## Estimación de Reservas Mediante un Método de Pronóstico Bayesiano para Series Cortas con Estacionalidad

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Seminario Aleatorio

25<sub>años</sub> ä<u>ctuaría</u>

## Claims reserving methods:

- Deterministic.
- Stochastic.

Stochastic models are too complex and tend to be overparameterized.

Model historical observations very accurately, but do not necessarily perform well when predicting future claims.



Bayesian methods developed for for forecasting very short series with stable (seasonal) patterns. At any given time  $t > t_0$ 

, Z(t) represents the accumulated value of the variable Z over the interval  $(t_0, t]$ . Series of interest is  $\{X_i\}, i = 1...n$ ;

 $X_i$  to the accumulated value of Z over the *i* -*th* year.

Series  $\{Y_i^{\alpha}\}$ , a partial accumulation process is also available.  $Y_i^{\alpha}$  stands for the accumulated value of *Z* over the first month  $(\alpha = 1/12)$  Given  $Y_{n+1}^{\alpha} = y$ ,  $X_{n+1}$  is obtained as a linear transformation of the ratio

$$W_{n+1}^{\alpha} = \frac{(X_{n+1} - y)}{y}$$

The predictive distribution of  $W_{n+1}^{\alpha}$  is obtained as a log – Student distribution and

$$X_{n+1}^{(q)} = y + y \left[\prod_{i=1}^{n} W_{i}^{\alpha}\right]^{1/n} \left[\exp(t_{n+1}^{(q)})\right]^{\tilde{\sigma}(1+\frac{1}{n})^{1/2}}$$



## Estimator for the total of n+1 year given accumulation up to $\alpha$

$$\hat{X}_{n+1} = y \left( 1 + \prod_{i=1}^{n} W_i^{\alpha} \right)^{1/n}$$







Mendoza, M. and de Alba, E. (2006), "Forecasting an Accumulated Series Based on Partial Accumulation II: A New Bayesian Method for Short Series with Seasonal Patterns", *International Journal of Forecasting* 4, Oct-Dec, 781-798.

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die-06	8.514	-

341-85	age-85	489-65	444-65	nov-85	die-85	******	feb-66	****	8,78.8	APPERP	jan-86	348-86	****	10p-06	111-06	300-86	41-66
0.007	-	0.006	0.862	8.892	0.049	8.008	0.000		-	0.045	8.066	0.068		-	8.001	0.000	0.061
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0.042	0.062	0.167	0.801	•	-	-	-		•	•	-	-		•	•	-	-
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0.041	0.005	-			-	-	-				-	-				-	-
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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2001-1	264.279	322.762	59.799	18.653	4.476	4.781	2.796	2.356	1.263	0.799	0.431	0.972	0.274	0.507	0.218	0.267
2001-2	274.292	358.070	71.054	11.562	9.283	5.850	3.937	1.317	2.316	1.799	0.839	0.538	0.615	0.377	0.561	-0.048
2001-3	289.229	385.881	39.257	22.241	10.045	6.446	2.955	4.735	3.939	3.066	0.868	1.010	1.091	1.394	0.163	0.941
2001-4	304.909	337.193	85.376	27.148	15.928	4.631	3.529	3.929	2.081	0.863	1.256	0.676	0.402	1.093	0.602	0.548
2002-1	239.667	401.053	78.387	26.534	7.960	6.576	6.427	3.557	1.469	2.083	1.278	0.404	0.292	0.567	1.144	0.120
2002-2	304.929	416.627	86.106	16.674	12.487	9.110	5.039	2.573	2.339	2.409	0.898	0.845	0.442	0.745	0.428	0.343
2002-3	327.187	490.316	62.423	31.480	15.222	8.746	4.596	5.045	2.705	2.052	1.334	1.163	0.565	0.849	0.895	0.315
2002-4	381.025	410.039	108.427	36.198	18.665	5.671	5.308	3.129	3.347	2.037	2.500	0.786	1.256	0.388	1.019	0.348
2003-1	295.942	430.232	79.464	28.152	10.828	6.734	3.203	2.692	2.072	1.200	1.735	0.870	0.439	0.182	0.966	0.183
2003-2	334.195	457.061	102.172	17.906	12.140	6.500	5.879	1.770	2.493	0.713	0.904	0.945	0.306	0.470	0.254	
2003-3	338.088	519.565	60.393	28.093	12.073	8.982	3.825	4.085	2.150	1.260	0.730	0.652	0.623	0.560		
2003-4	357.203	438.350	101.980	34.557	16.332	6.041	4.982	3.655	3.022	0.795	0.435	0.821	0.306			
2004-1	334.626	483.412	98.116	34.635	9.151	6.249	4.819	3.457	1.672	2.556	0.979	1.024				
2004-2	351.198	512.403	120.461	19.427	16.356	8.253	6.837	2.140	3.766	0.940	1.469					
2004-3	356.257	610.121	89.973	48.184	22.753	13.724	6.225	6.159	2.922	1.958						
2004-4	387.015	587.841	182.651	52.200	26.072	9.890	7.173	5.892	2.597							
2005-1	290.718	649.937	150.065	51.467	13.767	7.947	6.143	4.545								
2005-2	372.955	708.232	172.666	28.833	16.828	11.397	6.643									
2005-3	434.750	801.084	108.409	48.112	23.367	10.591										
2005-4	485.735	748.773	206.781	64.115	24.019											
2006-1	374.480	789.839	167.892	53.089												
2006-2	445.191	775.337	193.892													
2006-3	370.377	789.096														
2006-4	426.115															

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## Compare several methods.

- Chain ladder.
- Log linear model with a trend.
- Bayesian Log linear model w/trend (WinBUGS).
- Bayesian Forecasting.
- De Jong (Kalman Filter).



Development year (j)/Accident year (i)	1	2	3	4	5	6	7	8	
2	274.29	358.07	71.05	11.56	9.28	5.85	3.94	1.32	
3	289.23	385.88	39.26	22.24	10.04	6.45	2.95	4.74	4.74
4	304.91	337.19	85.38	27.15	15.93	4.63	3.53	3.93	7.46
5	239.67	401.05	78.39	26.53	7.96	6.58	6.43	3.56	16.56
6	304.93	416.63	86.11	16.67	12.49	9.11	5.04	2.57	29.21
7	327.19	490.32	62.42	31.48	15.22	8.75	4.60	5.04	65.09
8	381.03	410.04	108.43	36.20	18.66	5.67	5.31	3.13	177.40
9	295.94	430.23	79.46	28.15	10.83	6.73	3.20	2.69	561.31
							Res	serve	861.76

Comparison among different methods												
Accident year	Regression	Bayesian	Winbugs	Chain Ladder	De Jong (H)	De Jong (D)						
3	255.43%	150.70%	245.80%	248.96%	71.34%	71.34%						
4	28.78%	29.78%	46.93%	49.16%	32.84%	32.84%						
5	<mark>51.65</mark> %	45.7 <mark>5%</mark>	56.84%	56.40%	35.91%	35.91%						
6	29.08%	42.60%	36.16%	22.62%	18.46%	18.47%						
7	42.46%	53.52%	46.25%	27.36%	21.31%	21. <mark>33%</mark>						
8	37.61%	39.71%	42.74%	<b>34.79%</b>	25.14%	25.24%						
9	9 11.67% 16.65% 2.36% 11.21% 15.02% 3.18%											
Average	65.24%	54.10%	68.15%	64.36%	31.43%	29.76%						

Comparison among different methods												
Accident year	Regression	Bayesian	Winbugs	Chain Ladder	De Jong (H)	De Jong (D)						
4	30.12%	50.47%	<mark>24</mark> .92%	19.45%	24.15%	24.15%						
5         19.15%         53.22%         19.70%         24.70%         19.85%         19.85%												
6	12.47%	17.28%	15.58%	8.67%	7.92%	7.92%						
7	12.63%	20.53%	25.93%	9.00%	8.28%	8.30%						
8	5.81%	41.14%	27.74%	14.17%	12.26%	12.26%						
9	2.39%	25.54%	8.85%	0.63%	1.00%	0.86%						
10	<b>10</b> 2.62% <b>9.07%</b> 0.72% <b>2.30%</b> 0.88% 2.88%											
Average	12.17%	31.03%	17.64%	11.28%	10.62%	10.89%						

Comparison among different methods												
Accident year	Regression	Bayesian	Winbugs	Chain Ladder	De Jong (H)	De Jong (D)						
5	10.49%	17.45%	14.18%	8.02%	8.72%	8.72%						
6	18.63%	9.22%	21.52%	22.18%	28.72%	28.71%						
7	3.62%	15.13%	0.07%	2.10%	1.92%	1.91%						
8	9.96%	0.33%	6.16%	4.13%	4.08%	4.07%						
9	7.97%	8.7 <mark>4%</mark>	15.74%	<mark>11.03%</mark>	12.21%	12.20%						
10	4.21%	10.99%	1.42%	<mark>5.42%</mark>	6.24%	6.16%						
11	11         4.53%         17.89%         4.18%         4.47%         2.93%         2.07%											
Average	8.49%	11.39%	9.04%	8.19%	9.26%	9.12%						



Comparison among different methods												
Accident year	Regression	Bayesian	Winbugs	Chain Ladder	De Jong (H)	De Jong (D)						
6	32.10%	37.51%	32.35%	34.85%	53.48%	53.48%						
7         13.52%         8.32%         5.25%         12.75%         15.27%         15.26%												
8	41.72%	20.38%	32.82%	31.67%	46.65%	46.65%						
9	27.15%	19.48%	31.39%	25.73%	33.78%	33.77%						
10	34.19%	32.58%	36.60%	32.21%	46.79%	46.77%						
11	29.22%	34.88%	30.73%	30.33%	43.60%	43.50%						
12	<b>12</b> 9.96% <b>8.92%</b> 7.52% <b>9.78%</b> 12.17% 10.27%											
Average	26.84%	23.15%	25.24%	25.33%	35.96%	35.67%						

Comparison among different methods												
Accident year	Regression	Bayesian	Winbugs	Chain Ladder	De Jong (H)	De Jong (D)						
7	<mark>79.64</mark> %	43.29%	79.80%	77.51%	43.67%	43.67%						
8	1.35%	19.15%	<mark>4.98%</mark>	<b>4.03%</b>	3.58%	3.58%						
9	10.31%	28.65%	<mark>15.53%</mark>	12.96%	15.74%	15.72%						
10	6.93%	15.49%	9.19%	14.60%	17.11%	17.11 <mark>%</mark>						
11	<mark>11.59</mark> %	2.14%	4.85%	4.72%	4.82%	4.79%						
12	<mark>21.4</mark> 0%	9.56%	20.69%	18.19%	14.95%	15.04%						
13	13         8.79%         4.18%         2.77%         7.95%         6.66%         12.73%											
Average	Average         20.00%         17.49%         19.69%         19.99%         15.22%         16.09%											



Comparison among different methods											
Accident year	Regression	Bayesian	Winbugs	Chain Ladder	De Jong (H)	De Jong (D)					
8	42.90%	19.53%	42.97%	39.60%	49.38%	49.38%					
9	32.59%	28.09%	42.00%	34.80%	42.09%	42.09%					
10	6.15%	23.05%	16.06%	17.01%	18.71%	18.70%					
11	0.25%	<mark>15.31%</mark>	4.03%	11.48%	11.98%	11.97%					
12	4.57%	12.69%	15.25%	7.50%	7.23%	7.24%					
13	7.66%	13.21%	7.28%	4.49%	3.95%	4.06%					
14	9.44%	5.96%	6.57%	8.74%	7.65%	6.77%					
Average	14.79%	16.83%	19.17%	17.66%	20.14%	20.03%					

Comparison among different methods												
Accident year	Regression	Bayesian	Winbugs	Chain Ladder	De Jong (H)	De Jong (D)						
9	8.81%	24.48%	12.86%	2.82%	2.86%	2.86 <mark>%</mark>						
10         20.57%         13.58%         8.55%         3.38%         3.99%         4.00%												
11	38.40%	2.93%	25.03%	17.88%	16.49%	16.49%						
12	6.59%	7.43%	13.71%	10.96%	10.61%	10.61%						
13	1.10%	15.49%	6.62%	0.23%	0.20%	0.18%						
14	10.65%	7.40%	<mark>18.4</mark> 6%	7.81%	7.21%	7.30%						
15	<b>15</b> 25.12% <b>31.14%</b> 19.43% <b>24.41%</b> 21.14% 1.07%											
Average	Average         15.89%         14.63%         14.95%         9.64%         8.93%         6.07%											



Comparison among different methods											
Accident year	Regression	sion Bayesian Winbugs Chain Ladder De Jong (H) De Jong (									
10	40.22%	40.81%	<b>35</b> .96%	39.96%	49.94%	49.94%					
11	3.10%	4.83%	3.33%	1.05%	0.37%	0.36%					
12	17.82%	4.10%	13.55%	6.09%	5.82%	5.81%					
13	25.34%	20.67%	26.13%	19.40%	21.13%	21.14%					
14	20.43%	23.13%	21.61%	16.14%	17.44%	17.43%					
15	6.42%	3.81%	3.47%	3.14%	3.03%	3.13%					
16	18.24%	31.72%	17.92%	17.38%	15.97%	20.49%					
Average	18.80%	18.44%	17.43%	14.74%	16.24%	16.90%					

Comparison among different methods										
Accident year	Regression	Bayesian	Winbugs	Chain Ladder	De Jong (H)	De Jong (D)				
11	132.38%	72.37%	110. <mark>59%</mark>	122.45%	75.95 <mark>%</mark>	75.95%				
12	17.89%	19.90%	19.15%	<mark>28.98%</mark>	24.98%	24.99%				
13	3.98%	0.03%	<mark>3.51%</mark>	3.11%	2.97%	2.98%				
14	27.26%	17.49%	29.23%	18.87%	17.12%	17.12%				
15	72.83%	63.2 <mark>0%</mark>	80.96%	57.89%	44.60%	44.63%				
16	69.20%	59.36%	78.61%	64.27%	48.04%	48.15%				
17	61.30%	<mark>64.29%</mark>	23.45%	<b>59.57%</b>	45.79%	22.15%				
Average	54.98%	42.38%	49.36%	50.74%	37.06%	33.71%				



	Regression	Bayesian	WingBUGS	Chain ladder	De Jong (H)	De Jong( D)
Triangle 2	65.24%	54.10%	68.15%	64.36%	31.43%	29.76%
Triangle 3	12.17%	31.03%	17. <mark>64%</mark>	11.28%	10.62%	10.89%
Triangle 4	<mark>8.49</mark> %	11.39%	9.04%	8.19%	9.26%	9.12%
Triangle 5	<mark>26.84</mark> %	23.15%	25.24%	25.33%	35.96%	35.67%
Triangle 6	20.00%	17.49%	19.69%	19.99%	15.22%	16.09%
Triangle 7	14.79%	16.83%	19.17%	17.66%	20.14%	20.03%
Triangle 8	15.89%	14.63%	<mark>14.9</mark> 5%	9.64%	8.93%	6.07%
Triangle 9	18.80%	18.44%	<mark>17.43</mark> %	14.74%	16.24%	16.90%
Triangle 10	54.98%	42.38%	49.36%	50.74%	37.06%	33.71%
Average	26.35%	25.50%	26.74%	24.66%	18.48%	18.07%



	Regression Model								
Accident year	Triangle 2	Triangle 3	Triangle 4	Triangle 5	Triangle 6	Triangle 7	Triangle 8	Triangle 9	Triangle 10
2	255.43%	30.12%	10.49%	32.10%	79.64%	42.90%	8.81%	40.22%	132.38%
3	28.78%	19.15%	18.63%	13.52%	1.35%	32.59%	20.57%	3.10%	17.89%
4	51.65%	12.47%	3.62%	41.72%	10.31%	6.15%	38.40%	17.82%	3.98%
5	29.08%	12.63%	9.96%	27.15%	6.93%	0.25%	6.59%	25.34%	27.26%
6	42.46%	5.81%	7.97%	34.19%	11.59%	4.57%	1.10%	20.43%	72.83%
7	37.61%	2.39%	4.21%	29.22%	21.40%	7.66%	10.65%	6.42%	69.20%
8	11.67%	2.62%	4.53%	9.96%	8.79%	9.44%	25.12%	18.24%	61.30%
Average	65.24%	12.17%	8.49%	26.84%	20.00%	14.79%	15.89%	18.80%	54.98%

					Bayesian				
Accident year	Triangle 2	Triangle 3	Triangle 4	Triangle 5	Triangle 6	Triangle 7	Triangle 8	Triangle 9	Triangle 10
2	150.70%	50.47%	17.45%	37.51%	43. <mark>29%</mark>	19.53%	24.4 <mark>8</mark> %	40.81%	72.37%
3	29.78%	53.22%	9.22%	8.32%	19.15 <mark>%</mark>	28.09%	13.58%	4.83%	19.90%
4	45.75%	17.28%	15.13%	20.38%	28.65%	23.05%	2.93%	4.10%	0.03%
5	42.60%	20.53%	0.33%	19.48%	15.49%	15.31%	7.43%	20.67%	17. <mark>49%</mark>
6	53.52%	<mark>41.14</mark> %	8.74%	32.58%	2.14%	12.69%	15.49%	23.13%	63.20%
7	39.71%	<mark>25.5</mark> 4%	10.99%	34.88%	9.56%	13.21%	7.40%	3.81%	59.36%
8	16.65%	9.07%	17.89%	8.92%	<mark>4.18%</mark>	5.96%	31.14%	31.72%	64.29%
Average	54.10%	31.03%	11.39%	23.15%	17.49%	16.83%	14.63%	18.44%	42.38%



					WinBUGS				
Accident year	Triangle 2	Triangle 3	Triangle 4	Triangle 5	Triangle 6	Triangle 7	Triangle 8	Triangle 9	Triangle 10
2	245.80%	24.92%	14.18%	32.35%	79.80%	42.97%	12.86%	35.96%	110.59%
3	46.93%	19.70%	21.52%	5.25%	4.98%	42.00%	8.55%	3.33%	19.15%
4	56.84%	15.58%	0.07%	32.82%	15.53%	16.06%	25.03%	13.55%	3.51%
5	36.16%	25.93%	6.16%	31.39%	9.19%	4.03%	13.71%	26.13%	29.23%
6	46.25%	27.74%	15.74%	36.60%	4.85%	15.25%	6.62%	21.61%	80.96%
7	42.74%	8.85%	1.42%	30.73%	20.69%	7.28%	18.46%	3.47%	78.61%
8	2.36%	0.72%	4.18%	7.52%	2.77%	6.57%	19.43%	17.92%	23.45%
Average	68.15%	17.64%	9.04%	25.24%	19.69%	19.17%	14.95%	17.43%	49.36%

	Chain Ladder									
Accident year	Triangle 2	Triangle 3	Triangle 4	Triangle 5	Triangle 6	Triangle 7	Triangle 8	Triangle 9	Triangle 10	
2	248.96%	19.45%	8.02%	34.85 <mark>%</mark>	77.51%	<mark>39.60%</mark>	2.82%	39.96%	122.45 <mark>%</mark>	
3	49.16%	24.70%	22.18%	12.75%	4.03%	34.80%	3.38%	1.05%	28.98%	
4	56.40%	8.67%	2.10%	31.67%	12.96%	17.01%	17.88%	<mark>6.09%</mark>	3.11%	
5	22.62%	9.00%	4.13%	25.73%	<mark>14.6</mark> 0%	11.48%	10.96%	19.40%	1 <mark>8.8</mark> 7%	
6	27.36%	<mark>14.17</mark> %	11.0 <mark>3%</mark>	32.21%	<mark>4.72%</mark>	7.50%	0.23%	16.14%	57.89 <mark>%</mark>	
7	34.79%	0.63%	5. <mark>4</mark> 2%	30.33%	18.19%	4.49%	7.81%	3.14%	64.27%	
8	11.21%	2.30%	4.47%	9.78%	7.95%	8.74%	<b>24.41%</b>	17.38%	59.57%	
Average	64.36%	11.28%	8.19%	25.33%	19.99%	17.66%	9.64%	14.74%	50.74%	



	De Jong (Hertig)										
Accident year	Triangle 2	Triangle 3	Triangle 4	Triangle 5	Triangle 6	Triangle 7	Triangle 8	Triangle 9	Triangle 10		
2	71.34%	24.15%	8.72%	<mark>53.48</mark> %	43.67%	49.38%	2.86%	49.94%	75.95%		
3	32.84%	19.85%	28.72%	15.27%	3.58%	42.09%	3.99%	0.37%	24.98%		
4	35.91%	7.92%	1.92%	46.65%	15.74%	18.71%	16.49%	5.82%	2.97%		
5	18.46%	8.28%	4.08%	33.78%	17.11%	11.98%	10.61%	21.13%	17.12%		
6	21.31%	12.26%	12.21%	46.79%	4.82%	7.23%	0.20%	17.44%	44.60%		
7	25.14%	1.00%	6.24%	43.60%	14.95%	3.95%	7.21%	3.03%	48.04%		
8	15.02%	0.88%	2.93%	12.17%	6.66%	7.65%	21.14%	15.97%	45.79%		
Average	31.43%	10.62%	9.26%	35.96%	15.22%	20.14%	8.93%	16.24%	37.06%		

-	De Jong (Development)								
Accident year	Triangle 2	Triangle 3	Triangle 4	Triangle 5	Triangle 6	Triangle 7	Triangle 8	Triangle 9	Triangle 10
2	71.34%	24.15%	8.72%	53.48%	43.67%	49.38%	2.86%	49.94%	75.95%
3	32.84%	19.85%	28.71%	15.26%	3.58%	42.09%	4.00%	0.36%	24.99%
4	35.91%	7.92%	1.91%	46.65%	<mark>15</mark> .72%	18.70%	16.49%	5.81%	2.98%
5	18.47%	8.30%	4.07%	33.77%	17.11%	11.97 <mark>%</mark>	10.61%	21.14%	17. <mark>12%</mark>
6	21.33%	12.2 <mark>6</mark> %	12.20%	46.77%	<mark>4.79%</mark>	7.24%	0.18%	17.43%	44.63%
7	25.24%	0.86%	6.1 <mark>6</mark> %	43.50%	15.04%	4.06%	7.30%	3.13%	48.15%
8	3.18%	2.88%	2.07%	10.27%	12.73%	6.77%	1.07%	20.49%	22.15%
Average	29.76%	10.89%	9.12%	35.67%	16.09%	20.03%	6.07%	16.90%	33.71%



	1	2	3	4	5	6
1	8489.00	1296.00	924.00	580.00	246.00	126.00
2	12970.00	1796.00	1435.00	859.00	654.00	265.00
3	17522.00	2783.00	1469.00	1023.00	423.00	652.00
4	21754.00	2584.00	1163.00	783.00	887.00	355.00
5	19208.00	2341.00	1220.00	619.00	841.00	703.00
6	19604.00	2469.00	1223.00	1247.00	612.00	
7	21922.00	2311.00	1141.00	1508.00		
8	25038.00	3363.00	2144.00			
9	32532.00	4474.00				
10	39862.00					

Median
445.36
1296.67
2851.58
6366.46
13300.12
24260.17996



Doray (1996)







<b>229</b> 6794	227229	139950	146342	574398	527326	482940	610542	766940	357848
)46	425046	266172	527804	320996	445745	1193289	933594	884021	352118
		280405	495992	146923	750816	1016654	926219	1001799	290507
			206286	352053	272482	1562400	776189	1108250	310608
				470639	504851	769488	991983	693190	443160
					705960	805037	847498	937085	396132
						1063269	1131398	847631	440832
							1443370	1061648	359480
m9,10								986608	376686
1.018									344014

P a rtia l	Complete
	94,806
362,071	455,504
575,281	666,804
827,630	910,953
1,477,673	1,569,299
2,283,918	2,386,137
3,812,633	3,930,984
3,858,903	3,951,465
4,038,704	4,116,386
17,236,813	18,082,338

Model	Reserves (1,000)
Chain ladder	\$18,681
Verrall (no prior info)	19,512
Verrall (prior info)	16,743
Mack	18,085
Renshaw/Christofides	19,512
Bavesian (global)	19,627
Bavesian (exposure)	19,630
Taylor and Ashe	22,301
Bayesian (claims)	25,075

Taylor and Ashe (1983)





	1	2	3	4	5	6	7	8	9	10
1	5012	3257	2638	898	1734	2642	1828	599	54	172
2	106	4179	1111	5270	3116	1817	-103	673	535	0
3	3410	5582	4881	2268	2594	3479	649	603	0	0
4	5655	5900	4211	5500	2159	2658	984	0	0	0
5	1092	8473	6271	6333	3786	225	0	0	0	0
6	1513	4932	5257	1233	2917	0	0	0	0	0
7	557	3463	6926	1368	0	0	0	0	0	0
8	1351	5596	6165	0	0	0	0	0	0	0
9	3133	2262	0	0	0	0	0	0	0	0
10	2063	0	0	0	0	0	0	0	0	0

1.10491735



	Reserve	Chain-L
	154.0	154
	617.4	617
	1,636.1	1636
	2,746.7	2747
1,363.0	3,169.1	3649
3,757.0	5,443.1	5435
9,814.6	12,220.0	10907
8,200.3	9,626.7	10650
22,344.6	24,905.4	16339
45,479.41	60,518.44	52135