Let $k_1 = \frac{L_1}{E}$ $\quad S_1 = \frac{P_1}{E}$

r_1 : return on sale of insurance
r_A : return on Assets

$$r_E = r_A \cdot \left(1 + \frac{L_1}{E}\right) + r_1 \cdot \frac{P_1}{E}$$

$$r_A = \beta_A(r_m - r_f) + r_f$$

$$r_E = (\beta_A(r_m - r_f) + r_f)\left(1 + \frac{L_1}{E}\right) + r_1 \cdot \frac{P_1}{E}$$

① $$r_E = (\beta_A(r_m - r_f) + r_f)(1 + k_1) + r_1 \cdot S_1$$

$$= \beta_A(r_m - r_f)(1 + k_1) + r_f(1 + k_1) + r_1 S_1$$

$$r_E = \beta_E(r_m - r_f) + r_f$$

$$\beta_E = \beta_A(1 + k_1) + \beta_1 \cdot S_1 \leftarrow \text{From } r_E = r_A(1 + k_1) + r_1 \cdot S_1$$

$$r_E = [\beta_A(1 + k_1) + \beta_1 \cdot S_1](r_m - r_f) + r_f$$

② $$r_E = \beta_A(r_m - r_f)(1 + k_1) + \beta_1 \cdot S_1(r_m - r_f) + r_f$$

① − ②.
$$0 = r_f(1 + k_1) + r_1 S_1 - \beta_1 \cdot S_1(r_m - r_f) - r_f$$

$$0 = \cancel{r_f} + k_1 \cdot r_f + S_1 \cdot r_1 - \beta_1 \cdot S_1(r_m - r_f) \cancel{- r_f}$$

$$-r_1 \cdot S_1 = k_1 \cdot r_f - \beta_1 \cdot S_1 \cdot (r_m - r_f)$$

$$r_1 = \boxed{-\frac{k_1}{S_1}} \cdot r_f + \beta_1(r_m - r_f)$$

But Cumming's paper says.

$$r_1 = \boxed{-k_1} \cdot r_f + \beta_1(r_m - r_f).$$