2022 Case Competition: Bruin Mutual
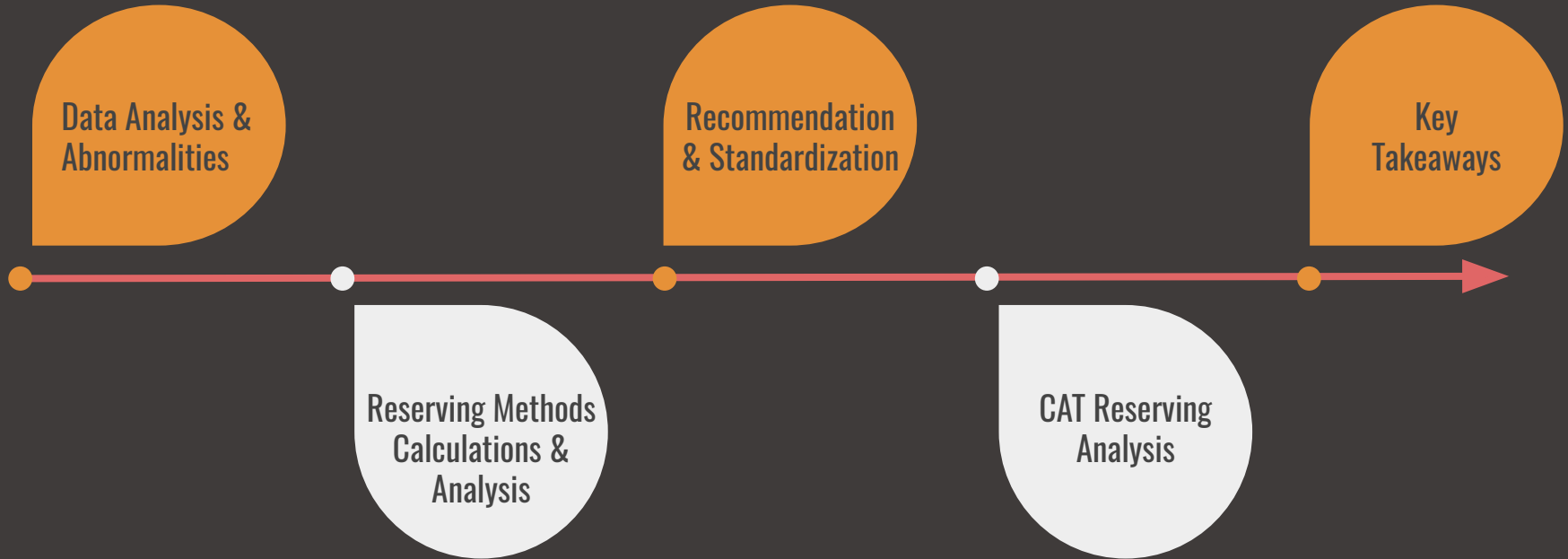
Team 11 - Tracy C., Minju K., Shannon L., Susanna T.

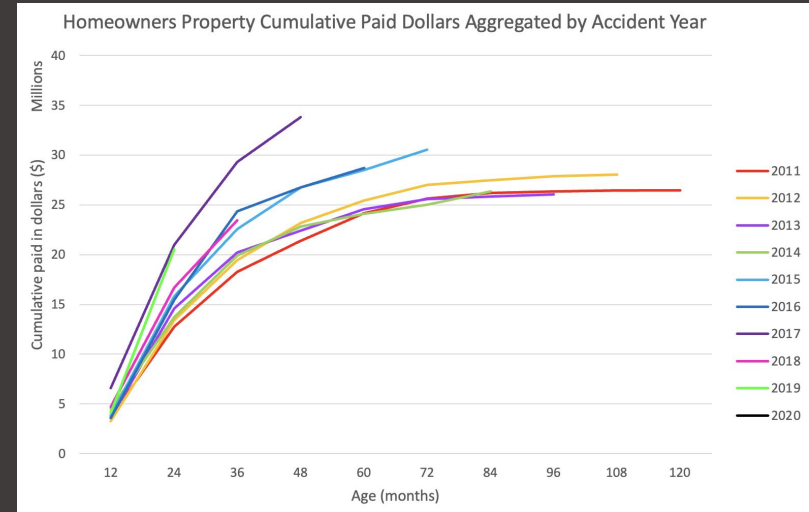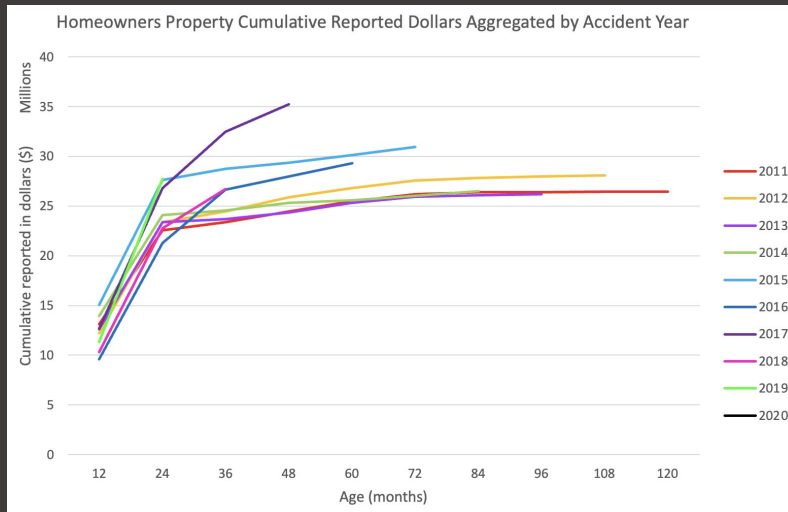# Agenda

Data Analysis & Abnormalities

Reserving Methods Calculations & Analysis

Recommendation & Standardization

CAT Reserving Analysis

Key Takeaways

Data Analysis & Abnormalities

Data Analysis & Abnormalities
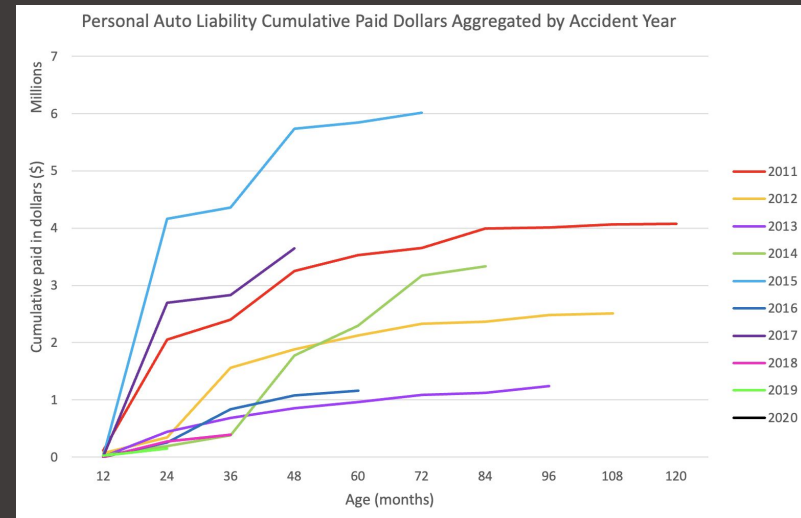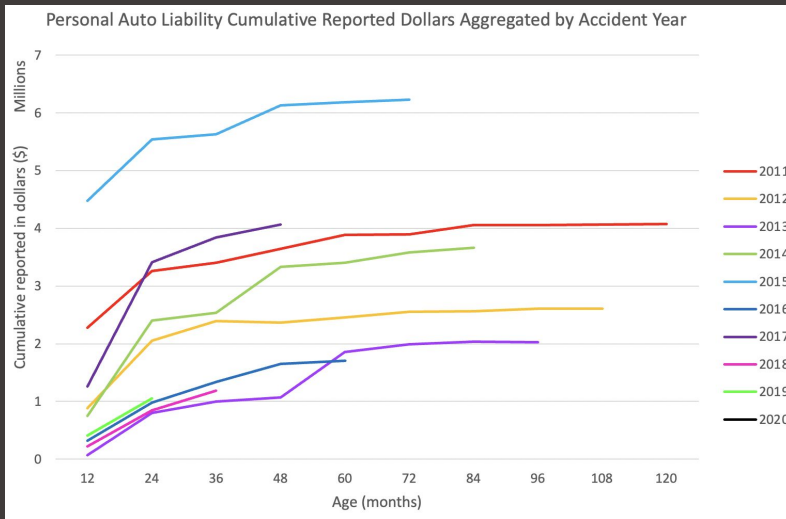
Homeowners Property
- Similar trends across different AYs
  - Rapid increase in the loss with the first year
  - Continuous gradual increase after the first year
- Abnormalities in 2017

Homeowners Property Cumulative Reported Dollars Aggregated by Accident Year

Homeowners Property Cumulative Paid Dollars Aggregated by Accident Year

4
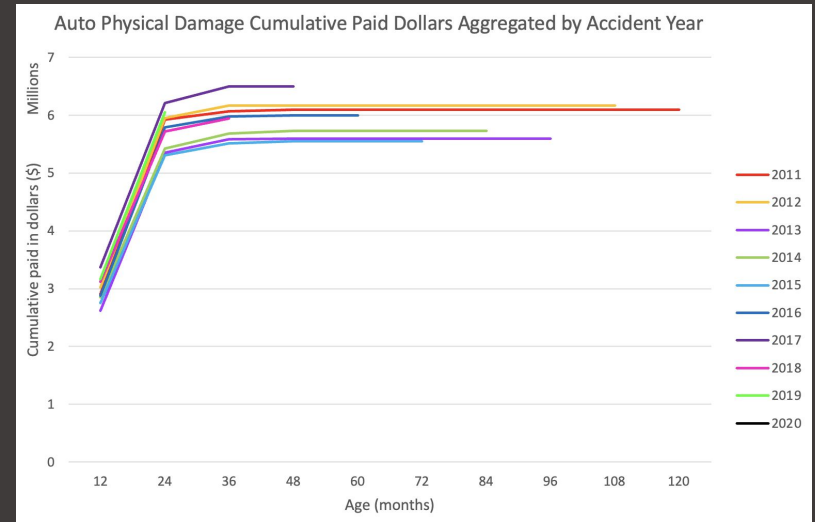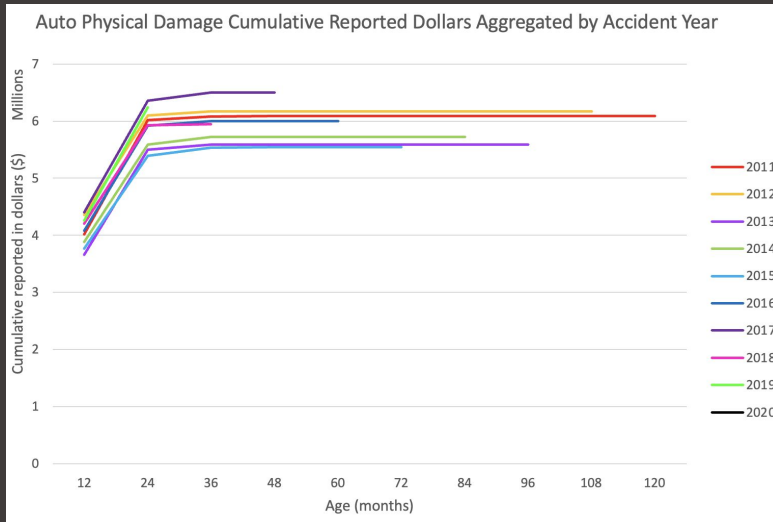
Data Analysis & Abnormalities

Personal Auto Liability
- Inconsistent and fluctuating across different AYs
  - Rapid increase in the loss with the first year
- Abnormalities in 2015

Personal Auto Liability Cumulative Reported Dollars Aggregated by Accident Year

Personal Auto Liability Cumulative Paid Dollars Aggregated by Accident Year

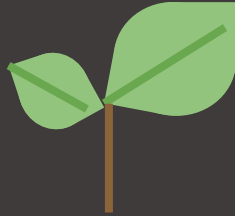# Data Analysis & Abnormalities

Personal Auto Physical Damage
- Similar trends across different AYs
  - Rapid increase in the loss with the first year
  - Gradually levels off after the first year

Auto Physical Damage Cumulative Reported Dollars Aggregated by Accident Year

Auto Physical Damage Cumulative Paid Dollars Aggregated by Accident Year

Reserving Method Calculations & Analysis

Assumptions

Changing Environment

Average										
Simple Average										
Latest 3	2.256	1.212	1.053	1.027	1.023	1.010	1.003	1.003	1.000	
Selected	2.256	1.212	1.053	1.027	1.023	1.010	1.003	1.003	1.000	1.000

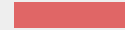**Selected Averages for the Age-to-Age Factors and Tail Factors**

$$Selected\ Loss\ Ratio = \frac{Total\ Initial\ Selected\ Ultimate\ Claims}{Total\ Earned\ Premium}$$

Selected Loss Ratio Formula

Chain Ladder Method

- **Simple & reliable with stable environment and consistent historical data**

- **Heavily reliant on historical data with no consideration of risk theory**
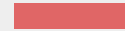
Accident Year	Projected Ultimate Losses ($000)					
	Auto Physdam		Auto Liability		Homeowners Prop	
	Reported	Paid	Reported	Paid	Reported	Paid
2011	6,093	6,093	4,075	4,077	26,466	26,458
2012	6,167	6,167	2,614	2,518	28,102	28,051
2013	5,594	5,594	2,029	1,258	26,281	26,038
2014	5,728	5,728	3,692	3,564	26,693	26,372
2015	5,537	5,547	6,375	6,639	31,472	30,549
2016	6,001	6,001	1,823	1,515	30,497	28,730
2017	6,502	6,502	4,437	5,358	37,703	33,913
2018	5,947	5,962	1,463	749	30,061	23,726
2019	6,325	6,308	1,678	564	37,815	22,084
2020	6,727	6,742	1,660	7,658	40,890	11,049
Total	**60,631**	**60,643**	**29,847**	**33,899**	**315,980**	**256,971**

Chain Ladder Method

Expected Method

- **Maintains stability over time, as actual claim data is not used**

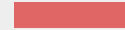- **Requires priori estimate with accurate ELR**

Accident Year	Projected Ultimate Losses ($000)		
	Auto Physdam	Auto Liability	Homeowners Prop
2011	5,723	2,916	20,944
2012	6,704	3,029	25,504
2013	5,630	2,789	24,503
2014	5,854	3,035	25,100
2015	5,723	2,843	27,960
2016	5,780	3,425	28,175
2017	6,674	3,502	32,759
2018	5,562	3,153	32,549
2019	6,754	2,497	34,548
2020	6,231	3,684	34,433
Total	**60,637**	**31,873**	**286,475**

Expected Method

Bornhuetter-Ferguson Method

- **Weighted combination of Chain Ladder and Expected methods**

- **Requires reasonable development patterns and accurate priori estimates**

Accident Year	Projected Ultimate Losses ($000)					
	Auto Physdam		Auto Liability		Homeowners Prop	
	Reported	*Paid*	*Reported*	*Paid*	*Reported*	*Paid*
2011	6,093	6,093	4,074	4,075	26,465	26,458
2012	6,167	6,167	2,615	2,519	28,100	28,051
2013	5,594	5,594	2,031	1,281	26,274	26,039
2014	5,728	5,728	3,688	3,530	26,682	26,372
2015	5,547	5,547	6,297	6,282	31,412	30,549
2016	6,001	6,001	1,927	1,960	30,407	28,730
2017	6,501	6,502	4,358	4,764	37,383	33,910
2018	5,947	5,943	1,779	1,895	30,338	23,823
2019	6,331	6,051	2,359	2,704	36,943	22,962
2020	6,571	3,472	3,269	3,692	36,532	21,610
Total	**60,480**	**57,097**	**32,398**	**32,702**	**310,537**	**268,505**

Bornhuetter-Ferguson Method

Cape Cod Method

- **Variability in losses at early maturities do not significantly skew estimates**

- **Highly dependent on a constant loss exposure and an accurate ELR**

Accident Year	Projected Ultimate Losses ($000)		
	Auto Physdam	Auto Liability	Homeowners Prop
2011	6,093	4,075	26,465
2012	6,167	2,615	28,102
2013	5,594	2,031	26,283
2014	5,728	3,688	26,699
2015	5,547	6,298	31,458
2016	6,001	1,931	30,514
2017	6,502	4,364	37,590
2018	5,947	1,790	30,692
2019	6,331	2,385	37,843
2020	6,566	3,328	38,801
Total	**60,475**	**32,506**	**314,448**

Cape Cod Method

Recommendations & Standardization

Accident Year	Ultimate Loss Selections ($) for		
	Auto Physdam	**Auto Liability**	**Homeowners Prop**
2011	6,093,005.04	4,075,202.45	26,467,240.97
2012	6,167,101,82	2,576,402.25	28,091,633.06
2013	5,594,091.84	1,726,270.90	26,251,736.20
2014	5,727,696.43	3,632,517.81	26,735,559.58
2015	5,547,188.08	6,378,235.02	31,623,721.67
2016	6,000,913.12	1,831,354.14	30,904,648.57
2017	6,501,639.72	4,656,282.02	38,301,891.37
2018	5,952,411.07	1,535,039.32	31,128,096.70
2019	6,324,123.81	1,937,772.81	38,658,010.38
2020	6,620,224.86	3,921,467.68	40,970,167.56
Total	**60,528,395.79**	**32,270,544.40**	**319,132,706.06**

Recommendation

Ultimate loss selection

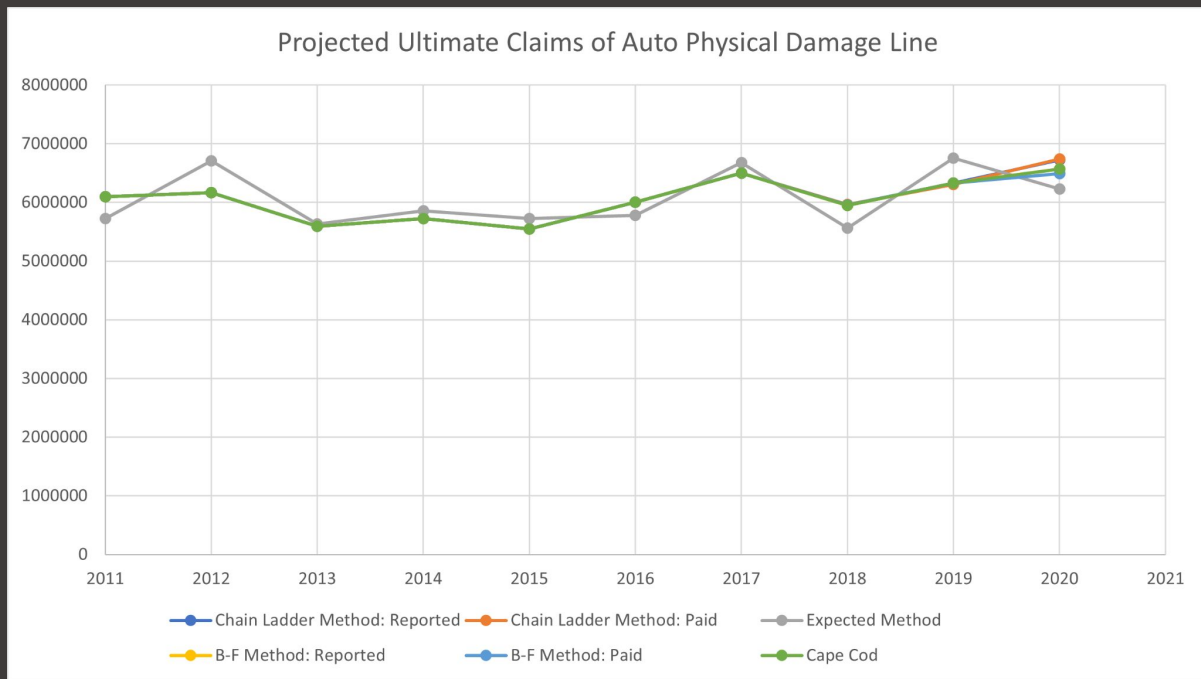Average of the three reserving methods (excluding Expected method)

Standardization

Auto Physical Damage Cumulative Reported Dollars Aggregated by Accident Year
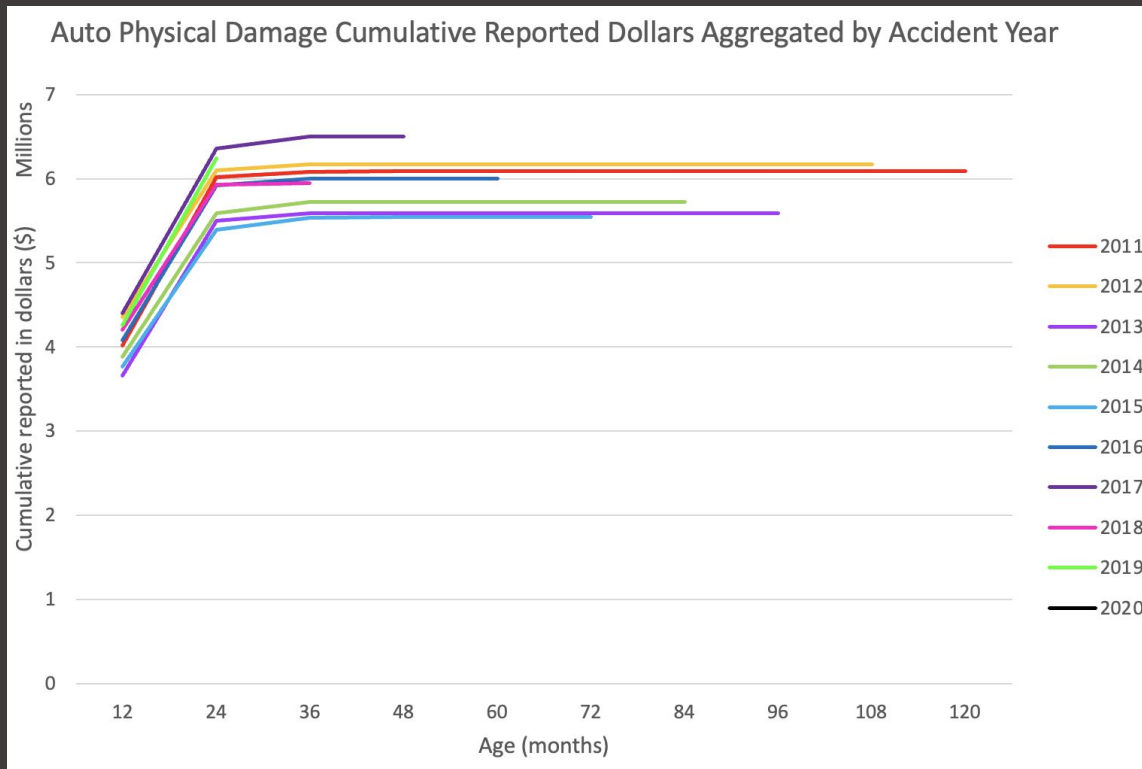
LoB: Auto Physical Damage

1) Similar trends for all accident years

Standardization

Projected Ultimate Claims of Auto Physical Damage Line

LoB: Auto Physical Damage

2) Least variability across methods

Chain Ladder Method

Bornhuetter-Ferguson Method

Expected Method
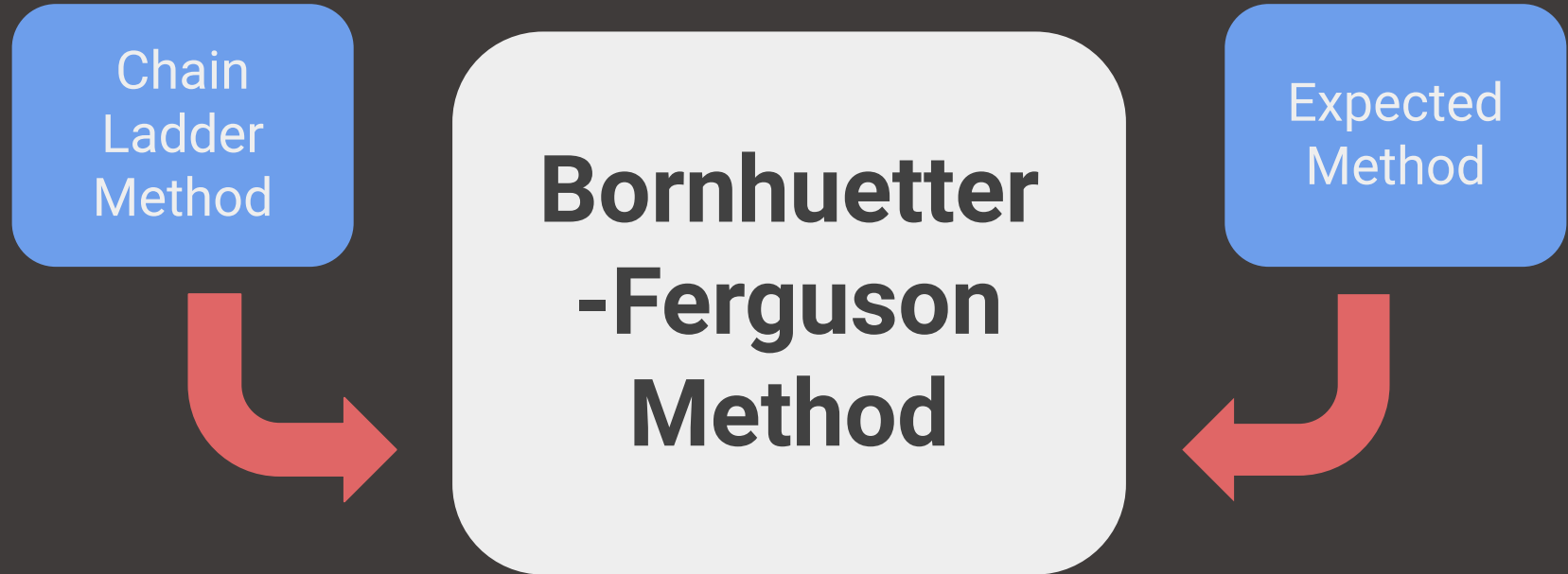
CAT Reserving Analysis

CAT Reserving Analysis: A Separate Process

CAT Reserves

Catastrophe Reserve Methods

1

Distinction from xCAT
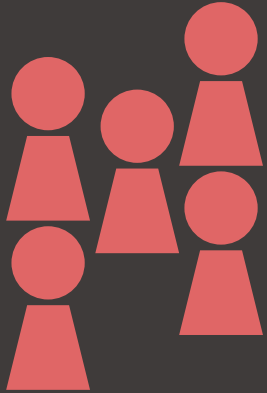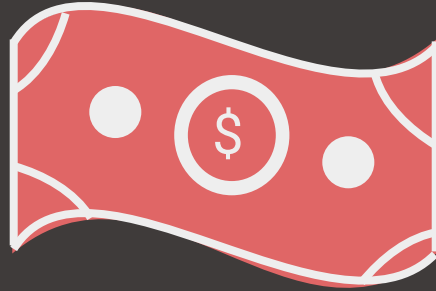
Why do we need to separate?

2

Disadvantages

Brings on many challenges

- Intrinsically tied to why it's separated

3

??

CAT Reserving Analysis: Challenges

Influx of Claims

Expensive

Unpredictable

Key Takeaways

Key Takeaways

Recommendation

- Simple average of Chain Ladder, B-F, and Cape Cod

Standardization

- Auto Physical Damage
- B-F Method

CAT Reserving Challenges

- Quantity
- Quality
- Unpredictability

Thank you!

Appendix

Projected Ultimate Claims of Homeowners Property Line

Projected Ultimate Claims of Auto Liability Line

Projected Ultimate Claims of Auto Physical Damage Line