

Claim Reserves

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Overview

- **Definitions and Methods**
- **Reserve Cycle**
- **Common Reserving Challenges**
- **Resources**
- **Dental Case Study**

Definitions

- **Valuation Date**: date at which reserves are estimated.
- **Incurred Date**: date at which event that establishes a reserve or liability occurs (Date of Disability, Date of Admission, etc...).
- **Reporting Date**: date at which claim is reported (may be claim receipt date or claim adjudication date).
- **Payment Date**: date at which payment is made on a claim (check date).
- **Lag**: Period of time between two dates (Payment lag is time between incurred date and payment date).

Reserve for Unpaid Claims – Common Methods

Reserve Methods	General Uses	Pitfalls
Lag or Development Method	Historical lag data available, sufficient volume of business	Significant changes in claims processing, large claims
Tabular Method	LTC, Disability	Can only be applied to reported claims
Loss Ratio	Limited lag and exposure data New blocks of business	Assumes that the Loss Ratio is appropriate
Projection	Most recent months experience	Seasonality, trend changes
Average Claim Size	Estimated Report but Not Paid Claims	Need inventory report

Reserve for Unpaid Claims – Lag Method (continued)

- Things to look for:
 - Large Claims
 - Changes in Inventory
 - Faster Claim Payments

- Other Things to look for:
 - How are recoveries handled?
 - Percentage of OON providers.
 - Change in administrative processes
 - How many check runs in a given month?
 - Reimbursement Increases

Reserve for Unpaid Claims – Projection Method

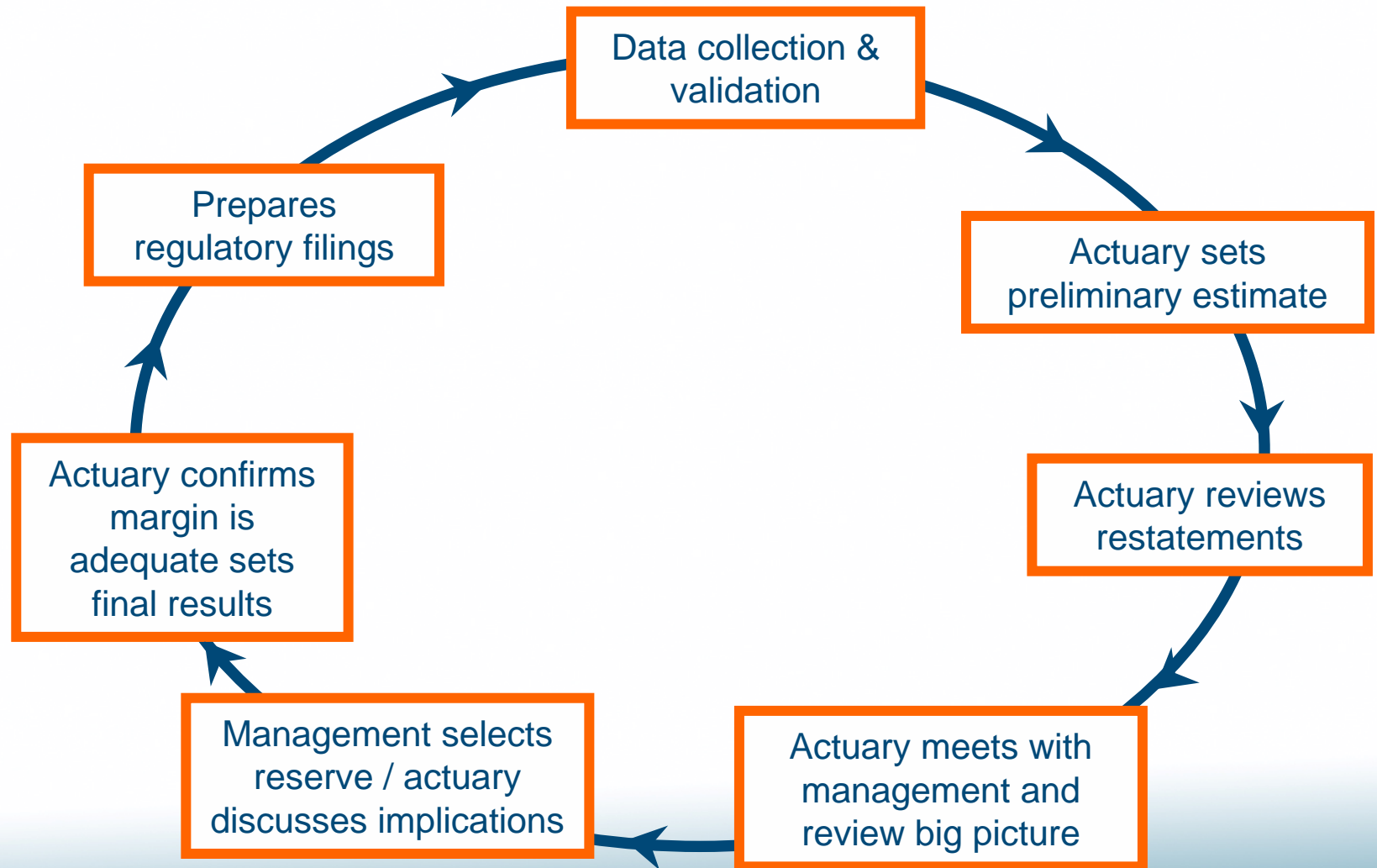
Why not use lag method for all months?

- Latest months of data may not be credible
 - Low CFs
 - Can Use other methods such as:
 - Projection PMPM
 - Loss Ratio
 - Regression
 - Simulation

Reserve for Unpaid Claims - Projection PMPM Method

- Calculate base PMPM using months for which CFs are credible (e.g.: >90% complete)
- Trend
- Seasonality
- Completion Factors – Reasonable compared to historical experience?

The Reserve Cycle



The Reserve Cycle

- Data Collection

General Data Requirements

- Lag Data
- Enrollment
- Premium
- Financials
- Other Supporting Data Sources

The Reserve Cycle

- Data Collection: Other Supporting Data Sources

Other Supporting Data Sources

- Large Claims
- Changes in Inventory
- Pending Claims

- Make sure to know if claims include:
 - C.O.B.
 - Subrogation
 - Network Access Fees
 - Withholds
 - Capitation Payments

The Reserve Cycle

- Data Validation

- GL Paid Claims, Check Register Paid Claims
- Adjustments for manual entries
- Comparison by Paid Month
- Tolerance varies but most would like to see unexplained variance < 1%

ABC Company, Inc.			
Paid Claim Reconciliation			
(000s)			
Month	Lag	Ledger	Difference
Jan	\$ 950	\$ 1,000	(5.0%)
Feb	\$ 990	\$ 990	0.0%
Mar	\$ 1,050	\$ 1,010	4.0%
Total	\$ 2,990	\$ 3,000	(0.3%)

The Reserve Cycle

- Data Validation

- Common Data Issues
 - Differences with financials
 - Claims backlog for reserve cells or providers
 - Encounter claims included with in the lag data
 - Lag data is not sufficiently divided
 - Lag data is based on adjudicated date, not 'paid'

Common Reserving Challenges

- Claims Backlog

- Completion factors developed from the Lag Method no longer valid.
- Discuss with client status timing of claims backlog, and catch-up status as of the valuation date.
- Example – Backlog for provider due to contractual issue (Approximately 40% of normal paid claims):

<u>Paid</u> <u>Month</u>	<u>Incurred Month</u>											
	<u>Dec-2006</u>	<u>Jan-2007</u>	<u>Feb-2007</u>	<u>Mar-2007</u>	<u>Apr-2007</u>	<u>May-2007</u>	<u>Jun-2007</u>	<u>Jul-2007</u>	<u>Aug-2007</u>	<u>Sep-2007</u>	<u>Oct-2007</u>	<u>Nov-2007</u>
Nov-2007	20,930	517,932	1,196,462	2,114,224	1,936,186	2,205,394	1,753,666	1,580,765	1,436,171	98,498	251,838	45,868
Oct-2007	-894	2,166,419	990,974	183,235	200,846	123,380	150,704	156,363	191,545	205,550	0	
Sep-2007	129,534	1,045	120,560	3,123	575	100	155	233	0	0		
Aug-2007	353	824	0	255	42	0	690	0	0			
Jul-2007	3,873	694	-20	2,804	1,342	0	0	0				
Jun-2007	7,126	76,414	743	0	0	0	0					
May-2007	101,832	914	813	502	0	0						
Apr-2007	16,492	0	750	0	0							
Mar-2007	71,041	265	0	0								
Feb-2007	391,711	59,526	0									
Jan-2007	1,818,596	240										
Dec-2006	42,329											

Common Reserving Challenges

- Claims Backlog

- Development of Reserve Estimate
 - Develop incurred estimate using lag method for all other providers, assume percentage of incurred claims will remain stable for provider with backlog.
 - Use projection method to estimate PMPMs during backlog period.

Common Reserving Challenges

- Splitting Reserve Estimate

- Client requests a reserve estimate for the 2 populations – Actives and Retirees
- TPA cannot split the lag data between the 2 groups.
- Have monthly paid claims for both populations from financials.

Common Reserving Challenges

- Splitting Reserve Estimate

- Develop incurred estimate for combined populations.
- Split cumulative paid amounts by paid month percentages.
- Check for reasonableness by allocating claims based on age/sex curve.

<u>Paid Month</u>	<u>Paid Claims Split</u>		<u>Incurred Month</u>											
	<u>Actives</u>	<u>Retirees</u>	<u>Jan-07</u>	<u>Feb-07</u>	<u>Mar-07</u>	<u>Apr-07</u>	<u>May-07</u>	<u>Jun-07</u>	<u>Jul-07</u>	<u>Aug-07</u>	<u>Sep-07</u>	<u>Oct-07</u>	<u>Nov-07</u>	<u>Dec-07</u>
Dec-07	75.9%	24.1%	596	1,284	(1,659)	1,035	1,994	6,725	8,639	9,050	87,995	56,610	289,373	104,880
Nov-07	74.6%	25.4%	1,692	625	4,442	17,520	4,023	30,729	21,845	36,951	88,278	381,425	146,843	
Oct-07	79.4%	20.6%	788	2,377	21,124	3,986	18,019	22,258	69,090	123,936	489,828	171,764		
Sep-07	79.7%	20.3%	(18,539)	1,470	4,330	190,244	26,643	50,224	55,867	241,546	373,385			
Aug-07	79.8%	20.2%	7,981	3,473	45,968	22,893	89,846	415,685	420,540	243,115				
Jul-07	79.1%	20.9%	2,554	5,090	18,541	21,578	96,303	263,592	131,534					
Jun-07	80.1%	19.9%	12,444	34,238	49,778	198,465	435,123	132,540						
May-07	80.9%	19.1%	28,579	52,627	211,858	343,437	169,409							
Apr-07	80.6%	19.4%	86,228	180,962	321,463	61,556								
Mar-07	76.7%	23.3%	185,377	413,888	80,738									
Feb-07	68.6%	31.4%	169,123	15,115										
Jan-07	75.1%	24.9%	25,752											
Active Incurred			74.8%	78.0%	80.1%	80.2%	80.0%	79.4%	79.4%	79.3%	78.8%	76.1%	75.5%	75.9%
Retiree Incurred			25.2%	22.0%	19.9%	19.8%	20.0%	20.6%	20.6%	20.7%	21.2%	23.9%	24.5%	24.1%

Common Reserving Challenges

- Large Claims in Lag Data

- Can remove and set aside if have actual claims data.
- Obtain list of large pending claims from client.
- Choose completion factors that are not artificially low due to large claims.

MONTHS IN COMPLETION FACTOR AVERAGE							
Lag	12		9		6		3
Month	Mid 10	All	Mid7	All	Mid 4	All	All
0	0.1187	0.0588	0.1743	0.1047	0.1925	0.1065	0.1328
1	0.5151	0.3618	0.6043	0.3820	0.6111	0.3500	0.4963
2	0.7737	0.5754	0.8343	0.5826	0.8383	0.5570	0.5688
3	0.8724	0.6614	0.9057	0.6549	0.9213	0.6418	0.6845
4	0.9035	0.6847	0.9356	0.6767	0.9478	0.6587	0.6986
5	0.9572	0.7565	0.9682	0.7175	0.9802	0.7065	0.7109
6	0.9673	0.7942	0.9773	0.7623	0.9866	0.7681	0.8310
7	0.9773	0.8030	0.9863	0.7703	0.9967	0.7772	0.8379
8	0.9788	0.8030	0.9875	0.7703	0.9971	0.7772	0.8406
9	0.9836	0.8095	0.9928	0.7777	0.9981	0.7840	0.8536
10	0.9874	0.8637	0.9973	0.8466	0.9991	0.7850	0.8552
11	0.9897	0.9470	0.9993	0.9545	0.9998	0.9336	0.8556
12	0.9942	0.9536	0.9996	0.9545	0.9998	0.9336	0.8665
13	0.9963	0.9602	0.9998	0.9551	0.9999	0.9343	0.8713
14	0.9999	0.9997	0.9999	0.9997	0.9999	0.9997	0.9964
15	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9978
16	1.0000	0.9999	1.0000	0.9999	1.0000	0.9999	0.9983
17	1.0000	0.9999	1.0000	0.9999	1.0000	0.9999	0.9991
18	1.0000	0.9999	1.0000	0.9999	1.0000	0.9999	0.9993

Potential Resources for Reserving Actuaries

- “Gerbils on Espresso” (Contingencies Jan-Feb 2004, pp 28-38)
- SOA 10/31/2008 Paper - “Statistical Methods for Health Actuaries, IBNR Estimates”
- Milliman Health Cost Guidelines
 - Determining Age Gender Factors
 - Splitting one reserve triangle into multiple triangles
 - Reflect changes in demographics
 - Calculate impact on benefit design changes

Dental Reserve Case Study

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Case Study Overview

- Project Details
- Reserve Methodologies
- Error Testing

Project Details

Task

- Developed Reserve Model to:
 - Follow Standard Actuarial Practice
 - Minimize Error
 - Streamline Monthly Reporting
 - Provide Reasonable Estimates without Assistance

Data Characteristics

- Short Lag Times – Smaller Reserves
- Strong Seasonality – Decent Predictability
- High Frequency & Low Severity – Low Volatility

Reserve Methodologies

Selected Methodologies

- Chain-Ladder Completion Factors
- Incurred Claims Forecasting
 - Seasonality of PMPM or Loss Ratios
 - Inventory Levels

Chain-Ladder Methodology

- Standard Actuarial Approach
- Assumes Consistency in Payment Patterns
- Weak Predictor of Most Recent Months

Chain-Ladder Methodology

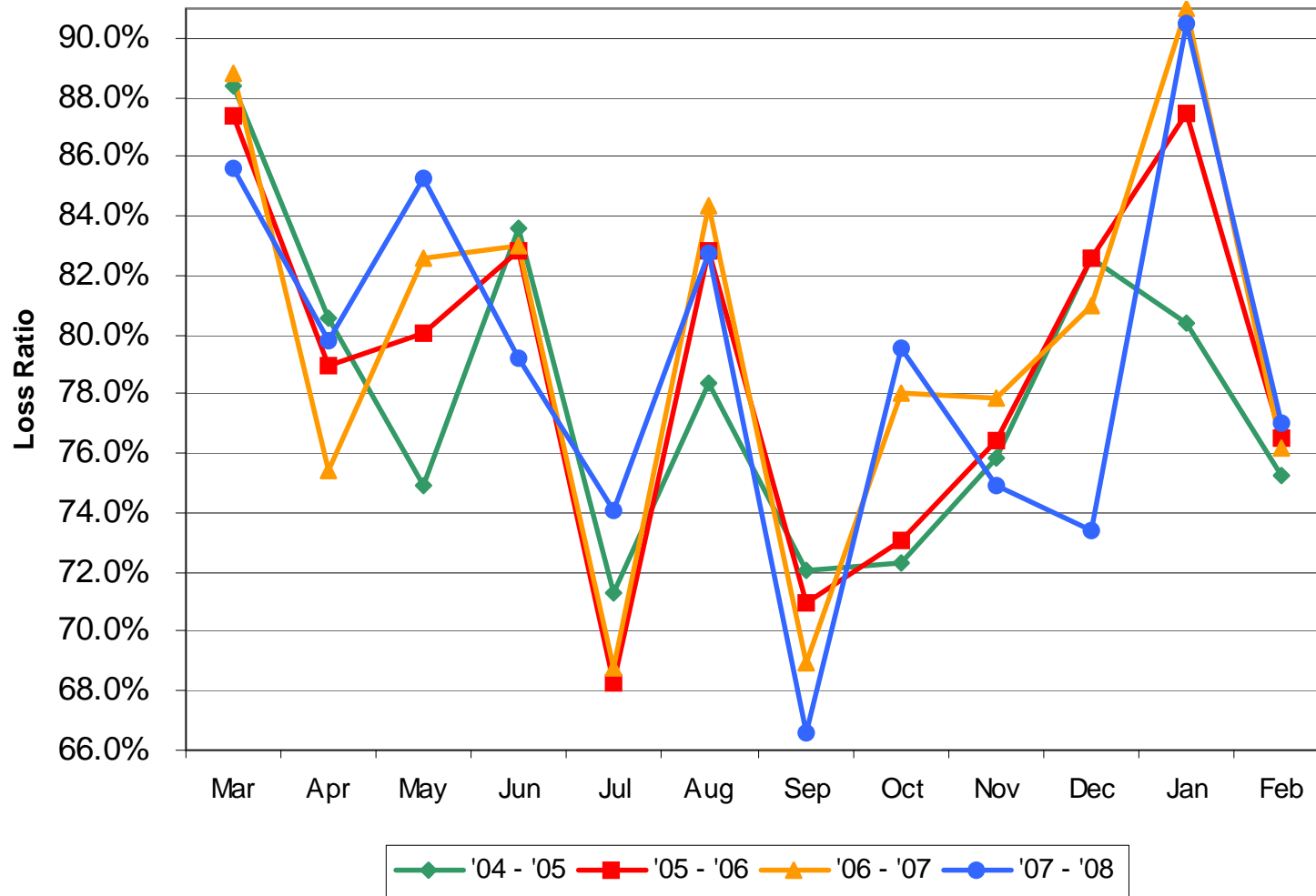
Lag Month	% Claims Paid
0	62%
1	90%
2	95%
3	97%
4	98%

- Shorter lag times than avg Medical Claims

Incurred Claims Forecasting

- Time Series Forecasting of PMPMs or LRs
 - Directly Predict Ultimate Incurred in Month
- Inventory Level as Additional Predictor
- Only Better than Chain-Ladder for Recent Months

Incurred Claims Forecasting



Recent Incurred Months

- Forecasting of LRs was the most accurate, but information still contained in
 - Payment Patterns (Chain-Ladder Method)
 - Inventory Levels
- In Normal Reserving, the information would be blended using “Actuarial Judgment”

Calculating Variance

- Incurred Claims Forecasting
 - Directly forecast the LR each month
 - Use the standard error of prediction

Calculating Variance

- Chain Ladder Methodology
 - Estimate Historic Completion Factors
 - Convert CFs into LRs (see next page)
 - Compute variance of LRs over last year for each lag month

Calculating Variance

- Convert CFs into LRs:
 - Complete Paid & Incurred Claims using Historical Lag₀ Completion Factors.
 - “Detrend” by removing such characteristics as:
 - Seasonality
 - Trend
 - Significant one-time payments

Calculating Variance

- Variance of a sample: $((X-E(X))^2) / (n-1)$
 - X = Naïve Estimate
 - $E(X)$ = Recast Reserve
 - n = # Months

Inverse Variance Weighting

- Weak Proxy for “Actuarial Judgment”
- First calculate variance of each method
- Give weight equal to inverse of variance

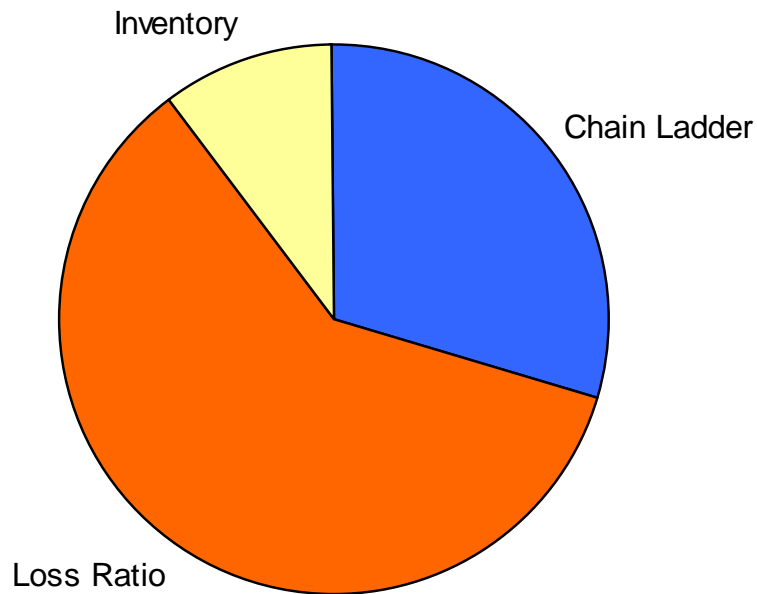
Inverse Variance Weighting

- Weighting for First Month

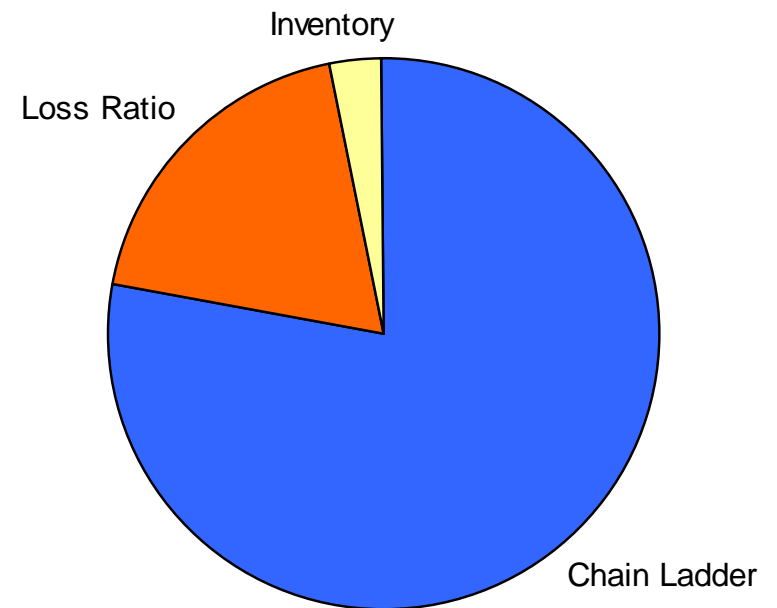
<u>Method</u>	<u>Inverse Variance</u>	<u>Weight</u>
Chain-Ladder	714	29%
Loss Ratios	1,549	62%
Inventory	232	9%

Inverse Variance Weighting

First Month



Second Month



Error Testing

Recast Reserve Error Testing

- Step Back in Time
- Compute Naïve Estimates for All Methods
- Compute Actual Paid after Valuation (Recast Reserve)

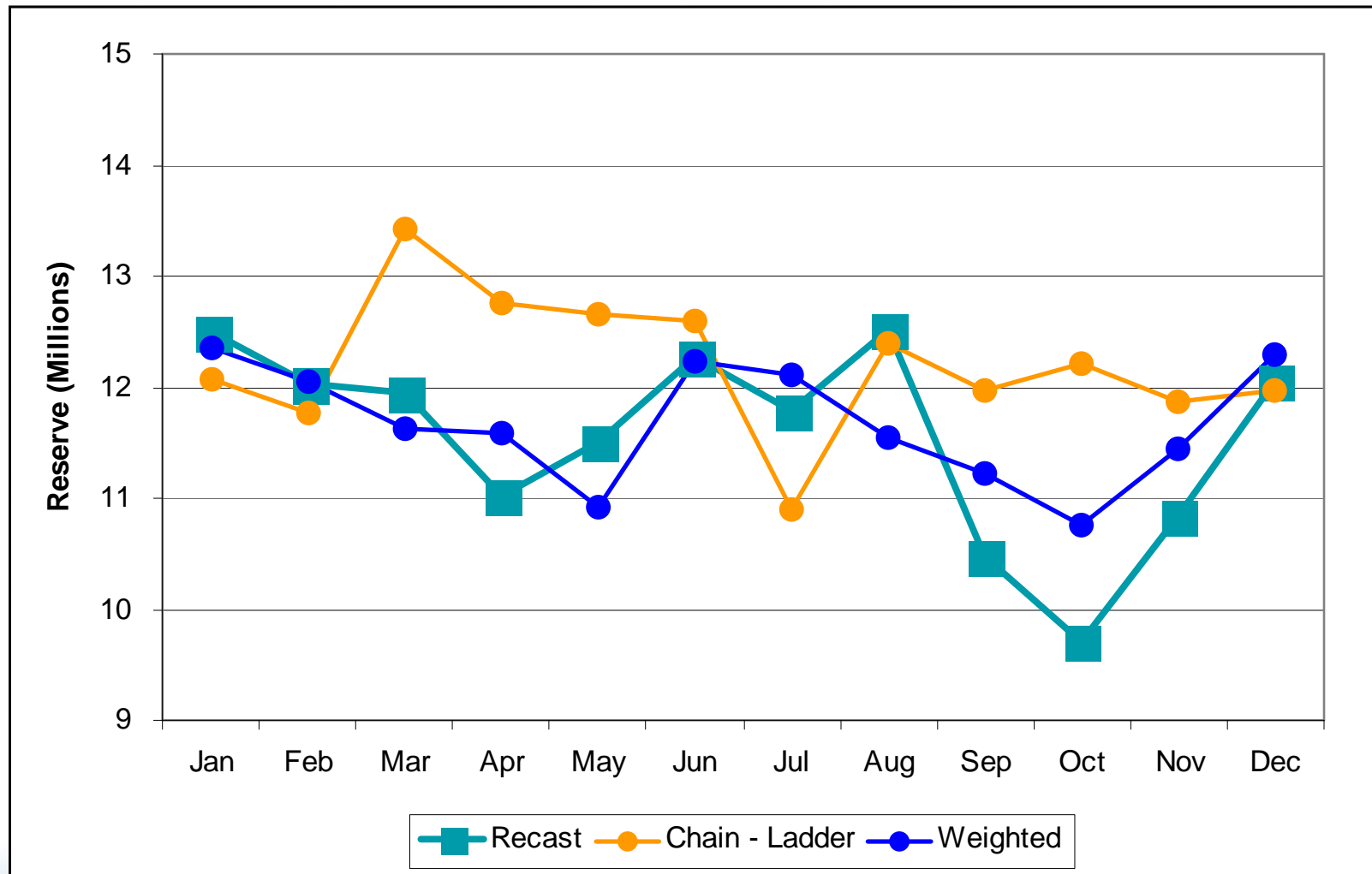
Naïve Estimates

- Step Back in Time
- Calculate reserve assuming no knowledge of future
- For incurred forecasting estimates, use chain-ladder results past first 2 lag months

Naïve Estimates

Month (2008)	Naïve (ie: Predicted, X)	Recast (ie: Actual, E(X))
January	3,200,000	3,000,000
February	3,200,000	3,400,000
March	2,900,000	2,900,000
April	3,400,000	3,300,000
May	3,300,000	3,200,000
June	3,600,000	3,400,000
.....

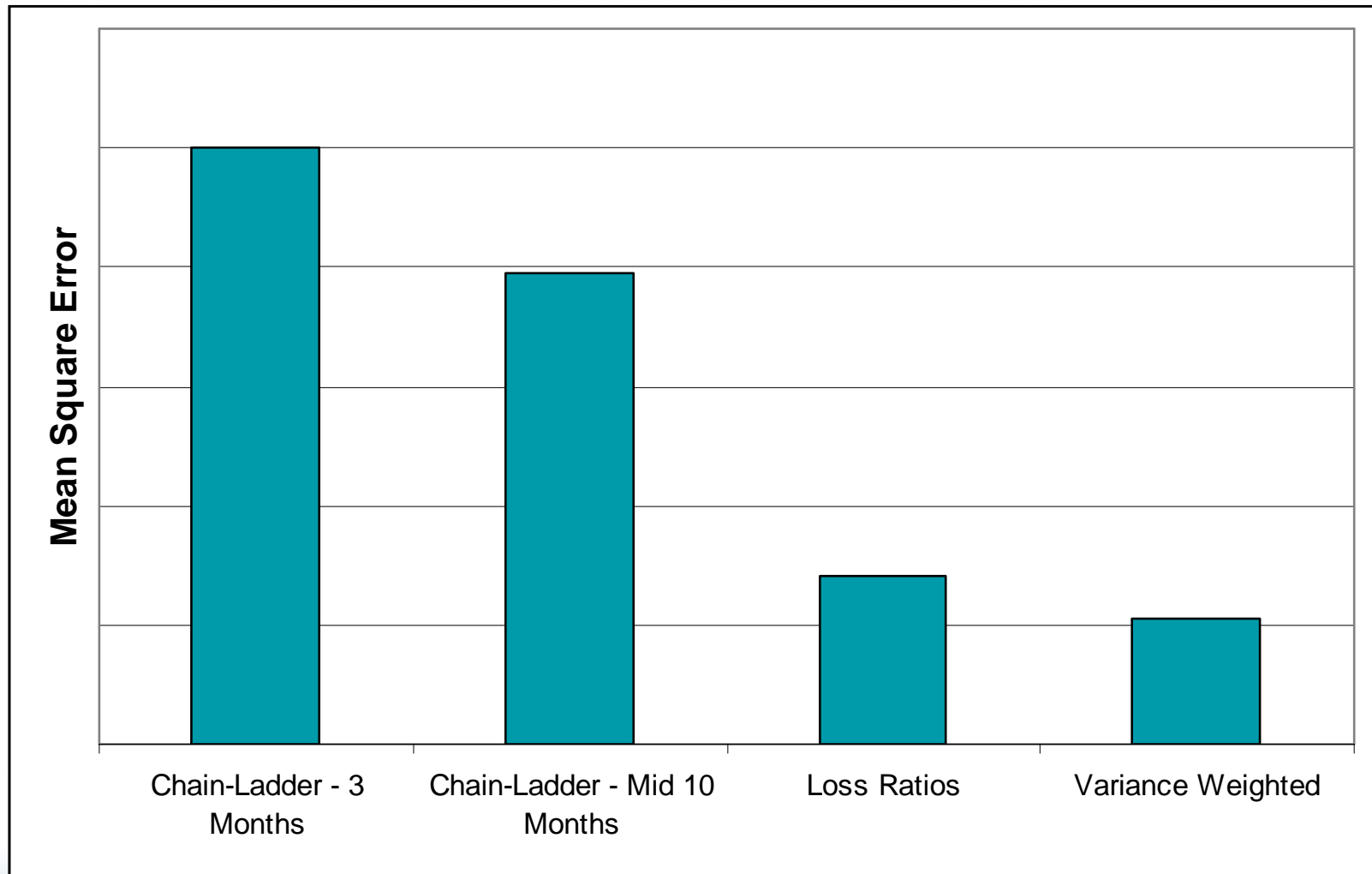
Historic Estimates



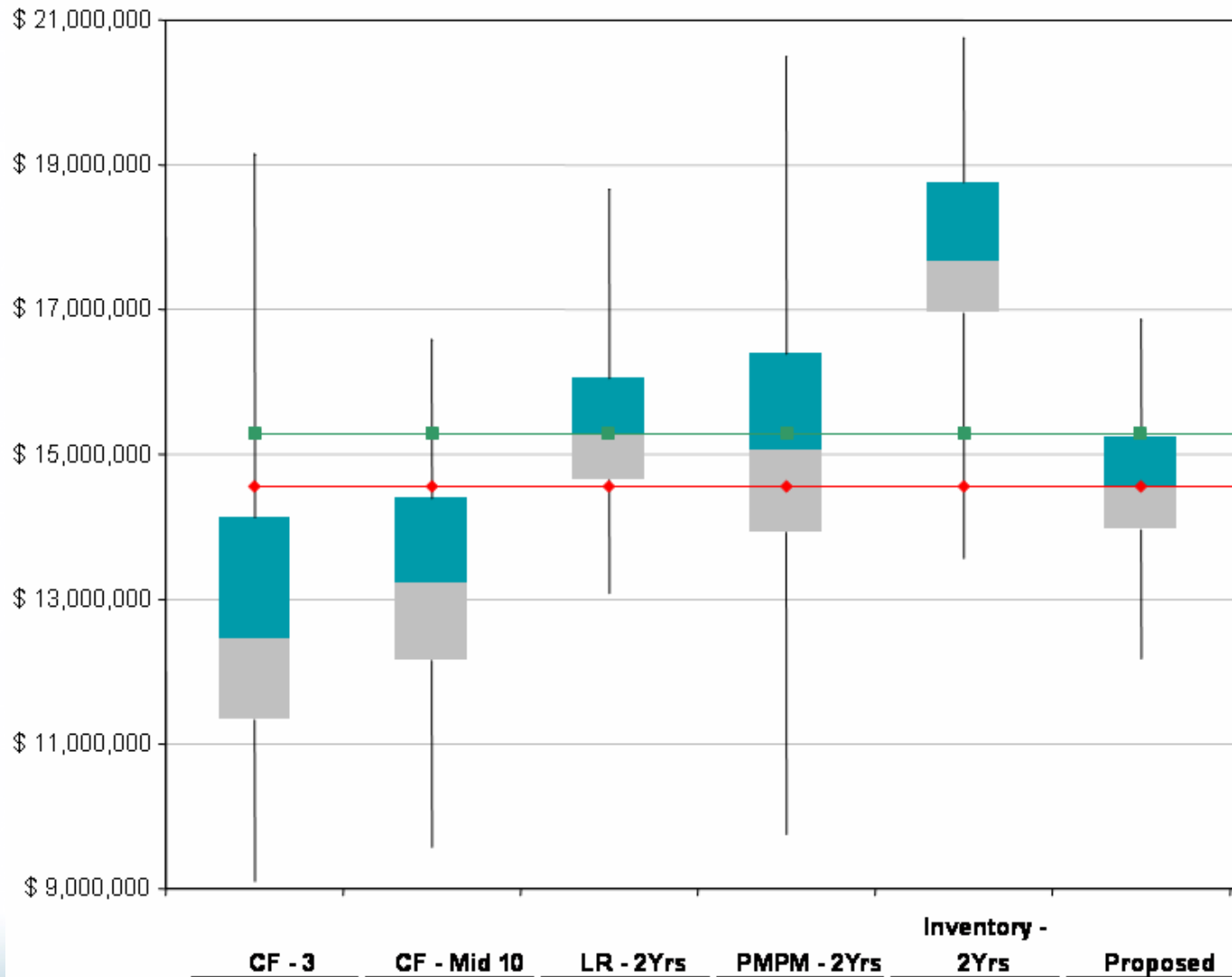
Error Statistics

- Average Error
- Mean Square Error
- Confidence Intervals

Mean Square Errors



Confidence Intervals



Conclusion

Reserving Methodologies

Error Testing

Reserving Methodologies

- Chain-Ladder Completion Factors
- Incurred Claims Forecasting
- Inverse Variance Weighting

Error Testing

- Comparison of
 - Recast Reserves
 - Naïve Estimates

- Error Statistics
 - Mean Square Errors
 - Confidence Intervals

Q&A

