$$\min \sum_{t \in T} \sum_{i \in T} \left( \sum_{s \in S} P^s \left[ c_i^l p_{it}^s - \lambda_t^{ds} p_{it}^{Ms} + c_i^q (p_{it}^s)^2 \right] \right) + c_{it}^u + c_{it}^d + c_i^l u_{it} \tag{1}$$

subject to

$$\sum_{i \in U_{jt}} f_{itj} = L_j \quad t \in T, \; j \in F \tag{2}$$

$$q_{it} \geq \sum_{j \in F_i} f_{itj} \quad i \in U_t, \; t \in T \tag{3}$$

$$\sum_{i \in U_t} b_{it} = \sum_{j \in BC} L_{jt}^{BC} \quad t \in T \tag{4}$$

$$p_{it}^s = b_{it} + p_{it}^{Ms} \quad s \in S, \; i \in U_t, \; t \in T \tag{5}$$

$$p_{it}^{Ms} \leq \overline{P}_i u_{it} - b_{it} \quad s \in S, \; i \in U_t, \; t \in T \tag{6}$$

$$p_{it}^{Ms} \geq q_{it} \quad s \in S, \; i \in U_t, \; t \in T \tag{7}$$

$$q_{it} \geq \underline{P}_i u_{it} - b_{it} \quad i \in U_t, \; t \in T \tag{8}$$

$$q_{it} \geq 0 \quad i \in U_t, \; t \in T \tag{9}$$

$$0 \leq b_{it} \leq \overline{P}_i u_{it} \quad i \in U_t, \; t \in T \tag{10}$$

$$c_{it}^u \geq c_t^{on} [u_{it} - u_{(i-1)t}] \quad i \in I, \; t \in T \tag{11}$$

$$c_{it}^d \geq c_t^{off} [u_{(i-1)t} - u_{it}] \quad i \in I, \; t \in T \tag{12}$$

$$\sum_{t=1}^{G_i} (1 - u_{it}) = 0 \quad i \in I \tag{13}$$

1

$$\sum_{t=1}^{L_i} u_{it} = 0 \quad i \in I \tag{14}$$

$$\sum_{n=t}^{t+t_i^{on}-1} u_{it} \geq t_i^{on} \left[ u_{it} - u_{(i-1)t} \right] \quad i \in I, \, t = G_i + 1 \ldots |T| - t_i^{on} + 1 \tag{15}$$

$$\sum_{n=t}^{t+t_i^{off}-1} \left[ 1 - u_{it} \right] \geq t_i^{off} \left[ u_{(i-1)t} - u_{it} \right] \quad i \in I, \, t = L_i + 1 \ldots |T| - t_i^{off} + 1 \tag{16}$$

$$\sum_{n=t}^{|T|} \{ u_{nt} - \left[ u_{it} - u_{(i-1)t} \right] \} \geq 0 \quad i \in I, \, t = |T| - t_i^{on} + 2 \ldots |T| \tag{17}$$

$$\sum_{n=t}^{|T|} \{ 1 - u_{nt} - \left[ u_{(i-1)t} - u_{it} \right] \} \geq 0 \quad i \in I, \, t = |T| - t_i^{off} + 2 \ldots |T| \tag{18}$$

$$c_{it}^u, c_{it}^d \geq 0 \quad i \in I, \, t \in T \tag{19}$$

$$f_{itj} \geq 0 \quad i \in I, \, t \in T, \, j \in F \tag{20}$$

$$u_{it} \in \{0,1\} \quad i \in I, \, t \in T \tag{21}$$