



تحلیل استراتژی‌های عملیاتی در زنجیره تأمین بشردوستانه در هنگام وقوع زلزله با استفاده از رویکرد QFDEA (مورد مطالعه: زلزله خوی)

پیوست شماره ۱

مدل ساخته شده QFDEA برای DR₁ براساس رابطه ۲، به شرح ذیل است:

$$\begin{aligned} \text{Max } & 0.184u_{11} + 0.187u_{21} + 0.178u_{31} + 0.167u_{41} + 0.254u_{51} + 0.049u_{61} + 0.091u_{71} \\ & + 0.134u_{81} + 0.099u_{91} + 0.168u_{10,1} + 0.129u_{11,1} + 0.146u_{12,1} \\ & + 0.066u_{13,1} + 0.063u_{14,1} + 0.058u_{15,1} \end{aligned}$$

S.t:

$$\begin{aligned} & 0.184u_{11} + 0.187u_{21} + 0.178u_{31} + 0.167u_{41} + 0.254u_{51} + 0.049u_{61} + 0.091u_{71} + \\ & 0.134u_{81} + 0.099u_{91} + 0.168u_{10,1} + 0.129u_{11,1} + 0.146u_{12,1} + 0.066u_{13,1} + \\ & 0.063u_{14,1} + 0.058u_{15,1} - 0.043v_{11} - 0.065v_{21} \leq 0 \end{aligned}$$

$$\begin{aligned} & 0.072u_{11} + 0.074u_{21} + 0.033u_{31} + 0.027u_{41} + 0.039u_{51} + 0.041u_{61} + 0.082u_{71} \\ & + 0.121u_{81} + 0.090u_{91} + \end{aligned}$$

$$\begin{aligned} & 0.027u_{10,1} + 0.049u_{11,1} + 0.057u_{12,1} + 0.066u_{13,1} + 0.063u_{14,1} + 0.077u_{15,1} - 0.021v_{11} \\ & - 0.022v_{21} \leq 0 \end{aligned}$$

$$\begin{aligned} & 0.067u_{11} + 0.068u_{21} + 0.037u_{31} + 0.060u_{41} + 0.040u_{51} + 0.049u_{61} + 0.086u_{71} \\ & + 0.126u_{81} + 0.096u_{91} + \end{aligned}$$

$$\begin{aligned} & 0.031u_{10,1} + 0.122u_{11,1} + 0.141u_{12,1} + 0.066u_{13,1} + 0.063u_{14,1} + 0.038u_{15,1} - 0.064v_{11} \\ & - 0.065v_{21} \leq 0 \end{aligned}$$



$$0.059u_{\varepsilon_1} + 0.17u_{\tau_1} + 0.078u_{\nu_1} + 0.110u_{\lambda_1} + 0.080u_{\rho_1} + 0.20u_{1,1} + 0.053u_{1,3,1} \\ + 0.050u_{1,\varepsilon_1} + 0.077u_{1,\rho_1} - 0.043v_{1,1} - 0.044v_{\tau_1} \leq 0$$

$$0.31u_{1,1} + 0.28u_{\tau_1} + 0.27u_{\rho_1} + 0.39u_{\tau_1} + 0.30u_{\rho_1} + 0.117u_{1,1,1} + 0.132u_{1,2,1} \\ + 0.66u_{1,3,1} + 0.63u_{1,\varepsilon_1} + 0.38u_{1,\rho_1} - 0.107v_{1,1} - 0.109v_{\tau_1} \leq 0$$

$$0.108u_{\rho_1} + 0.20u_{\varepsilon_1} + 0.47u_{\tau_1} + 0.079u_{\nu_1} + 0.20u_{\lambda_1} + 0.32u_{\rho_1} + 0.23u_{1,1} \\ + 0.119u_{1,1,1} + 0.139u_{1,2,1} + 0.66u_{1,3,1} + 0.63u_{1,\varepsilon_1} + 0.19u_{1,\rho_1} \\ - 0.107v_{1,1} - 0.109v_{\tau_1} \leq 0$$

$$0.64u_{1,1} + 0.61u_{\tau_1} + 0.29u_{\rho_1} + 0.23u_{\varepsilon_1} + 0.42u_{\tau_1} + 0.070u_{\nu_1} + 0.49u_{\lambda_1} \\ + 0.083u_{\rho_1} + 0.077u_{1,1}$$

$$+ 0.040u_{1,1,1} + 0.053u_{1,2,1} + 0.66u_{1,3,1} + 0.63u_{1,\varepsilon_1} + 0.080u_{1,\rho_1} - 0.080v_{1,1} - 0.044v_{\tau_1} \\ \leq 0$$

$$0.163u_{1,1} + 0.160u_{\tau_1} + 0.24u_{\rho_1} + 0.00u_{\varepsilon_1} + 0.47u_{\tau_1} + 0.17u_{\lambda_1} + 0.37u_{\rho_1} \\ + 0.149u_{1,1,1} + 0.047u_{1,1,1}$$

$$+ 0.21u_{1,2,1} + 0.66u_{1,3,1} + 0.63u_{1,\varepsilon_1} + 0.077u_{1,\rho_1} - 0.074v_{1,1} - 0.044v_{\tau_1} \leq 0$$

$$0.28u_{1,1} + 0.106u_{\tau_1} + 0.078u_{\rho_1} + 0.01u_{\varepsilon_1} + 0.43u_{\tau_1} + 0.14u_{\lambda_1} + 0.33u_{\rho_1} \\ + 0.077u_{1,1,1} + 0.047u_{1,1,1}$$

$$+ 0.047u_{1,2,1} + 0.66u_{1,3,1} + 0.63u_{1,\varepsilon_1} + 0.080u_{1,\rho_1} - 0.043v_{1,1} - 0.070v_{\tau_1} \leq 0$$

$$0.104u_{1,1} + 0.24u_{\tau_1} + 0.61u_{\varepsilon_1} + 0.40u_{\tau_1} + 0.10u_{\lambda_1} + 0.34u_{\rho_1} + 0.69u_{1,1,1} \\ + 0.043u_{1,1,1} + 0.18u_{1,2,1} + 0.66u_{1,3,1} + 0.63u_{1,\varepsilon_1} + 0.38u_{1,\rho_1} \\ - 0.043v_{1,1} - 0.087v_{\tau_1} \leq 0$$

$$0.103u_{\rho_1} + 0.60u_{\varepsilon_1} + 0.21u_{\tau_1} + 0.29u_{\rho_1} + 0.30u_{1,1,1} + 0.41u_{1,2,1} + 0.39u_{1,3,1} \\ + 0.050u_{1,\varepsilon_1} + 0.080u_{1,\rho_1} - 0.074v_{1,1} - 0.044v_{\tau_1} \leq 0$$



$$\begin{aligned} & 0.057u_{r1} + 0.144u_{e1} + 0.37u_{o1} + 0.44u_{t1} + 0.116u_{\lambda1} + 0.84u_{q1} + 0.37u_{11,1} \\ & + 0.144u_{12,1} + 0.66u_{13,1} + 0.63u_{14,1} + 0.08u_{1o,1} - 0.21v_{11} \\ & - 0.87v_{r1} \leq 0 \end{aligned}$$

$$\begin{aligned} & 0.22u_{e1} + 0.219u_{o1} + 0.146u_{t1} + 0.33u_{v1} + 0.44u_{\lambda1} + 0.33u_{q1} + 0.144u_{11,1} \\ & + 0.03u_{12,1} + 0.63u_{14,1} + 0.77u_{1o,1} - 0.43v_{11} - 0.44v_{r1} \leq 0 \end{aligned}$$

$$\begin{aligned} & 0.21u_{e1} + 0.98u_{o1} + 0.139u_{t1} + 0.266u_{v1} + 0.41u_{\lambda1} + 0.76u_{q1} + 0.36u_{11,1} \\ & + 0.39u_{12,1} + 0.00u_{14,1} + 0.96u_{1o,1} - 0.64v_{11} - 0.22v_{r1} \leq 0 \end{aligned}$$

$$\begin{aligned} & 0.08u_{11} + 0.61u_{r1} + 0.64u_{r1} + 0.07u_{e1} + 0.34u_{o1} + 0.01u_{t1} + 0.28u_{v1} \\ & + 0.46u_{\lambda1} + 0.32u_{q1} + \end{aligned}$$

$$\begin{aligned} & 0.144u_{1,1} + 0.40u_{11,1} + 0.49u_{12,1} + 0.03u_{13,1} + 0.63u_{14,1} + 0.37u_{1o,1} - 0.80v_{11} \\ & - 0.60v_{r1} \leq 0 \end{aligned}$$

$$\begin{aligned} & 0.28u_{o1} + 0.48u_{t1} + 0.88u_{v1} + 0.11u_{\lambda1} + 0.27u_{q1} + 0.136u_{1,1} + 0.39u_{12,1} \\ & + 0.37u_{14,1} + 0.96u_{1o,1} - 0.21v_{11} - 0.22v_{r1} \leq 0 \end{aligned}$$

$$\begin{aligned} & 0.179u_{11} + 0.176u_{r1} + 0.172u_{r1} + 0.63u_{e1} + 0.240u_{o1} + 0.134u_{t1} + 0.94u_{v1} \\ & + 0.131u_{\lambda1} + 0.90u_{q1} + \end{aligned}$$

$$\begin{aligned} & 0.79u_{1,1} + 0.126u_{11,1} + 0.144u_{12,1} + 0.66u_{13,1} + 0.63u_{14,1} + 0.37u_{1o,1} - 0.80v_{11} \\ & - 0.60v_{r1} \leq 0 \end{aligned}$$

$$1.021u_{11} - u_{r1} = 0 \quad 0.660u_{11} - u_{r1} = 0 \quad 0.909u_{11} - u_{e1} = 0 \quad 0.928u_{11} - u_{o1} = 0$$

$$0.887u_{11} - u_{t1} = 0 \quad 0.774u_{11} - u_{v1} = 0 \quad 1.002u_{11} - u_{\lambda1} = 0 \quad 0.969u_{11} - u_{q1} = 0$$

$$0.629u_{11} - u_{1,1} = 0 \quad 0.806u_{11} - u_{11,1} = 0 \quad 0.067u_{11} - u_{12,1} = 0$$

$$u_{11} \cdot u_{r1} \cdot u_{r1} \cdot u_{e1} \cdot u_{o1} \cdot u_{t1} \cdot u_{v1} \cdot u_{\lambda1} \cdot u_{q1} \cdot u_{1,1} \cdot u_{11,1} \cdot u_{12,1} \cdot u_{13,1} \cdot u_{14,1} \cdot u_{1o,1} \cdot v_{11} \cdot v_{r1} \geq 0$$