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$$\begin{aligned}
 & 1 \qquad \qquad \qquad \tau \frac{k}{T} \qquad \qquad \qquad \delta_i \\
 & \varepsilon \qquad \qquad \qquad \tau \\
 & P\left(\left| \tau \quad \tau \mid \varepsilon \right.\right) \frac{C}{\varepsilon} \frac{N}{\left| \delta_i \right|} T^{\frac{h}{\varepsilon}}
 \end{aligned}$$

$$\begin{aligned}
 & 1 \qquad \qquad \qquad \tau \frac{k}{T} \qquad \qquad \qquad \delta_i \\
 & \varepsilon \qquad \qquad \qquad \tau \\
 & P\left(\left| \tau \quad \tau \mid \varepsilon \right.\right)
 \end{aligned}$$

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$$\begin{aligned}
 & 1 \qquad \qquad \qquad k \\
 & \frac{Y_{it} - Y_{it}^*}{T} \frac{TY_{it}}{T} \frac{(Y_{it} - Y_{it}^*)}{Y} \frac{9}{111}
 \end{aligned}$$

$$|E V_{NT} k| |E V_{NT} k| \begin{cases} \left| \begin{matrix} \tau & \tau & \gamma \\ \delta_i & \tau & \tau & \tau & \tau & \tau & k & k \end{matrix} \right|^N \\ \left| \begin{matrix} \tau & \tau & \gamma \\ \delta_i & \tau & \tau & \tau & \tau & \tau & k & k \end{matrix} \right|^N \\ \left| \begin{matrix} \tau & \tau & \gamma \\ \delta_i & \tau & \tau & \tau & \tau & \tau & k & k \end{matrix} \right|^N \\ \left| \begin{matrix} \tau & \tau & \gamma \\ \delta_i & \tau & \tau & \tau & \tau & \tau & k & k \end{matrix} \right|^N \end{cases}$$

$$f \tau \tau \gamma \quad f \tau \tau \gamma$$

$$|E V_{NT} k| |E V_{NT} k| \begin{cases} \left| \begin{matrix} \tau & \tau & \gamma \\ \delta_i & \tau & \tau & \tau & \tau & \tau & k & k \end{matrix} \right|^N \\ \left| \begin{matrix} \tau & \tau & \gamma \\ \delta_i & \tau & \tau & \tau & \tau & \tau & k & k \end{matrix} \right|^N \end{cases}$$

$$\bar{\tau} |(\tau)|(\gamma)\tau \tau \tau \tau$$

$$|E V_{NT} k| |E V_{NT} k| \bar{\tau} | \tau \tau | \left| \delta_i \right|^N$$

$$\begin{aligned} & |E V_{NT} k| |E(V_{NT}(k))|_{kT} |V_{NT}(k) E(V_{NT}(k))| |V_{NT}(k)| |V_{NT}(k)| \\ & k k \quad |V_{NT} k| |V_{NT} k| \\ & |E V_{NT} k| |E(V_{NT}(k))|_{kT} |V_{NT}(k) E(V_{NT}(k))| \end{aligned}$$

$$\bar{\tau} | \tau \tau | \left| \delta_i \right|^N \begin{aligned} & |V_{NT} k E V_{NT} k| \\ & \left| \left(\frac{k(T-k)}{T} \right) \left(\frac{Y_{it} EY_{it}}{k} - \frac{T}{k} \frac{Y_{it} EY_{it}}{k} \right) \right|^N \\ & \left| \left(\frac{Y_{it} EY_{it}}{k} - \frac{T}{k} \frac{Y_{it} EY_{it}}{k} \right) \right|^N \end{aligned}$$

$$P\left(\bar{\tau} | \tau \tau | \left| \delta_i \right|^N \varepsilon\right) \begin{aligned} & P\left(\left| \frac{Y_{it} EY_{it}}{k} - \frac{T}{k} \frac{Y_{it} EY_{it}}{k} \right| \frac{\varepsilon}{N} \right) P\left(\left| \frac{Y_{it} EY_{it}}{k} - \frac{T}{k} \frac{Y_{it} EY_{it}}{k} \right| \frac{\varepsilon}{N} \right) \\ & P\left(\left| \frac{Y_{it} EY_{it}}{k} - \frac{T}{k} \frac{Y_{it} EY_{it}}{k} \right| \frac{\varepsilon}{N} \right) P\left(\left| \frac{Y_{it} EY_{it}}{k} - \frac{T}{k} \frac{Y_{it} EY_{it}}{k} \right| \frac{\varepsilon}{N} \right) \end{aligned}$$

$$\left(\frac{\varepsilon}{N} \right) P\left(\left| \frac{Y_{it} EY_{it}}{k} - \frac{T}{k} \frac{Y_{it} EY_{it}}{k} \right| \frac{\varepsilon}{N} \right) \left(\frac{\varepsilon}{N} \right) P\left(\left| \frac{Z_{it}}{k} \right| \frac{\varepsilon}{N} \right)$$

$$\begin{aligned} & \frac{E Z_{ik}}{k} \left(\frac{E Z_{im} Z_{il}}{m l} \right)^{-1} \frac{E Z_{ik}}{k} \\ & \frac{E Z_{im} Z_{il}}{m l} \frac{E Z_{ik}}{k} \end{aligned}$$

$$\begin{array}{c} T \\ k \end{array} \left| \begin{array}{c} k \\ m \ l \end{array} \right. \begin{array}{c} \text{Cov}(Y_{im} Y_{il}) \\ \text{Cov}(Y_{im} Y_{il}) \end{array} \begin{array}{c} T \\ k \end{array} \frac{\text{Var } Y_{i k}}{k} \begin{array}{c} - \\ - \end{array} \begin{array}{c} k \\ m \ l \end{array} \left(\begin{array}{c} \text{Cov}(Y_{im} Y_{il}) \end{array} \right) \begin{array}{c} - \\ - \end{array} \begin{array}{c} k \\ m \ l \end{array}$$

1 h $\frac{h}{T}$

$$\frac{T^{\frac{h}{T}}}{T^{\frac{h}{T}}} \frac{1}{T^{\frac{h}{T}}}$$

$$\theta \theta \theta \quad \theta_i \quad i \quad \frac{N}{T^{\frac{h}{T}}} \quad \frac{N}{T^{\theta}} \quad \frac{N}{T^{\theta}} \quad \frac{N}{T^{\theta}}$$

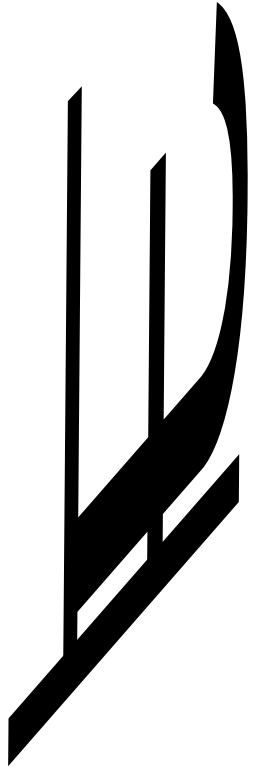
$$P(|\tau \tau | \varepsilon) P \left(\frac{V_{NT} k E V_{NT} k}{\tau \delta_i} \mid \varepsilon \right) \frac{C}{\varepsilon} \frac{N}{\delta_i} \frac{N}{T^{\frac{h}{T}}}$$

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$$Y_{it} \begin{cases} \mu_i & \sigma_i \eta_{it} & t & k \\ \mu_i & \sigma_i \eta_{it} & t & k & k \\ \mu_i & \sigma_{im} \eta_{it} & t & k_m & k_m \\ \mu_i & \sigma_{im} \eta_{it} & t & k_m & T \end{cases} \quad i \quad N$$

$$Y_{ik} \quad Y_{ik} \quad Y_{iT} \quad i \quad N \quad k' \quad k \quad Y_i \quad Y_i \quad Y_{ik}$$

$$V_{NT}(k') \quad k \quad k \quad V_{NT} \quad k'$$



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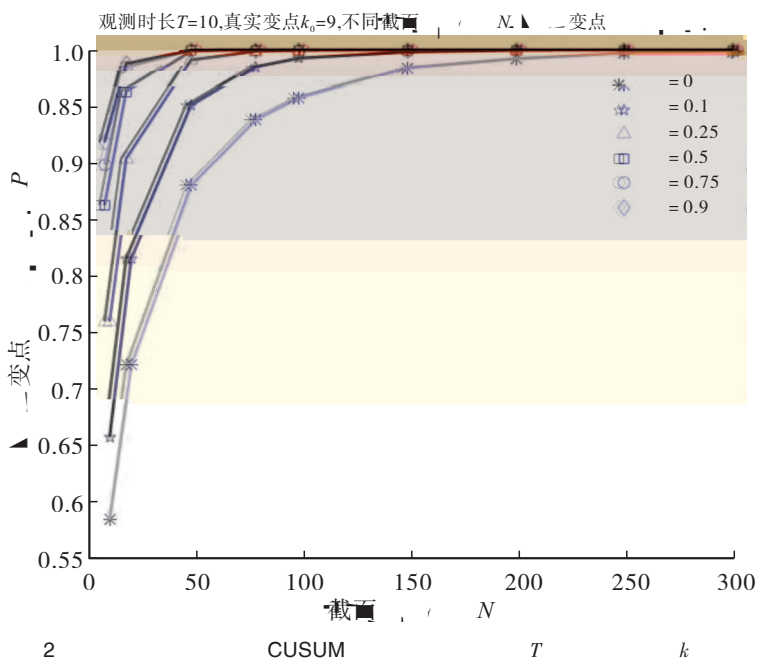
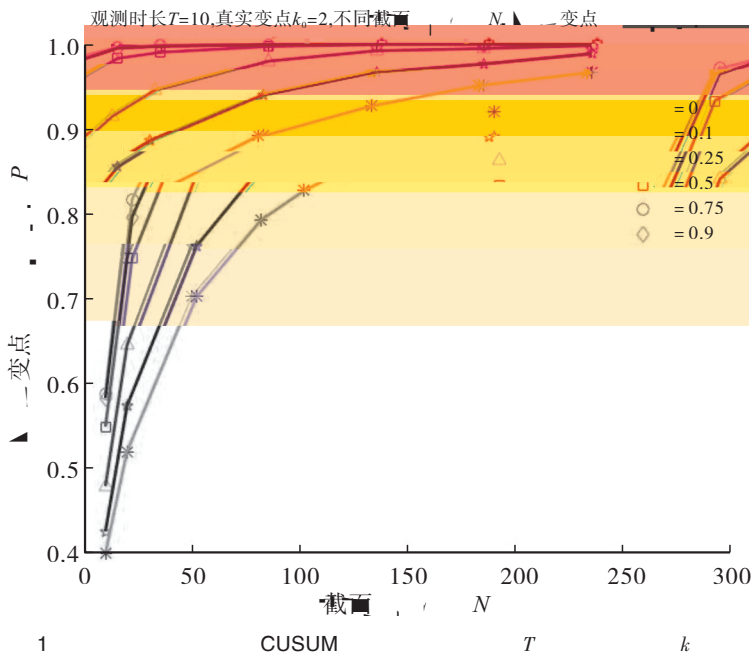
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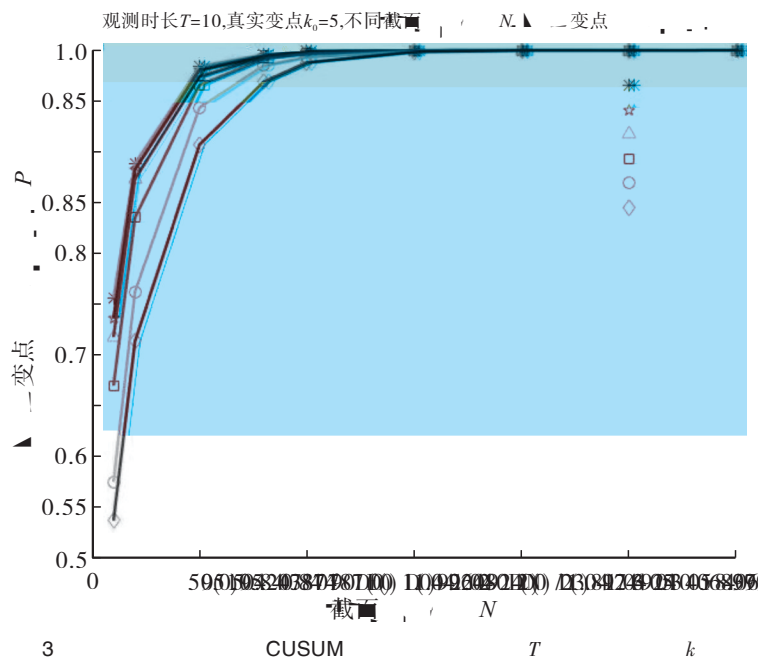
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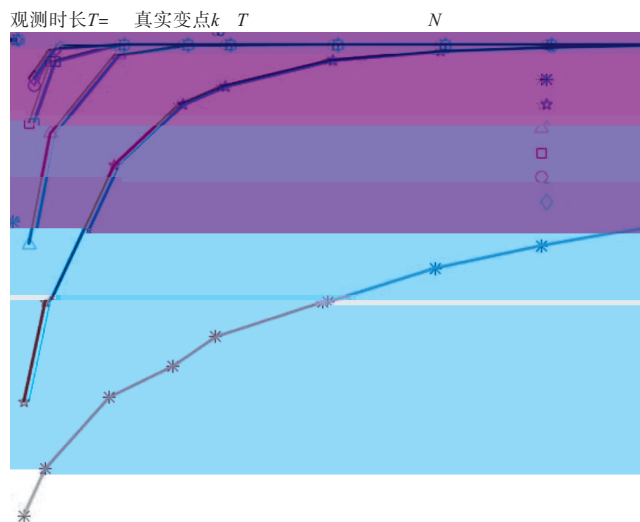


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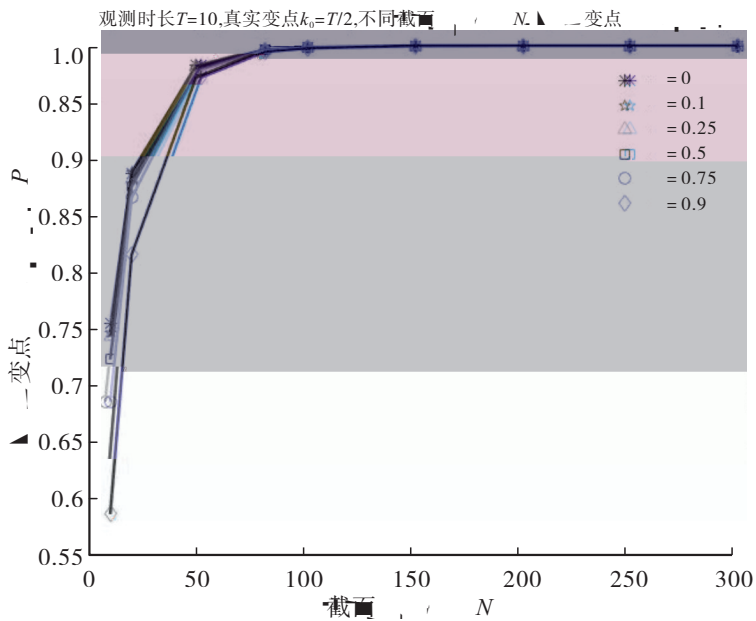
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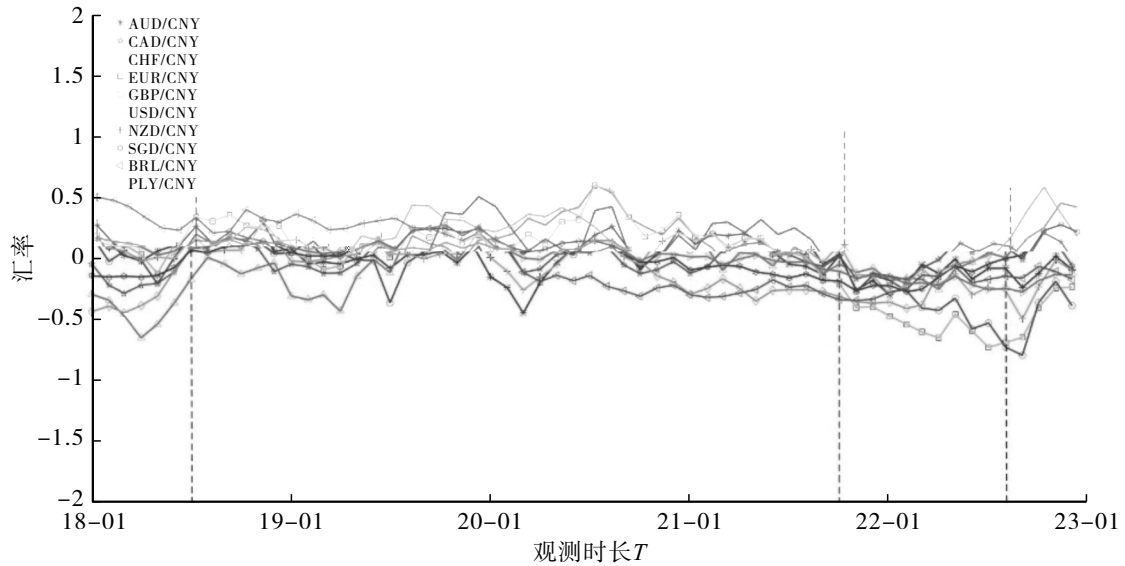


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Common Change Point Estimation of Variance in Panel Data

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