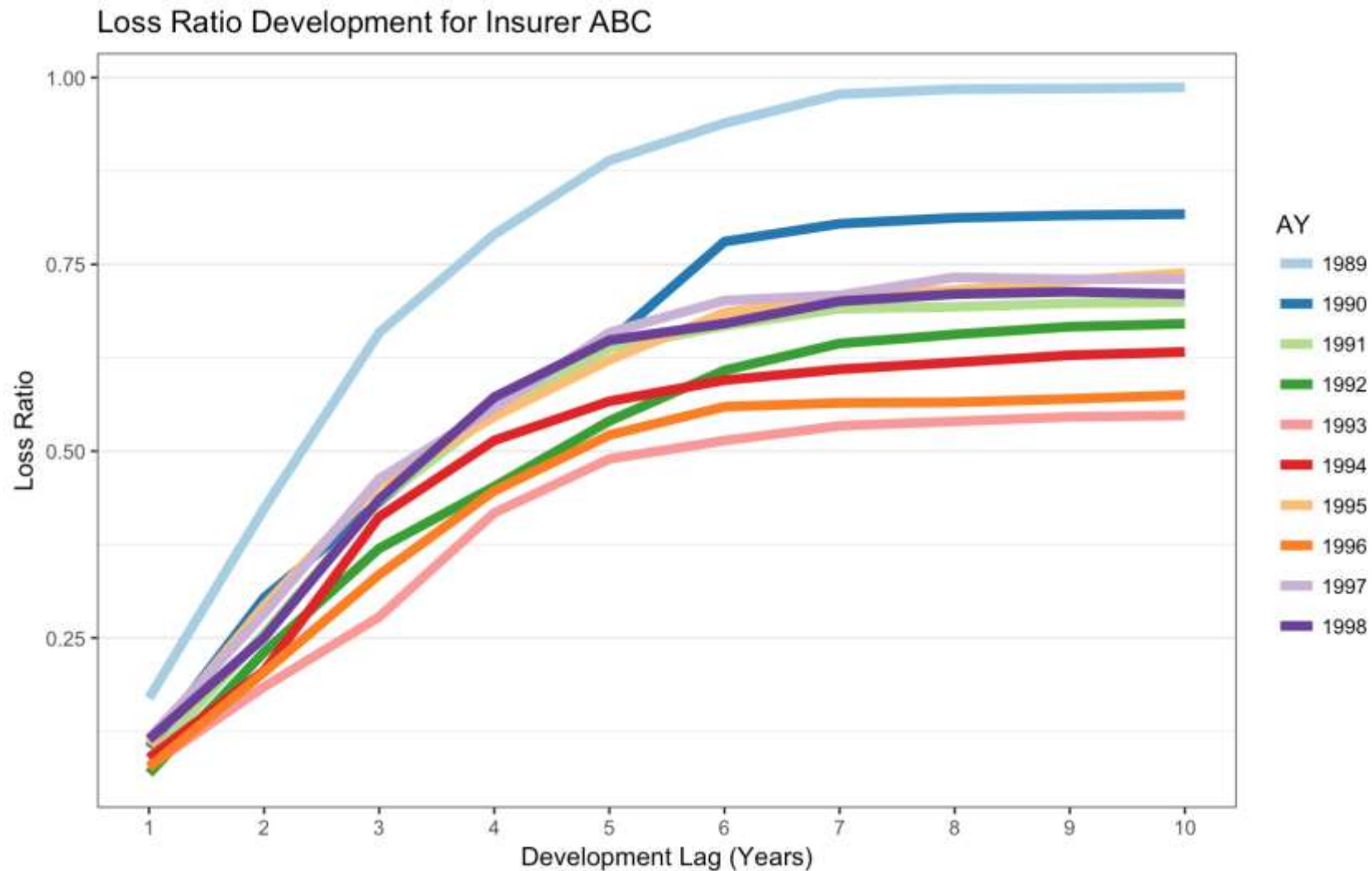
Insurer ABC 1989-1998 Loss Development for all AY's

Insurer ABC - Filing Year 1998 (Commerical Auto)														
Accident Year	AY Index	Net Premiums (M)	Lag1	Lag2	Lag3	Lag4	Lag5	Lag6	Lag7	Lag8	Lag9	Lag10	Losses (M)	Ultimate Loss Ratio
1989	9	\$ 34,652	\$ 5,871	\$ 14,666	\$ 22,827	\$ 27,381	\$ 30,811	\$ 32,541	\$ 33,884	\$ 34,122	\$ 34,146	\$ 34,201	\$ 34,201	99%
1990	8	\$ 34,694	\$ 3,582	\$ 10,542	\$ 14,980	\$ 19,416	\$ 22,436	\$ 27,078	\$ 27,910	\$ 28,182	\$ 28,303	\$ 28,358	\$ 28,358	82%
1991	7	\$ 30,197	\$ 2,662	\$ 7,717	\$ 13,110	\$ 16,649	\$ 19,274	\$ 20,158	\$ 20,856	\$ 20,931	\$ 21,077	\$ 21,129	\$ 21,129	70%
1992	6	\$ 25,121	\$ 1,719	\$ 5,802	\$ 9,288	\$ 11,368	\$ 13,575	\$ 15,279	\$ 16,182	\$ 16,486	\$ 16,745	\$ 16,846	\$ 16,846	67%
1993	5	\$ 26,912	\$ 2,109	\$ 4,964	\$ 7,482	\$ 11,231	\$ 13,175	\$ 13,836	\$ 14,368	\$ 14,528	\$ 14,691	\$ 14,744	\$ 14,744	55%
1994	4	\$ 26,729	\$ 2,382	\$ 5,504	\$ 11,012	\$ 13,747	\$ 15,149	\$ 15,904	\$ 16,293	\$ 16,537	\$ 16,797	\$ 16,914	\$ 16,914	63%
1995	3	\$ 24,561	\$ 2,644	\$ 7,192	\$ 11,208	\$ 13,418	\$ 15,279	\$ 16,838	\$ 17,344	\$ 17,576	\$ 17,884	\$ 18,141	\$ 18,141	74%
1996	2	\$ 28,475	\$ 2,174	\$ 5,813	\$ 9,531	\$ 12,724	\$ 14,852	\$ 15,932	\$ 16,075	\$ 16,100	\$ 16,230	\$ 16,376	\$ 16,376	58%
1997	1	\$ 23,687	\$ 2,729	\$ 6,695	\$ 10,966	\$ 13,208	\$ 15,605	\$ 16,621	\$ 16,787	\$ 17,358	\$ 17,294	\$ 17,304	\$ 17,304	73%
1998	0	\$ 22,443	\$ 2,559	\$ 5,622	\$ 9,778	\$ 12,844	\$ 14,552	\$ 15,056	\$ 15,726	\$ 15,939	\$ 16,011	\$ 15,938	\$ 15,938	71%

Each Accident Year has had 10 years of development

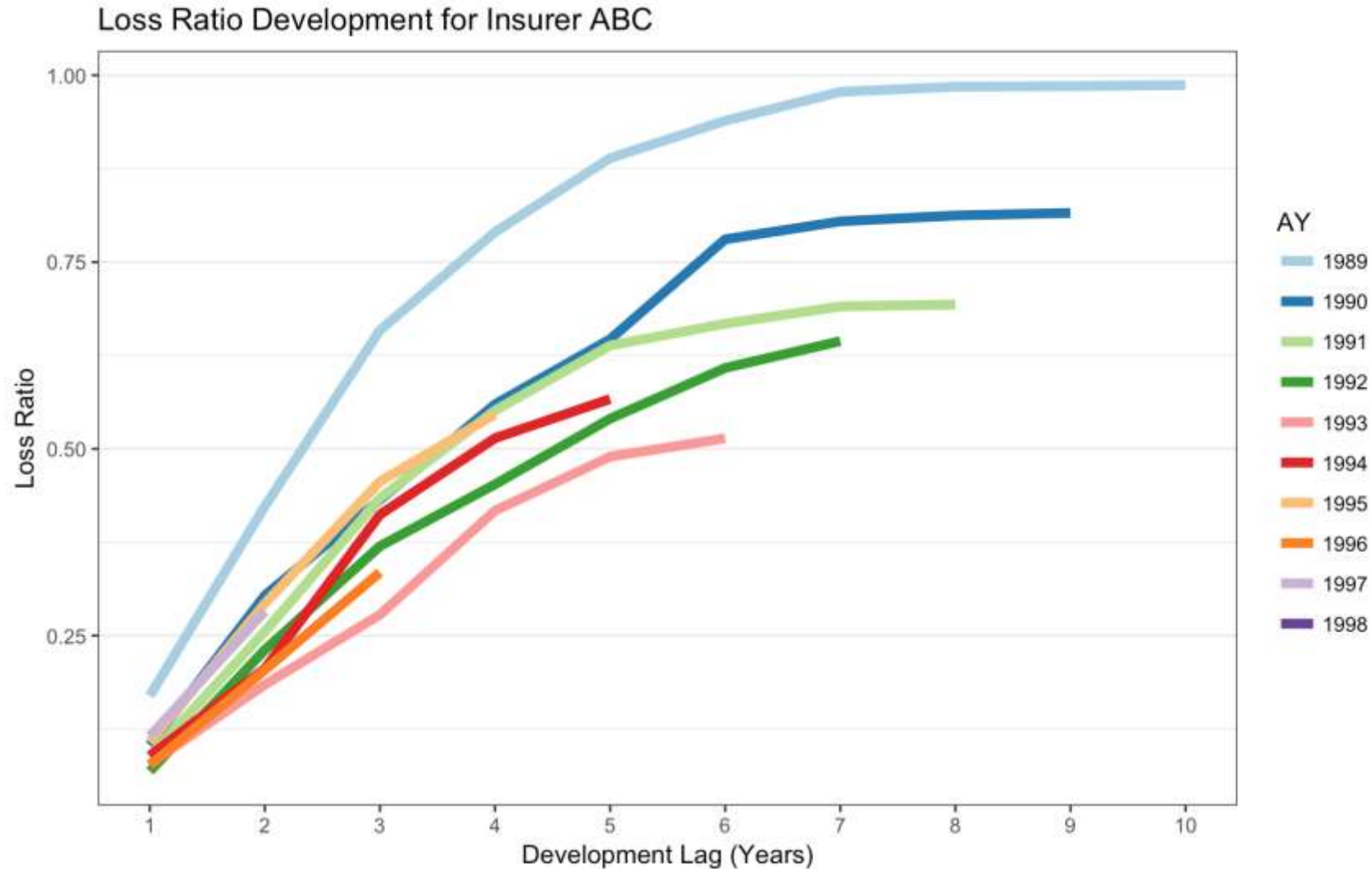
Primer on SLR

Insurer ABC 1989-1998 Visual Loss Development



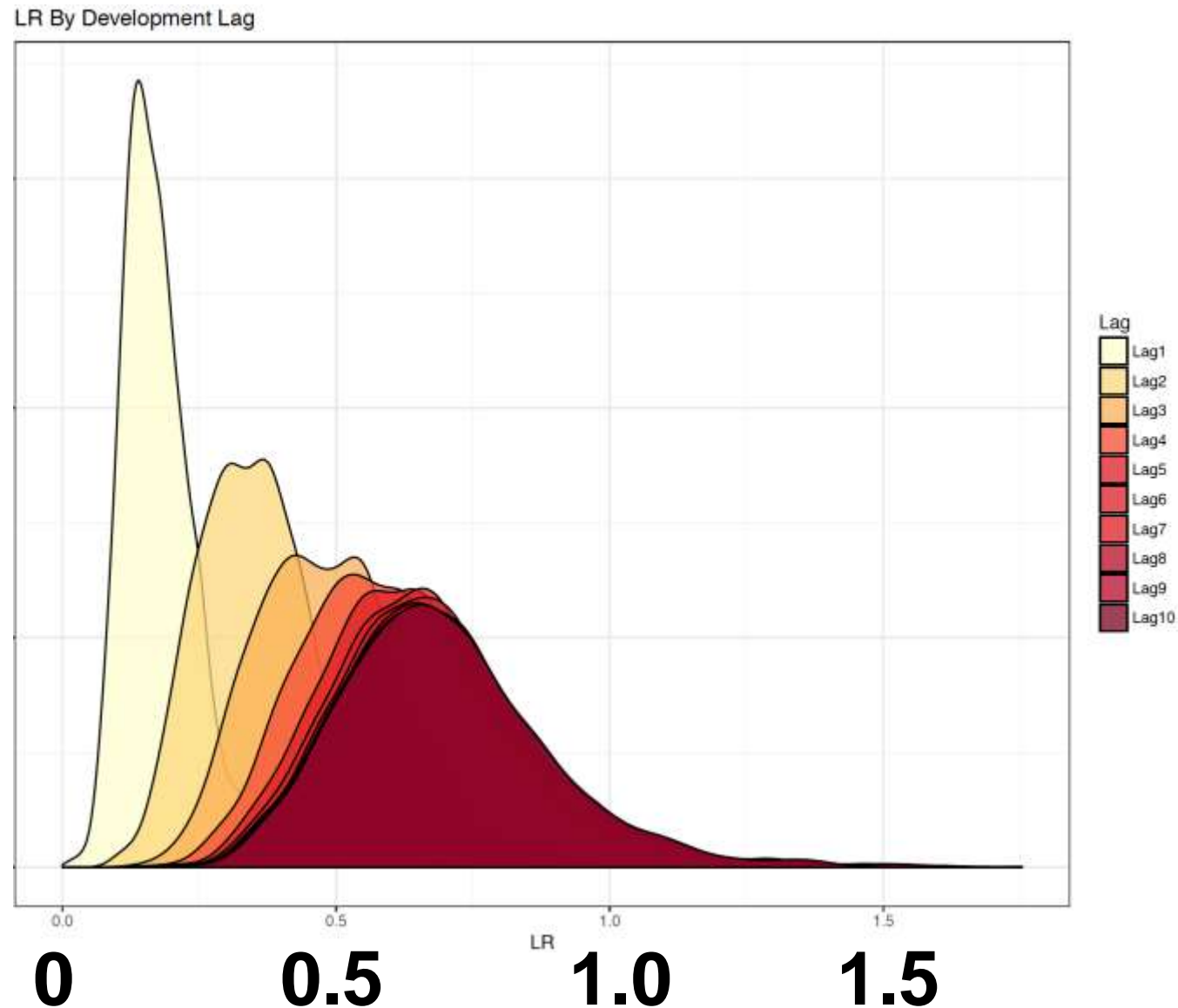
Primer on SLR –

But what if we were in 1998? Complete the trajectories

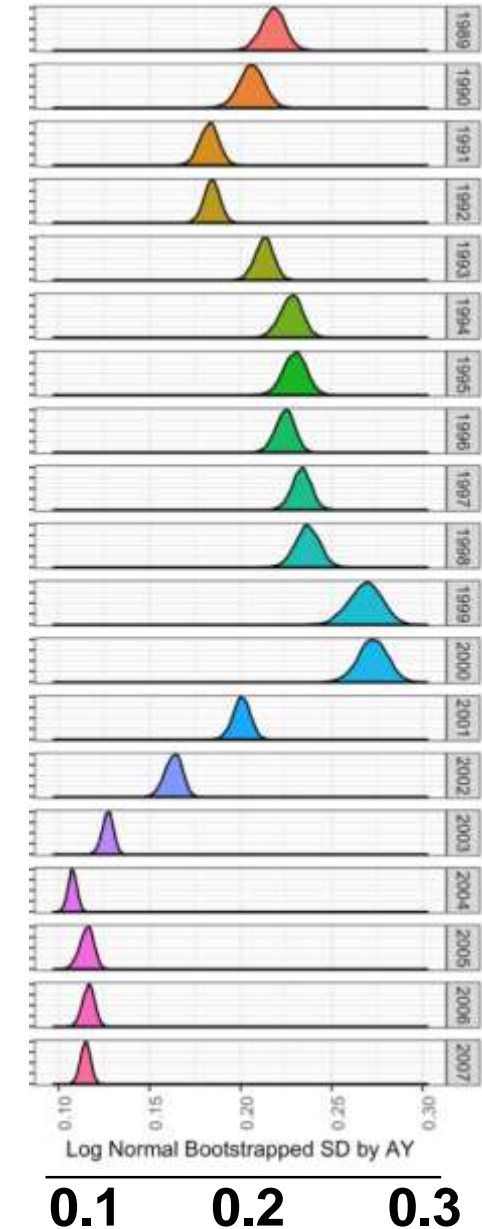
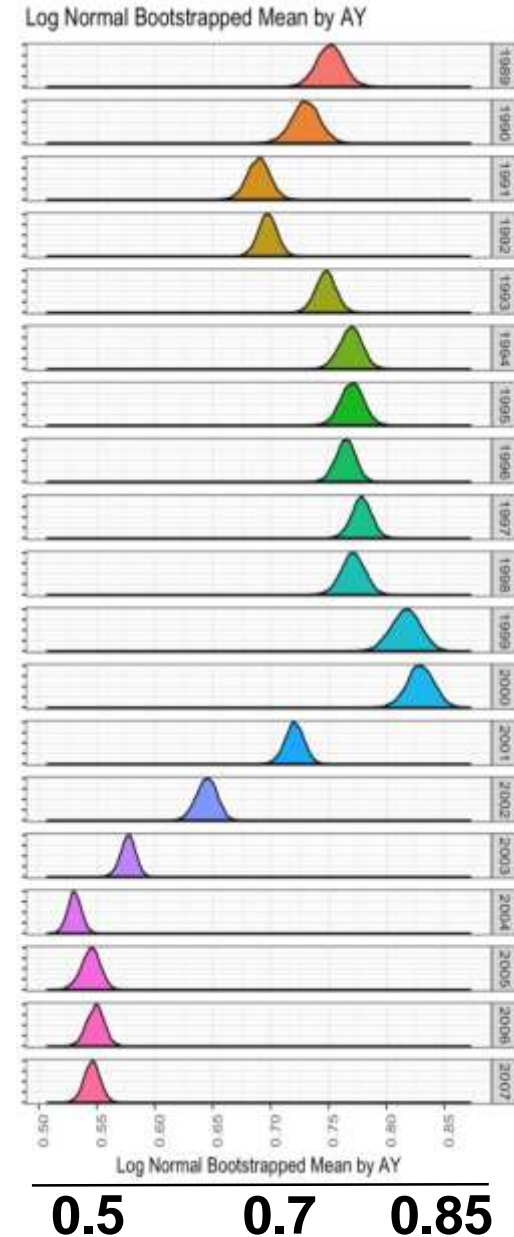
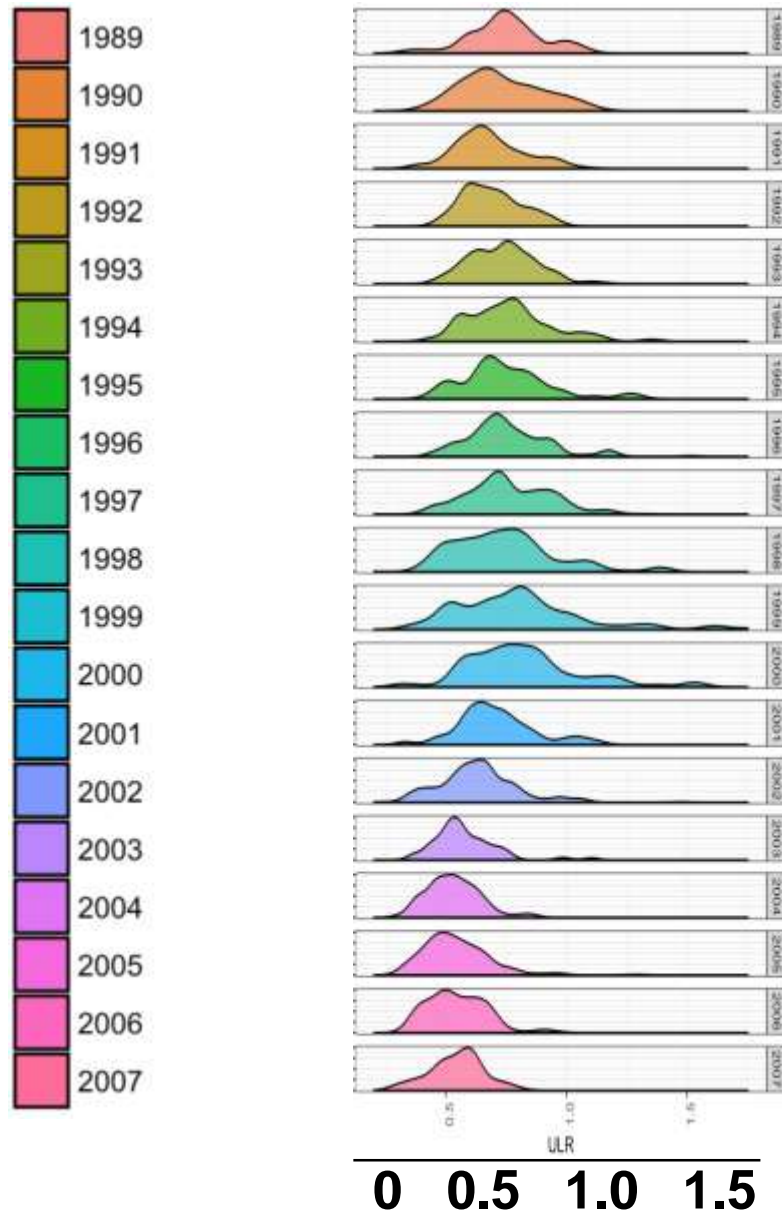


Loss Development EDA

The Convergence of LR Predictive Distribution by Development Year



Industry LR by Accident Year – 1989-2007



ML Approaches

1. GLMs
2. Random Forests
3. Gradient Boosted Machines
4. XGBoost
5. Artificial Neural Networks

Performance – ML versus conventional methods

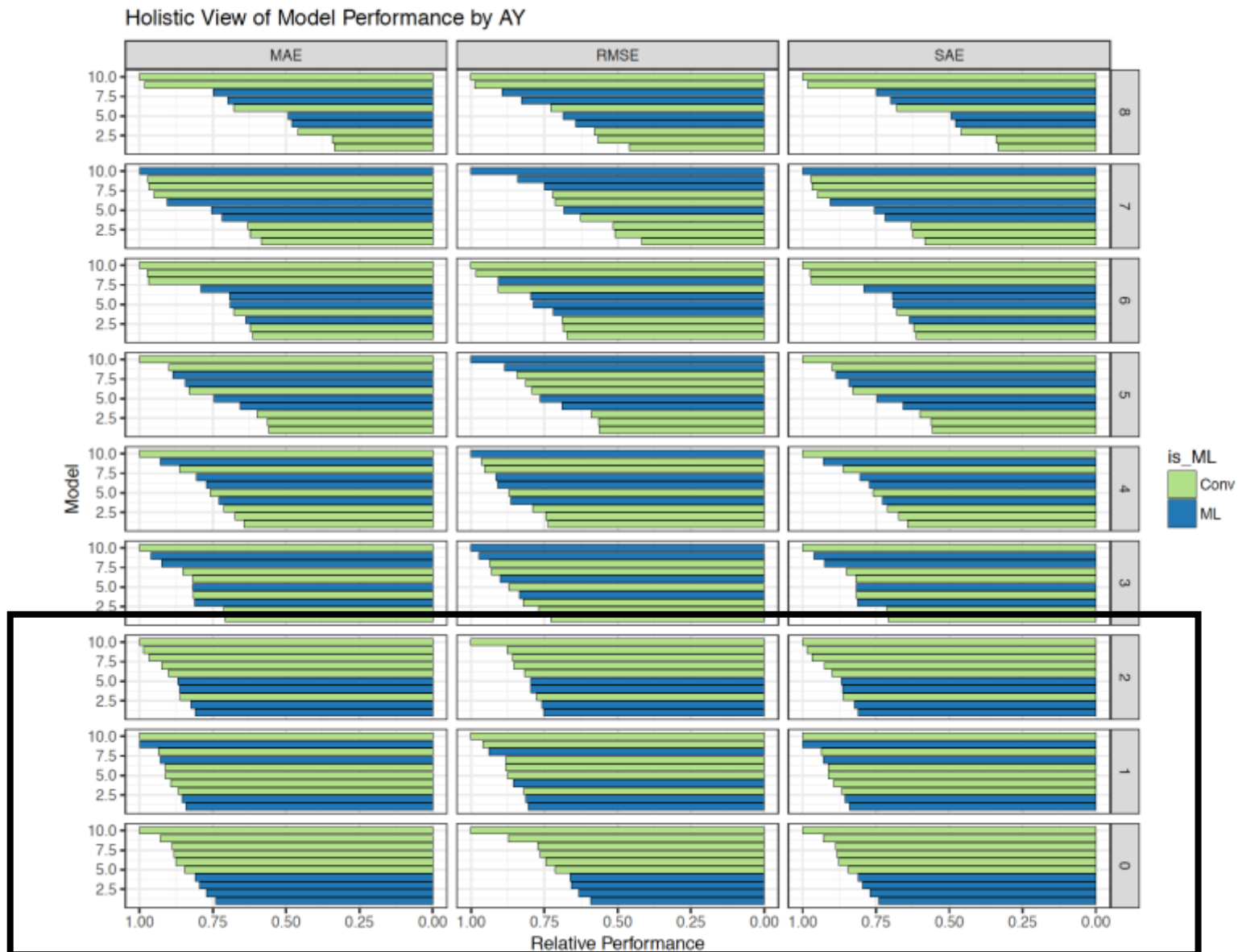
Performance Metric

↓

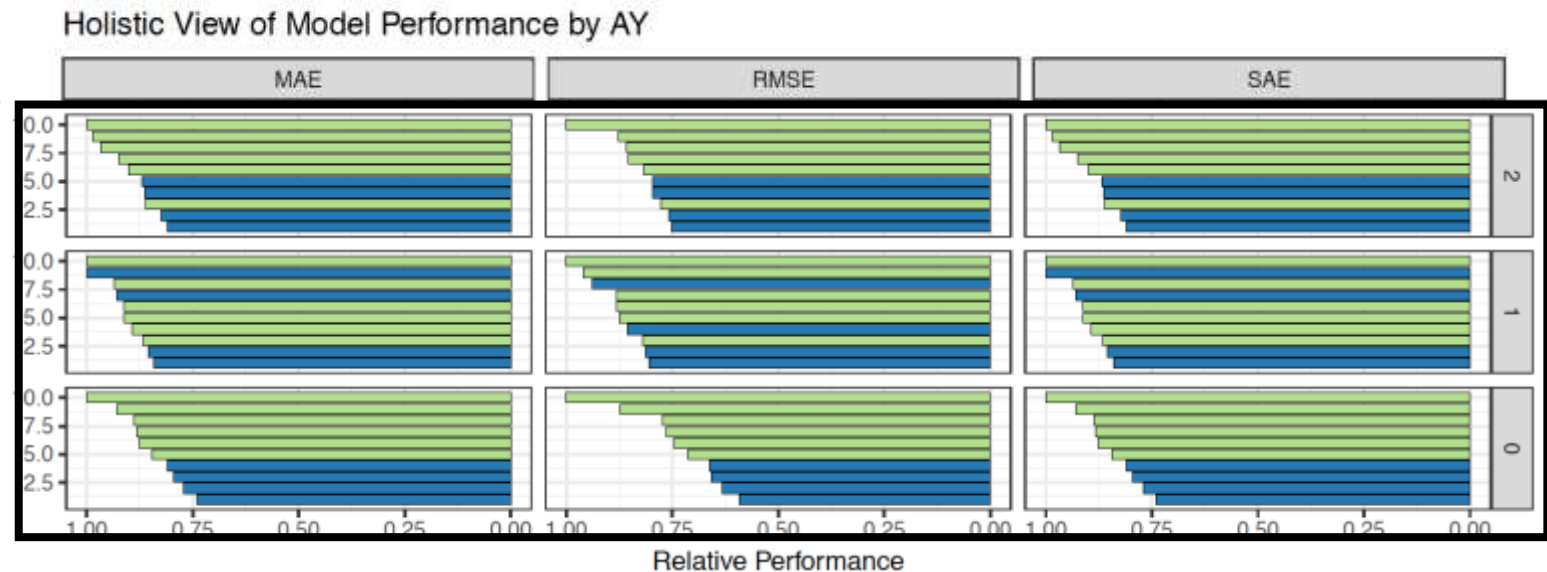
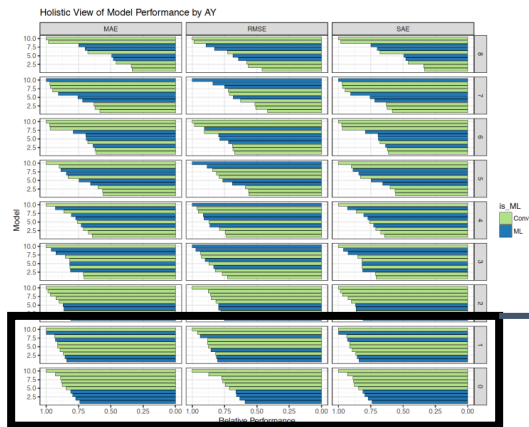
	MAE	RMSE	SAE
Accident Year →			

ASC Rank ordered models

Performance – ML versus conventional methods

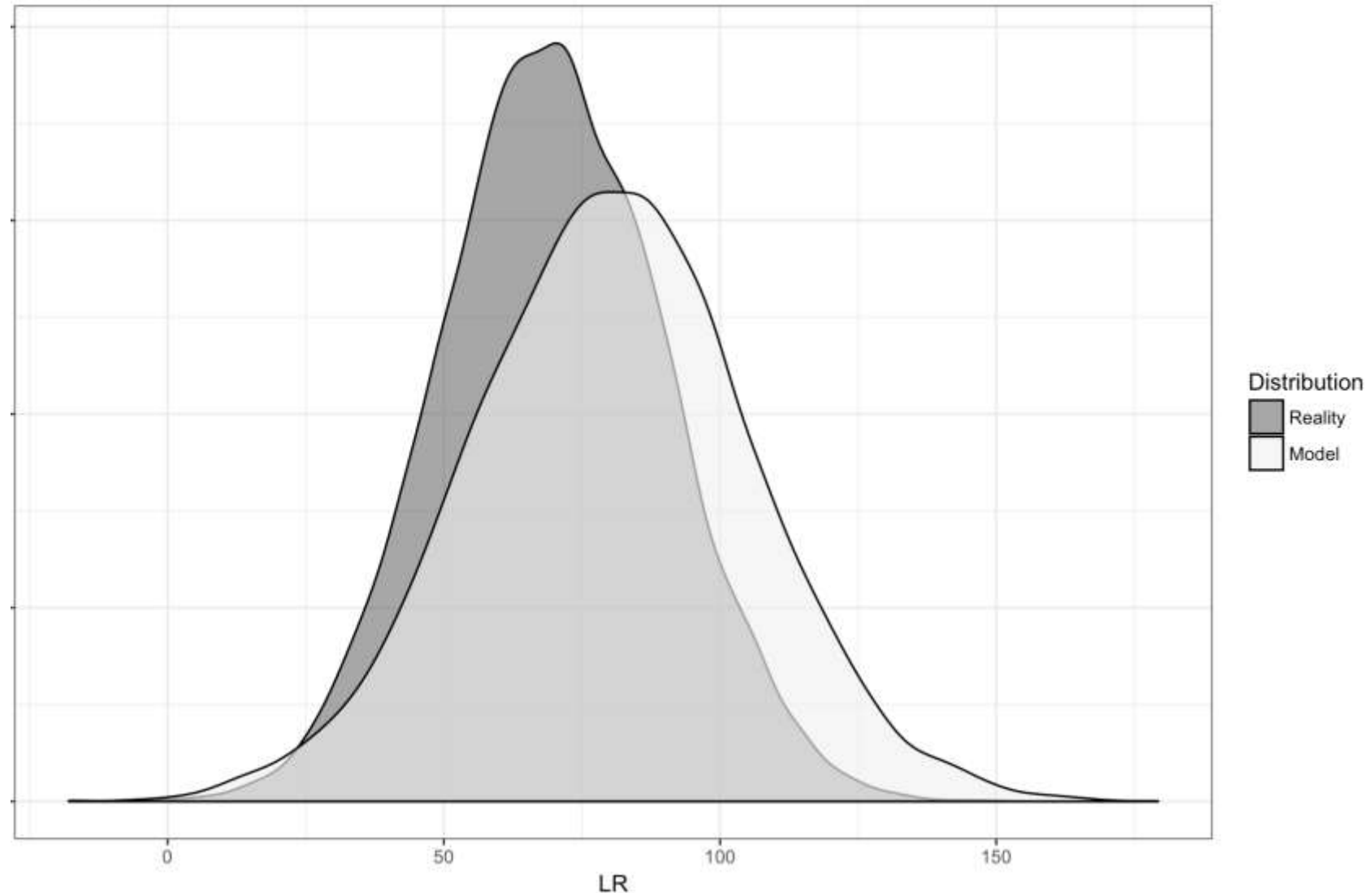


Performance – ML approaches dominate in most important areas



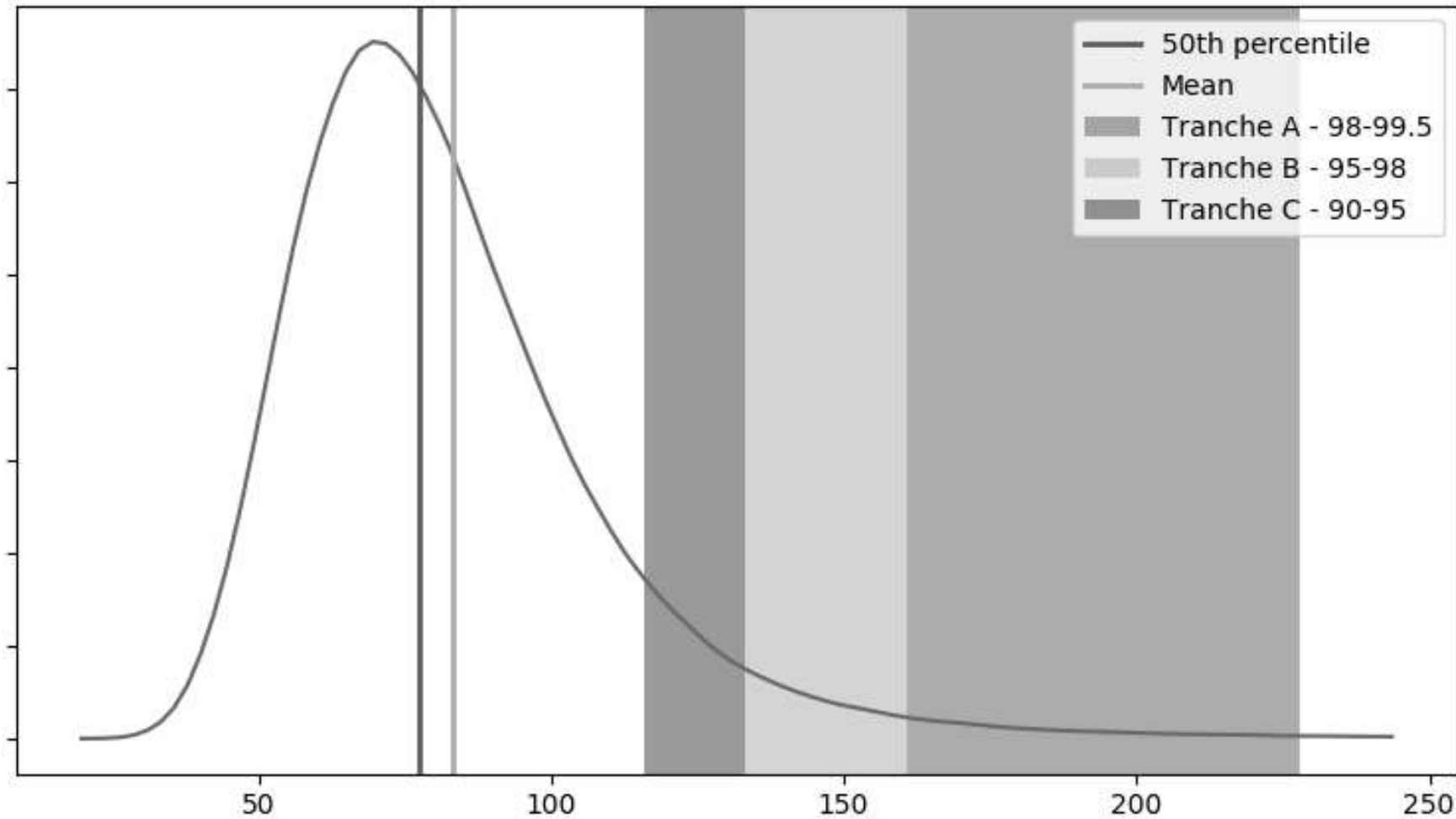
Performance – we need the predictive distribution, not just the expected value

Reality vs Model Predictive Distribution



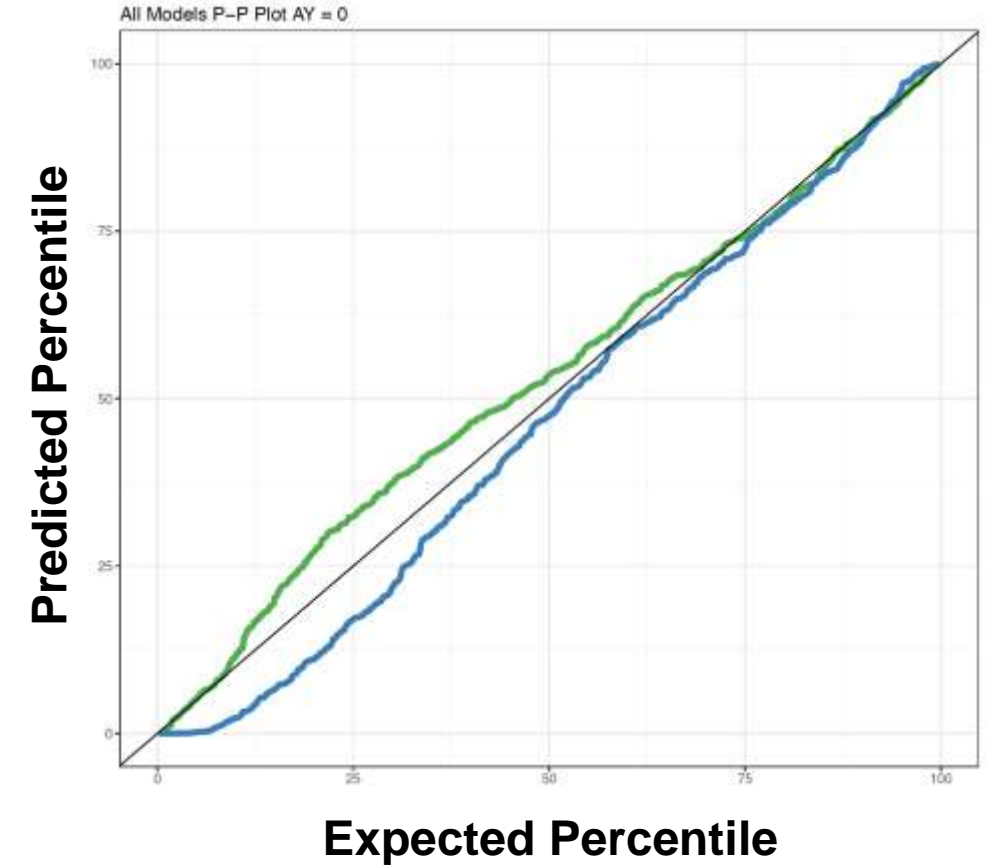
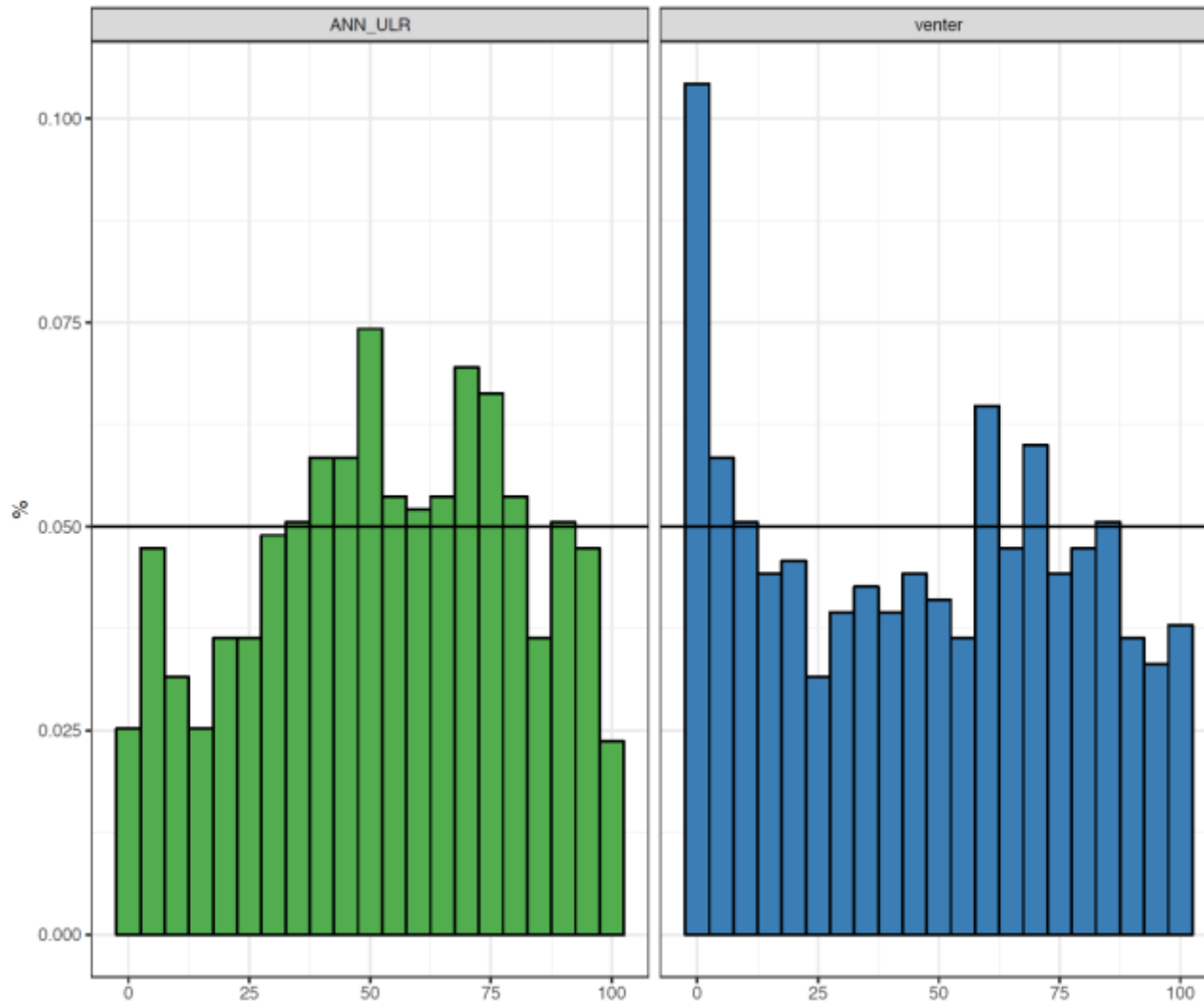
How investors use these results

Risk-return tradeoffs based on probabilities



Performance – are the percentiles of our predictive distribution uniformly distributed?

Best ML* Method ■ Best Conventional Method ■



Why we chose H₂O

What makes this group so unique



