0.1 Mack Method

1. $C_{i,j}$: cummulated claim for accident period i, development period j.
2. $f_{i,j}$: development factor from $C_{i,j}$ to $C_{i,j+1}$.

$$f_{i,j} = \frac{C_{i,j}}{C_{i,j+1}}$$

3. f_j: estimated development factor for period j.

$$f_j = \frac{\sum_{i=1}^{n} C_{i,j} f_{i,j}}{\sum_{i=1}^{n} C_{i,j}}$$

4. σ_i: standard error for $C_{i,J}$:

$$\sigma_{i,J}^2 = C_{i,J}^2 \sum_{j=1}^{n} \frac{\alpha_j^2}{f_j^2} (\frac{1}{C_{i,j}} + \frac{1}{\sum_{a=1}^{n} C_{a,j}})$$

where

$$\alpha_j^2 = \frac{1}{I-j-1} \sum_{i=1}^{I-j} C_{i,j} (\frac{C_{i,j+1}}{C_{i,j}} - f_j)^2$$

5. R_i: Is the outstanding reserve for accident year i., given by the standard chain-ladder method.
6. Calculate significance intervals by assuming $R_i \sim N(R_i, \sigma_j)$, or $R_i \sim LN(\mu_i, s_j)$ where:

$$s_i = ln(1 + \frac{\sigma_i^2}{R_i^2})$$

$$\mu_i = ln(R_i) - \frac{s_i^2}{2}$$

0.1.1 Assumptions of chain-ladder method

1. $f_{i,j}$ and $f_{i,j+1}$ are uncorrelated. (Appendix G)
2. $\{C_{a,1} \dots C_{a,}j\}$ and $\{C_{b,1} \dots C_{b,}j\}$ are independent for $a \neq b$. (Appendix H)
3. $Var(C_{i,j+1}|C_{i,1} \dots C_{i,j}) = C_{i,j}\alpha_j^2$. where α_j is an unknown proportionality constant. Thus the variance of claim amounts are proportional to the previous year. (Chapter V.)