

# Administración de Riesgos

Subgerencia: *Makeham Area of Risk*

Mayo 2019

## Ejercicio 4 - Demostración

Demuestre el procedimiento para realizar una cobertura Delta-Gamma-Vega simultánea.

### Demostración:

La idea es anular pérdidas utilizando 1er y 2do orden de sensibilidad, con respecto a  $S$ , mientras que el factor de la volatilidad utilizamos sólo 1er orden

$$\begin{aligned}\frac{\partial P}{\partial f_R} + \frac{\varphi_1 \partial P_1}{\partial f_R} + \frac{\varphi_2 \partial P_2}{\partial f_R} + \frac{\varphi_3 \partial P_3}{\partial f_R} &= 0 \\ \rightarrow \frac{\partial^2 P}{\partial f_R^2} + \frac{\varphi_1 \partial^2 P_1}{\partial f_R^2} + \frac{\varphi_2 \partial^2 P_2}{\partial f_R^2} + \frac{\varphi_3 \partial^2 P_3}{\partial f_R^2} &= 0 \\ \frac{\partial P}{\partial f'_R} + \frac{\varphi_1 \partial P_1}{\partial f'_R} + \frac{\varphi_2 \partial P_2}{\partial f'_R} + \frac{\varphi_3 \partial P_3}{\partial f'_R} &= 0\end{aligned}$$
$$\begin{pmatrix} \frac{\varphi_1 \partial P_1}{\partial f_R} & \frac{\varphi_2 \partial P_2}{\partial f_R} & \frac{\varphi_3 \partial P_3}{\partial f_R} \\ \frac{\varphi_1 \partial^2 P_1}{\partial f_R^2} & \frac{\varphi_2 \partial^2 P_2}{\partial f_R^2} & \frac{\varphi_3 \partial^2 P_3}{\partial f_R^2} \\ \frac{\varphi_1 \partial P_1}{\partial f'_R} & \frac{\varphi_2 \partial P_2}{\partial f'_R} & \frac{\varphi_3 \partial P_3}{\partial f'_R} \end{pmatrix} \begin{pmatrix} \varphi_1 \\ \varphi_2 \\ \varphi_3 \end{pmatrix} = \begin{pmatrix} \frac{\partial P}{\partial f_R} \\ \frac{\partial^2 P}{\partial f_R^2} \\ \frac{\partial P}{\partial f'_R} \end{pmatrix}$$

Si  $f_R = S$  y  $f'_R = \sigma$

$$\rightarrow \begin{pmatrix} \Delta_1 & \Delta_2 & \Delta_3 \\ \gamma_1 & \gamma_2 & \gamma_3 \\ \nu_1 & \nu_2 & \nu_3 \end{pmatrix} \begin{pmatrix} \varphi_1 \\ \varphi_2 \\ \varphi_3 \end{pmatrix} = \begin{pmatrix} \Delta_p \\ \gamma_p \\ \nu_p \end{pmatrix} \blacksquare$$