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(d)

i) Decision Variables

$x_{HSBC}$

$x_{paypal}$

$x_{p10}$

$x_{BP}$

$x_{blaze}$

$x_{ningbo}$

$x_{ASTM}$

$x_{voda}$

$x_{elon}$

$x_{uni}$

a fraction of investment  $\in [0, 1]$

(Banking)  $y_{HSBC}$

(oil)  $y_{paypal}$

(oil)  $y_{p10}$

(oil)  $y_{BP}$

(Pharm)  $y_{blaze}$

(Bev)  $y_{biogen}$

(Pharm)  $y_{ASTM}$

(tele)  $y_{voda}$

(Min)  $y_{elon}$

(Food)  $y_{uni}$

1 if invested, otherwise 0  $\in \{0, 1\}$

ii) Objective function

Maximise expected return  $\mu^T x$

iii) CONSTRAINTS

$$\bullet x_{\text{HSBC}} + x_{\text{Royal}} + \dots + x_{\text{Glen}} + x_{\text{Uni}} = 1$$

$$\bullet x^T \Sigma x \leq \bar{R}$$

$$\bullet y_{\text{Royal}} + y_{\text{Rio}} + y_{\text{BP}} \leq 1$$

$$\bullet y_{\text{Glaxo}} + y_{\text{Astra}} \leq 1$$

$$\bullet y_{\text{HSBC}}, y_{\text{Diageo}}, y_{\text{Voda}}, y_{\text{Glen}}, y_{\text{Uni}} \leq 1$$

$$\bullet x_{\text{HSBC}} \leq y_{\text{HSBC}}$$

$$x_{\text{Royal}} \leq y_{\text{Royal}}$$

$$x_{\text{Rio}} \leq y_{\text{Rio}}$$

$$x_{\text{BP}} \leq y_{\text{BP}}$$

$$x_{\text{Glaxo}} \leq y_{\text{Glaxo}}$$

$$x_{\text{Diageo}} \leq y_{\text{Diageo}}$$

$$x_{\text{Astra}} \leq y_{\text{Astra}}$$

$$x_{\text{Glen}} \leq y_{\text{Glen}}$$

$$x_{\text{Uni}} \leq y_{\text{Uni}}$$

$$\bullet x_{\text{HSBC}}, \dots, x_{\text{Uni}} \geq 0 \quad (\text{nonnegative})$$

$$\bullet y_{\text{HSBC}}, \dots, y_{\text{Uni}} \in \{0, 1\} \quad (\text{Binary}).$$