1. $r_{11}=4 \quad r_{12}=7 \quad q_1=3 \quad q_2=1.$

$r_{21}=12 \quad r_{22}=2$

$\frac{r_{22}}{q_2}=\frac{2}{1}=2 \quad \frac{r_{21}}{q_1}=\frac{12}{3}=4 \quad \frac{r_{22}}{q_2}-\frac{r_{21}}{q_1}=2-4=-2<0$

$\frac{r_{11}}{q_1}=\frac{4}{3}=\frac{4}{3} \quad \frac{r_{12}}{q_2}=\frac{7}{1}=7. \quad \frac{r_{11}}{q_1}-\frac{r_{12}}{q_2}=\frac{4}{3}-7<0$

$\therefore \frac{\frac{r_{22}}{q_2}-\frac{r_{21}}{q_1}}{\frac{r_{11}}{q_1}-\frac{r_{12}}{q_2}}>0.$ No arbitrage condition satisfies.

2. $\det R=\begin{vmatrix}4 & 7\\ 12 & 2\end{vmatrix}=4\times2-7\times12\neq0.$

∴ The asset ~~stocks~~ structure is complete.

3. $w_0=q\cdot\bar{a}=q_1\bar{a}_1+q_2\bar{a}_2=3\cdot4+1\cdot5=12+5=17.$

4. $w_1=4a_1+7a_2=4\cdot4+7\cdot5=16+35=51$ in state 1.

$w_2=12a_1+2a_2=12\cdot4+2\cdot5=48+10=58$ in state 2.

5. $p_{1w}=\frac{w_1}{w_0}=\frac{51}{17} \quad p_{2w}=\frac{w_2}{w_0}=\frac{58}{17}$

$E[p_w]=\frac{1}{2}\times\frac{51}{17}+\frac{1}{2}\times\frac{58}{17}=\frac{109}{34}.$