

$$\pi_1 - \underline{\pi}_1 \gamma_1 = -\beta_1 \quad (24.18)$$

$$\boxed{\underline{\pi}_1^*} \gamma_1 = \pi_1^* \quad (24.19)$$

$$(\underline{\pi}_1^* \quad \pi_1^*)$$

$$p = \frac{\alpha_0 - \alpha_1}{\delta - \beta} + \underbrace{\frac{\gamma}{\delta - \beta}}_{\pi_1} y \quad \begin{cases} q = \alpha_0 + \beta p + \gamma y \\ q = \alpha_1 + \delta p \end{cases}$$

$$\hat{q} = \frac{\delta \alpha_0 - \beta \alpha_1}{\delta - \beta} + \underbrace{\frac{\delta \gamma}{\delta - \beta}}_{\pi_2} y$$

$$\hat{\pi}_1 = \frac{\hat{cov}(p, y)}{\hat{var}(y)} \quad , \quad \hat{\pi}_2 = \frac{\hat{cov}(q, y)}{\hat{var}(y)}$$

$$\frac{\hat{\pi}_2}{\hat{\pi}_1} = \frac{\hat{cov}(q, y)}{\hat{cov}(p, y)}$$