

软件培训之家

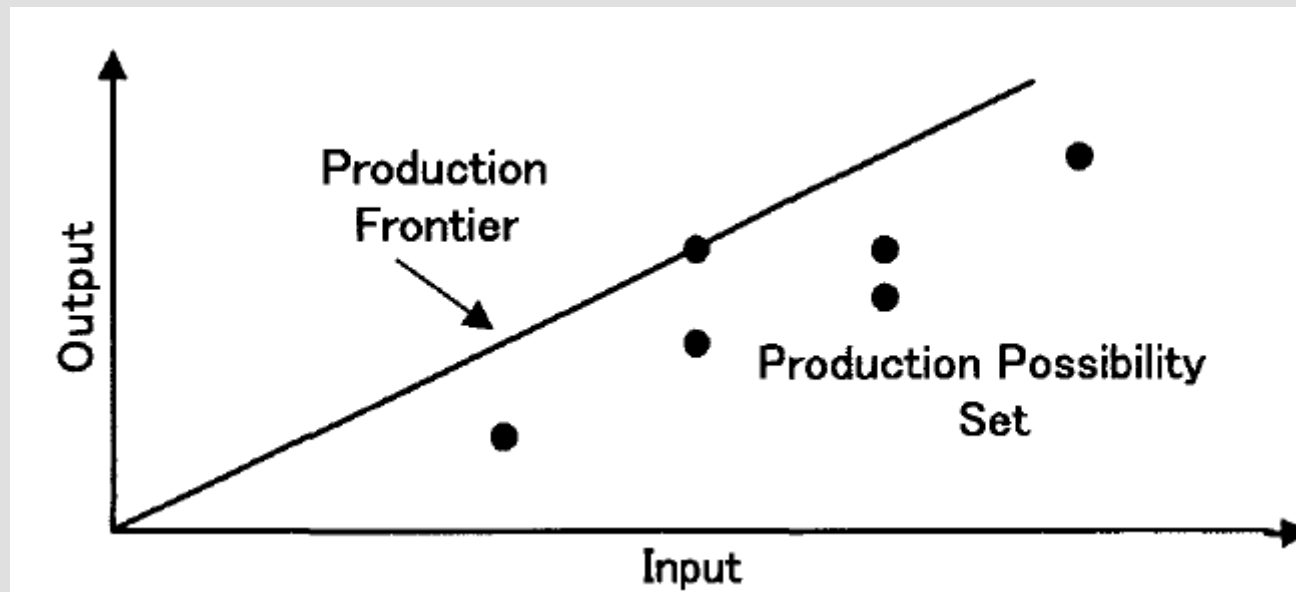
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CCR和BCC

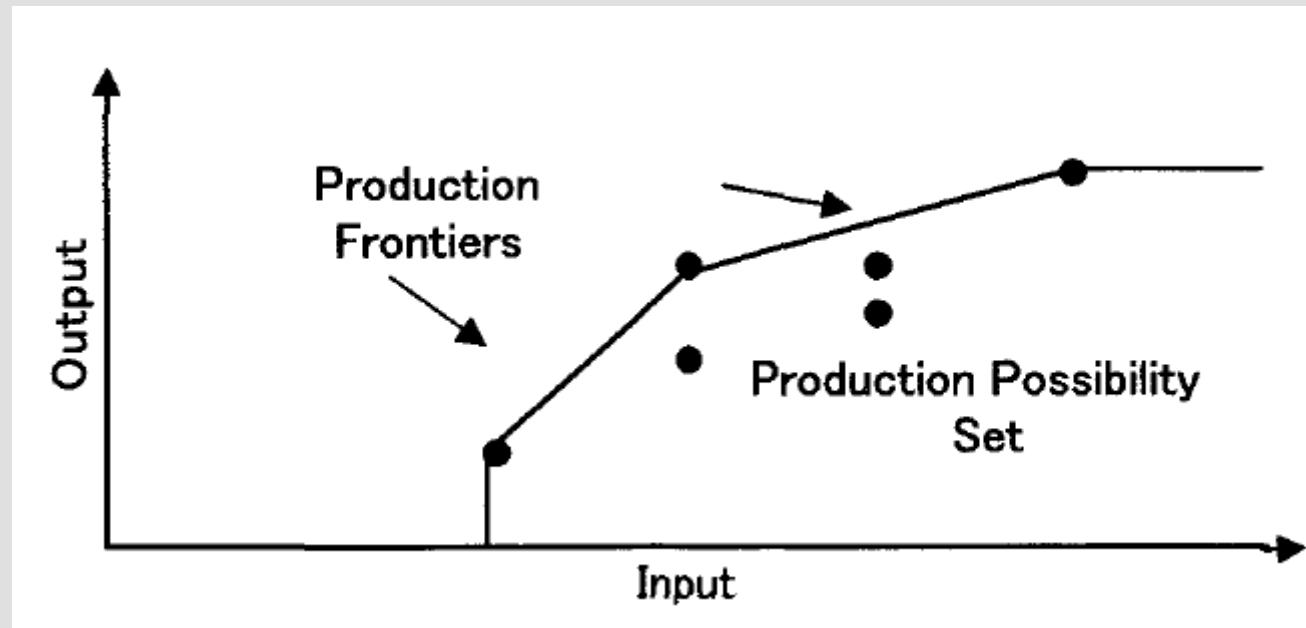
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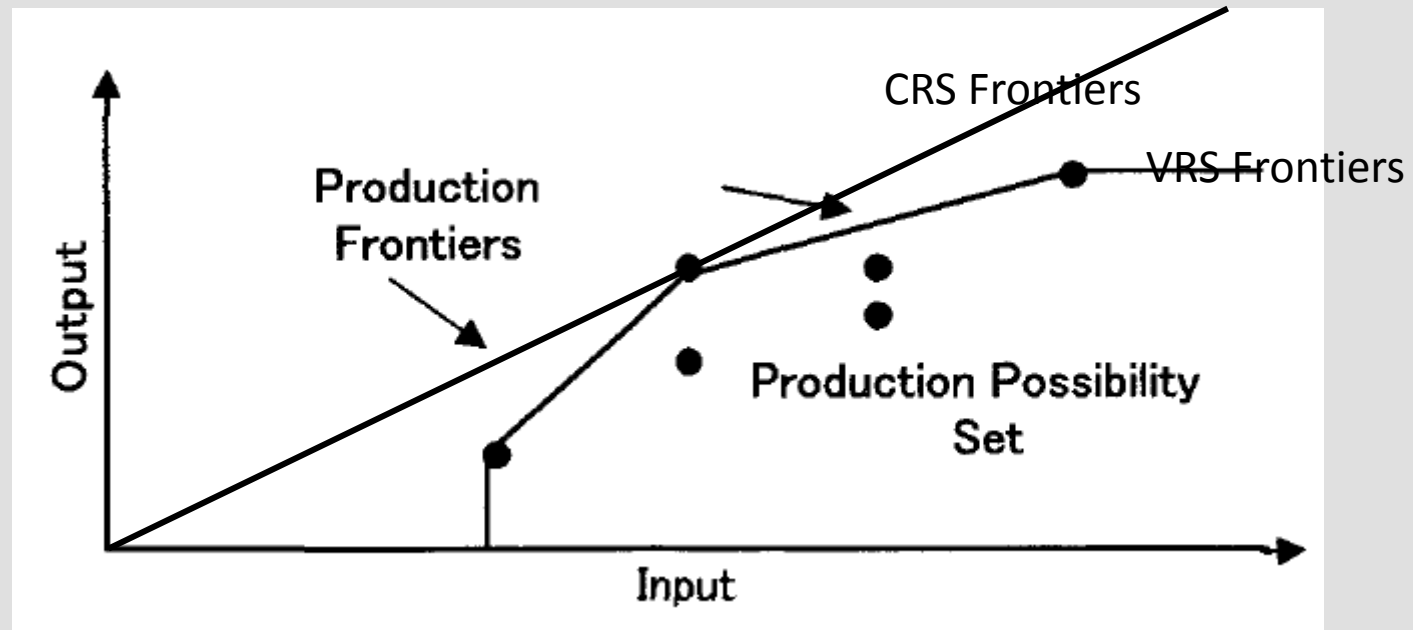
1.CCR模型图解

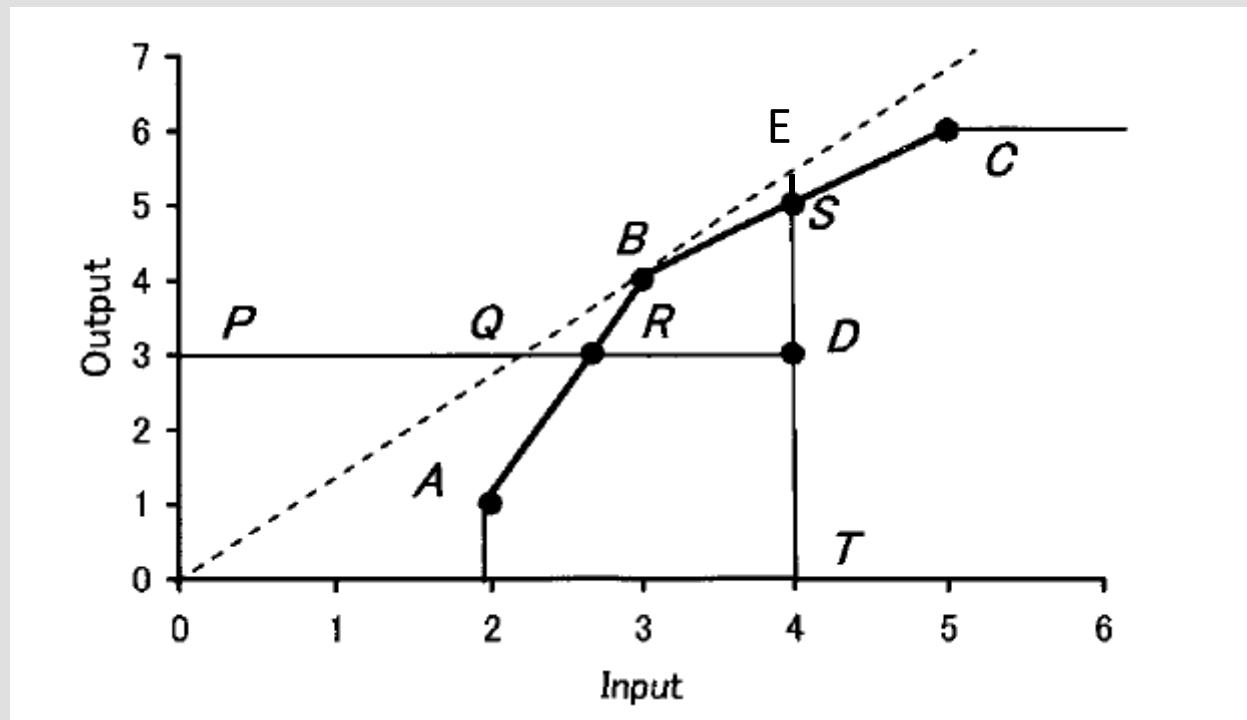


2.BCC模型图解



3.CRS和VRS





投入角度: $CCR TE_D = PQ/PD$
 $BCC TE_D = PR/PD$



4.初始CCR模型：分式规划

$$\begin{array}{ll}\max_{\mathbf{u}, \mathbf{v}} & (\mathbf{u}'\mathbf{q}_i/\mathbf{v}'\mathbf{x}_i), \\ \text{st}^1 & \mathbf{u}'\mathbf{q}_j/\mathbf{v}'\mathbf{x}_j \leq 1, \quad j=1,2,\dots,I, \\ & \mathbf{u}, \mathbf{v} \geq \mathbf{0}.\end{array}$$



投入角度

$$\begin{array}{ll}\min_{\theta, \lambda} & \theta, \\ \text{st} & -\mathbf{q}_i + \mathbf{Q}\lambda \geq \mathbf{0}, \\ & \theta\mathbf{x}_i - \mathbf{X}\lambda \geq \mathbf{0}, \\ & \lambda \geq \mathbf{0},\end{array}$$

包络模型：最为常用



4.BCC模型：包络形式

$$\begin{array}{ll}\min_{\theta, \lambda} & \theta, \\ \text{st} & -\mathbf{q}_i + \mathbf{Q}\lambda \geq \mathbf{0}, \\ & \theta \mathbf{x}_i - \mathbf{X}\lambda \geq \mathbf{0}, \\ & \mathbf{1}'\lambda = 1 \\ & \lambda \geq \mathbf{0},\end{array}$$

投入角度

注意：投入角度的技术效率TE=θ



BCC产出角度

$$\begin{aligned}
 &\max_{\phi, \lambda} \phi, \\
 &\text{st} \quad -\phi \mathbf{q}_i + \mathbf{Q}\lambda \geq 0, \\
 &\quad \mathbf{x}_i - \mathbf{X}\lambda \geq 0, \\
 &\quad \mathbf{1}'\lambda = 1 \\
 &\quad \lambda \geq 0,
 \end{aligned}$$

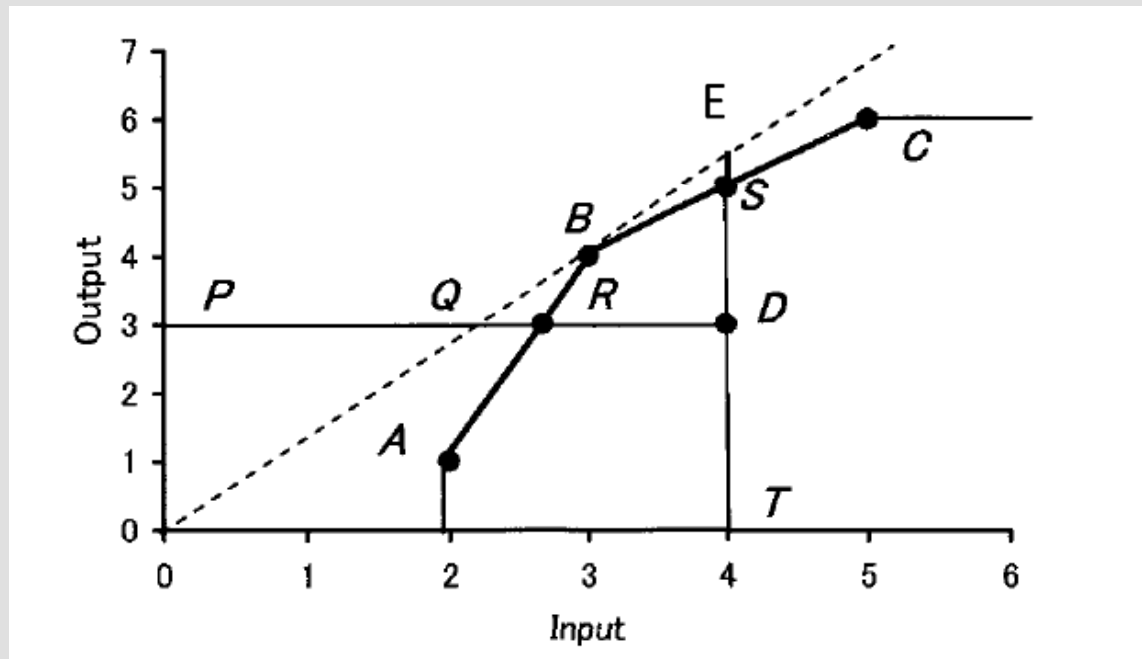
CCR产出角度

$$\begin{aligned}
 &\max_{\phi, \lambda} \phi, \\
 &\text{st} \quad -\phi \mathbf{q}_i + \mathbf{Q}\lambda \geq 0, \\
 &\quad \mathbf{x}_i - \mathbf{X}\lambda \geq 0, \\
 &\quad \cancel{\mathbf{1}'\lambda = 1} \\
 &\quad \lambda \geq 0,
 \end{aligned}$$

注意：产出角度的技术效率 $TE = 1/\phi$



5. 规模效率



投入角度: $CCR TE_D = PQ/PD$
 $BCC TE_D = PR/PD$
 $SE_D = PQ/PR = CCR TE / BCC TE$

