I : set of transaction id
J : set of priority type, 1 2 3 4
K : set of probability type, 1 2 3 for the probability of transaction, description and customer respectively
B : set of banks
a_i : amount of the transaction i
$date_i$: the date of transaction i
w_k : weight of probability type k
$Priority_i$: the priority type of transaction i, 1 2 3 4
$cost_j$: the cost of employee hired to deal with priority type j t_j : time cost for investigate according to the priority type j $from_i$: the bank from of transaction i
to_i : the bank to of transaction i
$p_{k,i}$: the probability type k of transaction i
M_b : the investigator number in bank b decision variable:
x_i : 1 if decide to investigate the transaction i, 0 otherwise.
y_i : 1 if hired employee to investigate transaction i, 0 otherwise
$E_{m,n}$ for the investigate time cost by bank m for the transaction between bank m and bank n

Objective function:

$$min. \sum_{i \in I} \{ \sum_{k \in K} (w_k * p_{k,i}) * a_i * (1 - x_i) \} + \sum_{i \in I} y_i * cost_{Priority_i}$$

Constraints :

we introduce I' that $I' = \{i \in I / y_i = 0\}$

for bank A:

$$\sum_{i \in \{I'/from_i = 1\}} t_{Priority_i} * x_i - \sum_{n \in 2,3,4,5} E_{1,n} + \sum_{m \in \{2,3,4,5} E_{m,1} \leq M_1$$

for bank B:

$$\sum_{i \in \{I'/from_i = 2\}} t_{Priority_i} * x_i - \sum_{n \in 1,3,4,5} E_{2,n} + \sum_{m \in \{1,3,4,5} E_{m,2} \leq M_2$$

for bank c:

$$\sum_{i \in \{I'/from_i = 3\}} t_{Priority_i} * x_i - \sum_{n \in 1,2,4,5} E_{3,n} + \sum_{m \in \{1,2,4,5} E_{m,3} \leq M_3$$

for bank D:

$$\sum_{i \in \{I'/from_i = 4\}} t_{Priority_i} * x_i - \sum_{n \in 1,2,3,5} E_{4,n} + \sum_{m \in \{1,2,3,5} E_{m,4} \leq M_4$$

for bank E:

$$\sum_{i \in \{I'/from_i = 5\}} t_{Priority_i} * x_i - \sum_{n \in 1,2,3,4} E_{5,n} + \sum_{m \in \{1,2,3,4} E_{m,5} \leq M_5$$

transactions between bank m and bank n:

$$E_{m,n}+E_{n,m} \leq \sum_{i\in\{I'/from_i=m,to_i=n\}} + \sum_{i\in\{I'/from_i=n,to_i=m\}} t_{Priority_i}*x_i,\ \forall m,n \in B$$

Binary Variable Constraints:
$x_i \in \{0,1\}$
$y_i \in \{0,1\}$
Outcome and iterative:
z_i : 1 if the transaction i is scam, 0 otherwise.
α_i : 1 if $x_i = z_i$, 0 otherwise.

1 method 1

Change the objective function into:

$$min.\ \sum_{i\in I}(p_{k,i}) * a_i * (1-x_i) + \sum_{i\in I} y_i * cost_{Priority_i}$$

run the model for k=1,2,3 respectively. And record the x_i as $x_i^{(1)}$, $x_i^{(2)}$ and $x_i^{(3)}$. Then we can have $\alpha_i^{(1)}$,$\alpha_i^{(2)}$ and $\alpha_i^{(3)}$.
Let $w_1 = \alpha_i^{(1)}/(\alpha_i^{(1)}+\alpha_i^{(2)}+\alpha_i^{(3)})$
$w_2 = \alpha_i^{(2)}/(\alpha_i^{(1)}+\alpha_i^{(2)}+\alpha_i^{(3)})$
$w_3 = \alpha_i^{(3)}/(\alpha_i^{(1)}+\alpha_i^{(2)}+\alpha_i^{(3)})$
with these new w_k, We get our model for the 1st iteration.
for the 2nd iteration, $w_1(new) = (w_1(old) + \alpha_i^{(1)}/(\alpha_i^{(1)}+\alpha_i^{(2)}+\alpha_i^{(3)})/2$
...
for the nth iteration,
$w_1(new) = (w_1(old)*(n-1) + \alpha_i'/\alpha_i^{(1)}/(\alpha_i^{(1)}+\alpha_i^{(2)}+\alpha_i^{(3)}))/n$
...

2 method 2

run the original model and we get optimal solution x'
change $\sum_{k\in K}(w_k * p_{k,i}$ into z_i then we get the real cost c' if we take the optimal solution x' get from our model

$$\sum_{i\in I} z_i * a_i * (1-x_i') + \sum_{i\in I} y_i * cost_{Priority_i} = c'$$

solve this objective function with same constrains:

$$min.\ \sum_{i\in I} z_i * a_i * (1-x_i) + \sum_{i\in I} y_i * cost_{Priority_i}$$

we have optimal value $\tilde{c}$ and optimal solution $tildex$ which is perfect.
Adjust w_k until we minimize $c' - \tilde{c}$, and we get optimal $\tilde{w_k}$ for the model.