## 20. (2.25 points)

Given the following data as of December 31, 2017:

	Accident	Case Outstanding (\$000) as of (months)				
	Year	12	48			
Î	2014	50,400	51,150	35,100	9,600	
	2015	45,900	64,500	36,000		
	2016	60,300	68,400			
	2017	62,100				

ſ	Accident	Cumulative Paid Claims (\$000) as of (months)					
L	Year	12	36	48			
Γ	2014	10,800	21,600	129,600	276,000		
1	2015	9,800	19,000	125,000			
١	2016	10,350	20,000				
	2017	10,500					

Accident	Open Claim Counts as of (months)				
Year	12	48			
2014	360	465	270	80	
2015	340	430	250		
2016	335	450			
2017	345				

7.5%	Selected annual severity trend
1.05	48 to ultimate reported claim development factor

## a. (0.5 point)

Evaluate whether there has been a change in the adequacy of case outstanding over the experience period.

## b. (1.25 points)

Estimate the ultimate claims for accident year 2017 using the Berquist-Sherman adjustment.

### c. (0.25 point)

Briefly explain the effect of the Berquist-Sherman adjustment in part b. above when compared to the result using unadjusted data.

## d. (0.25 point)

Briefly describe a potential limitation to the Berquist-Sherman adjustment in part b. above.

QUESTION 20	
TOTAL POINT VALUE: 2.25	LEARNING OBJECTIVE(S): B2, B5
SAMPLE ANSWERS	
Part a: 0.5 point	

Sample 1

	Unadjusted A	Unadjusted Average Case Outstanding (000s)				
Accident						
Year	12	24	36	48		
2014	140	110	130	120		
2015	135	150	144			
2016	180	152				
2017	180					

Yes. There has been a change in the adequacy of case outstanding since the avg case O/S has increased down the column, suggesting strengthening in case O/S adequacy level.

# Sample 2

	Unadjusted Average Case Outstanding (000s)				
Accident					
Year	12	24	36	48	
2014	140	110	130	120	
2015	135	150	144		
2016	180	152			
2017	180				

Change in average case

12	24	36	48
-3.6%	36.4%	10.8%	
33.3%	1.3%		
0.0%			

Trend is different than severity trend of 7.5%. Assume that difference in trend is due to a change in case adequacy over the experience period.

Part b: 1.25 points						
Sample 1						
Adj Avg Case						
Case						
Accident						
Year	12	24	36	48		

Cum       4.747       3.637       1.809       1.050         3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60						
Adj	2014		144,893	131,531	133,953	120,000
Adj Reported Accident Year 12 24 36 48 2014 62,961,480 79,799,850 161,000,000 2015 62,758,400 79,799,850 161,000,000 2017 72,600,000 2017 72,600,000 2017 72,600,000 2017 72,600,000 2017 72,600,000 2017 72,600,000 2017 72,600,000 2017 72,600,000 2017 72,600,000 2017 72,600,000 2017 2017 2017 2018 2018 2019 2019 2019 2019 2019 2019 2019 2019	2015		155,760	141,395	144,000	
Adj Reported Accident Year 12 24 36 48  2014 62,961,480 82,761,915 165,767,310 285,600,000 2015 62,758,400 79,799,850 161,000,000 2016 66,443,070 88,400,000  LDF Accident Year 12 24 36 48  2014 1.314 2.003 1.723  2015 1.272 2.018  2016 1.33  2017 2016 1.33  2017 2016 1.33 2017  Avg 1.305 2.0105 1.723 1.05  Cum 4.747 3.637 1.809 1.050  3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2  Adj Avg Case Accident Year 12 24 36 48  2014 145 132 134 120  2015 156 141 144  2016 167 152  2017 180  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48  Adj Case O/S Accident Year 12 24 36 48	2016		167,442	152,000		
Reported Accident Year         12         24         36         48           2014         62,961,480         82,761,915         165,767,310         285,600,000           2015         62,758,400         79,799,850         161,000,000           2016         66,443,070         88,400,000         88,400,000           2017         72,600,000         72,600,000         72,600,000           LDF         Accident         48           2014         1.314         2.003         1.723           2015         1.272         2.018         1.201           2016         1.33         1.201         1.723         1.05           Cum         4.747         3.637         1.809         1.050           38 Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60         34,60           Sample 2           Adj Avg         2.22         24         36         48           2014         1.45         132         134         120           2015         1.56         141         144         144         144         201         2015         156         141         144         201         201         180         48         2014<	2017		180,000			
Reported Accident Year         12         24         36         48           2014         62,961,480         82,761,915         165,767,310         285,600,000           2015         62,758,400         79,799,850         161,000,000           2016         66,443,070         88,400,000         88,400,000           2017         72,600,000         72,600,000         72,600,000           LDF         Accident         48           2014         1.314         2.003         1.723           2015         1.272         2.018         1.201           2016         1.33         1.201         1.723         1.05           Cum         4.747         3.637         1.809         1.050           38 Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60         34,60           Sample 2           Adj Avg         2.22         24         36         48           2014         1.45         132         134         120           2015         1.56         141         144         144         144         201         2015         156         141         144         201         201         180         48         2014<						
Accident Year 12 24 36 48 2014 62,961,480 82,761,915 165,767,310 285,600,000 2015 62,758,400 79,799,850 161,000,000 2017 72,600,000  LDF Accident Year 12 24 36 48 2014 1.314 2.003 1.723 2015 1.272 2.018 2016 1.333 2017  Avg 1.305 2.0105 1.723 1.05 Cum 4.747 3.637 1.809 1.050 3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2 Adj Avg Case Accident Year 12 24 36 48 2014 1.314 2.003 1.723 2.018 2.016 1.33 2.017  Avg 1.305 2.0105 1.723 1.05 Cum 4.747 3.637 1.809 1.050  Adj Case Accident Year 12 24 36 48 2014 145 132 134 120 2015 156 141 144 2016 2016 167 152 2017 180  Adj Case O/S Accident Year 12 24 36 48 2014 36 36 48 2014 36 36 36 36 36 36 36 36 36 36 36 36 36	-					
Year         12         24         36         48           2014         62,961,480         82,761,915         165,767,310         285,600,000           2015         62,758,400         79,799,850         161,000,000           2016         66,443,070         88,400,000         88,400,000           LDF         Accident         Accident         Accident         Accident           Year         12         24         36         48           2014         1.314         2.003         1.723         1.723           2015         1.272         2.018         2.016         1.33         2.017           Avg         1.305         2.0105         1.723         1.05           Cum         4.747         3.637         1.809         1.050           3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60         34,60           5ample 2         Adj Avg         Accident         Accident         48           2014         1.45         1.32         1.34         120           2015         1.56         1.41         1.44         1.44           2016         1.67         1.52         2017         180           Adj Case O/	•					
2014 62,961,480 82,761,915 165,767,310 285,600,000 2015 62,758,400 79,799,850 161,000,000 2016 66,443,070 88,400,000 2017 72,600,000  LDF Accident Year 12 24 36 48 2014 1.314 2.003 1.723 2015 1.272 2.018 2016 1.33 2017  Avg 1.305 2.0105 1.723 1.05 Cum 4.747 3.637 1.809 1.050  3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2 Adj Avg Case Accident Year 12 24 36 48 2014 145 132 134 120 2015 156 141 144 2016 167 152 2017 180  Adj Case O/S Accident Year 12 24 36 48 2014 52,200 61,380 36,180 9,600			_	_		_
2015 62,758,400 79,799,850 161,000,000  2016 66,443,070 88,400,000  2017 72,600,000  LDF  Accident Year 12 24 36 48  2014 1.314 2.003 1.723  2015 1.272 2.018  2016 1.33  2017  Avg 1.305 2.0105 1.723 1.05  Cum 4.747 3.637 1.809 1.050  3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2  Adj Avg Case  Accident Year 12 24 36 48  2014 145 132 134 120  2015 156 141 144  2016 167 152  2017 180  Adj Case O/S  Accident Year 12 24 36 48  2014 2015 156 141 144  2016 167 152  2017 180  Adj Case O/S  Accident Year 12 24 36 48  2014 52,200 61,380 36,180 9,600						
2016 66,443,070 88,400,000  2017 72,600,000  LDF Accident Year 12 24 36 48  2014 1.314 2.003 1.723  2015 1.272 2.018  2016 1.33  2017  Avg 1.305 2.0105 1.723 1.05  Cum 4.747 3.637 1.809 1.050  3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2  Adj Avg Case Accident Year 12 24 36 48  2014 145 132 134 120  2015 156 141 144  2016 167 152  2017 180  Adj Case O/S Accident Year 12 24 36 48  2014 52,200 61,380 36,180 9,600						285,600,000
LDF					161,000,000	
LDF Accident Year 12 24 36 48 2014 1.314 2.003 1.723 2015 1.272 2.018 2016 1.33 2017  Avg 1.305 2.0105 1.723 1.05 Cum 4.747 3.637 1.809 1.050  Sample 2  Adj Avg Case Accident Year 12 24 36 48 2014 145 132 134 120 2015 156 141 144 2016 167 152 2017 180  Adj Case O/S Accident Year 12 24 36 48 2014 52,200 61,380 36,180 9,600	2016	66	5,443,070	88,400,000		
Accident Year 12 24 36 48  2014 1.314 2.003 1.723 2015 1.272 2.018 2016 1.33 2017  Avg 1.305 2.0105 1.723 1.05  Cum 4.747 3.637 1.809 1.050  3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2  Adj Avg Case Accident Year 12 24 36 48  2014 145 132 134 120  2015 156 141 144 2016 167 152 2017 180  Adj Case O/S Accident Year 12 24 36 48  48  48  48  48  48  48  48  48  48	2017	72	2,600,000			
Accident Year 12 24 36 48  2014 1.314 2.003 1.723 2015 1.272 2.018 2016 1.33 2017  Avg 1.305 2.0105 1.723 1.05  Cum 4.747 3.637 1.809 1.050  3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2  Adj Avg Case Accident Year 12 24 36 48 2014 145 132 134 120 2015 156 141 144 2016 167 152 2017 180  Adj Case O/S Accident Year 12 24 36 48 48 48 48 48 48 49 49 40 40 40 40 40 40 40 40 40 40 40 40 40						
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2016 1.33					1.723	
Avg 1.305 2.0105 1.723 1.05  Cum 4.747 3.637 1.809 1.050  BS Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2  Adj Avg Case  Accident Year 12 24 36 48  2014 145 132 134 120  2015 156 141 144  2016 167 152  2017 180  Adj Case O/S  Accident Year 12 24 36 48  2014 52,200 61,380 36,180 9,600				2.018		
Avg 1.305 2.0105 1.723 1.05  Cum 4.747 3.637 1.809 1.050  3S Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60  Sample 2  Adj Avg Case Accident Year 12 24 36 48  2014 145 132 134 120  2015 156 141 144  2016 167 152  2017 180  Adj Case O/S Accident Year 12 24 36 48  2014 52,200 61,380 36,180 9,600	2016		1.33			
Cum       4.747       3.637       1.809       1.050         BS Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60         Sample 2         Adj Avg Case       36       48         Accident Year       12       24       36       48         2014       145       132       134       120         2015       156       141       144       144         2016       167       152       152       150         2017       180       48         Adj Case O/S       Accident Year       12       24       36       48         2014       52,200       61,380       36,180       9,600	2017					
Cum       4.747       3.637       1.809       1.050         BS Adj Ultimate for AY 2017 = 72,600,000 x 1.305 x 2.0105 x 1.723 x 1.05 = 344,60         Sample 2         Adj Avg Case       36       48         Accident Year       12       24       36       48         2014       145       132       134       120         2015       156       141       144       144         2016       167       152       152       150         2017       180       48         Adj Case O/S       Accident Year       12       24       36       48         2014       52,200       61,380       36,180       9,600						
Adj Case O/S  Adj Case O/S  Adj Case O/S  Adj Case O/S  Accident Year 12 24 36 48  2014 145 132 134 120  2015 156 141 144  2016 167 152  2017 180  Adj Case O/S  Accident Year 12 24 36 48  2014 52,200 61,380 36,180 9,600	Avg		1.305	2.0105	1.723	1.05
Sample 2       Adj Avg     24       Accident     36       Year     12       2014     145       132     134       2015     156       141     144       2016     167       2017     180       Adj Case O/S       Accident Year     12       24     36       48       2014     52,200       61,380     36,180       9,600	Cum		4.747	3.637	1.809	1.050
Accident     12     24     36     48       2014     145     132     134     120       2015     156     141     144       2016     167     152     152       2017     180     180       Adj Case O/S     Accident Year     12     24     36     48       2014     52,200     61,380     36,180     9,600	Sample 2 Adj Avg	e for	AY 2017 = 72	,600,000 x 1.305	x 2.0105 x 1.723	5 x 1.05 = 344,60
Year         12         24         36         48           2014         145         132         134         120           2015         156         141         144         144           2016         167         152         167         152         167           2017         180						
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2015     156     141     144       2016     167     152       2017     180       Adj Case O/S       Accident Year     12     24     36     48       2014     52,200     61,380     36,180     9,600						
2016     167     152       2017     180       Adj Case O/S     Strain of the control of t						120
2017     180       Adj Case O/S     Stransport of the control of the					144	
Adj Case O/S       48         Accident Year       12       24       36       48         2014       52,200       61,380       36,180       9,600				152		
Accident Year         12         24         36         48           2014         52,200         61,380         36,180         9,600	2017		180			
2014 52,200 61,380 36,180 9,600	Adj Case O	/S				
			12	24	36	48
	2014		52,200	61,380	36,180	9,600
	2015					

2016	55,945	68,400	
2017	62,100		

Adj				
Reported				
Accident				
Year	12	24	36	48
2014	63,000	82,980	1658,780	285,600
2015	62,840	79,630	161,000	
2016	66,295	88,400		
2017	72,600			

	12-24	24-36	36-48	48-Ult
LDF	1.31	2.01	1.72	1.05
Cum	4.755			

Ultimate claims AY 17 = 72,600 x 4.755 = 345,240

## **Additional**

Graders also gave full credit to alternative development factor selections such as weighted average.

## Part c: 0.25 point

## Sample 1:

With the B-S adjustment, the ultimate claims estimate for AY2017 is not overestimated as compared to the unadjusted data.

### Sample 2:

Case OS increased in recent years because of adequacy changes. Based on prior LDFs calculated from unadjusted data, applied to higher reported loss in year would have overestimated the ultimate.

### Sample 3:

Results in b is lower compared to unadjusted data because not overestimated.

## Part d: 0.25 point

### Sample 1:

The Berquist-Sherman adjustment used in part (b) assumes that claim settlement rates have been consistent.

### Sample 2:

The selection of the underlying trend in severity for this method required much care due to the sensitivity of reserve estimate & need for judgmental selection. If this trend is incorrect reserve estimates may be off by a lot.

### Sample 3:

A limitation would be if our loss trend unexpectedly changes throughout the historical period.

### Sample 4:

It highly depends on selected severity trend.

### Sample 5:

Assumes that change in case outstanding severity is due to case adequacy change and not due to other factors like change in prioritization between large and small claims.

### **EXAMINER'S REPORT**

Candidates were expected to apply the Berquist-Sherman case outstanding adjustment to adjust for changes in the adequacy of case outstanding. Candidates were also expect to know the limitations of the technique and understand how it impacts the calculated ultimate as compared to unadjusted techniques.

#### Part a

The candidate was expected to calculate the average case outstanding triangle and evaluate the triangle to identify that there has been a change (increase) in the adequacy of case outstanding over time.

#### Common mistakes included:

- Concluding the case reserve adequacy was decreasing.
- Examine only a single period (for example: 12 month average case per open claim). A
  change in the average case outstanding per open claim at a single evaluation does not
  provide sufficient evidence of case reserve adequacy changes.

#### Part b

The candidate was expected to apply the Berquist Sherman case outstanding adjustment to the data given. They were also expected to use the adjusted data to calculate the ultimate loss for AY 2017.

### Common mistakes included

- Restating only the 2016 and prior average case outstanding diagonals using the 2016 diagonal as a basis and not restating the 2017 diagonal as well.
- Failure to apply the tail factor provided
- Applying the trend factor incorrectly (e.g., multiplied by trend factor or used 7% instead of 7.5%)

#### Part c

The candidates were expected to identify that the unadjusted loss development method would overstate ultimate loss when case reserve adequacy increases.

## Common mistakes include:

Concluding that the unadjusted loss development method would understate the ultimate loss.

• Describing the mechanics of the adjustment but not providing a comparison to the unadjusted result.

## Part d

The candidates were expected to understand the limitations of the Berquist-Sherman case outstanding adjustment.

# Common msitakes include:

- Identifying assumptions of the adjustment that could be violated instead of a limitation of the adjustment.
- Identifying when the technique is not appropriate.