\[ J_{12} = E \left( \frac{\partial^2 \log f}{\partial \theta_1 \partial \theta_2} \right) = \frac{-\rho}{\sigma^2 (1 - \rho^2)} \]
\[ h_{11}^{-1} = \sigma^2(1 - \rho^2) \]

\[ f_{X|Y}(x|y) = \frac{1}{\sqrt{2\pi \sigma^2}} e^{-\frac{1}{2\sigma^2} (x - \theta_1 - \rho(x - \theta_2))} \]

\[ \frac{\partial\log f}{\partial \theta_1} = \frac{y_1 - \rho(y_2 - \theta_2) - \theta_1}{\sigma^2(1 - \rho^2)} = f_{11}(y_1 - \rho(y_2 - \theta_2) - \theta_1) \]

\[ W_2 \text{ is the second-order derivative of } f \text{ with respect to } \theta_1 \text{ and } \theta_2 \text{ evaluated at } (\theta_1, \theta_2) \]
\[
\begin{pmatrix}
1 & 0 & 0 \\
\alpha_{n+1} & \alpha_{n} & \alpha_{n+2} \\
\beta_{n+1} & \beta_{n} & \beta_{n+2}
\end{pmatrix}
= \begin{pmatrix}
1 & -k_{m+1} & 0 \\
0 & 1 & -k_{m+1} \\
0 & 0 & 1
\end{pmatrix}
\]

where \( k_{m+1} = \) some constant.multiply the matrix by \( \alpha_{n+1} \) and \( \beta_{n+1} \) to get the equation:

\[
\alpha_{n+1} = \alpha_{n+2} \frac{1}{1 - \alpha_{n}^2}
\]

and

\[
\beta_{n+1} = \beta_{n+2} \frac{1}{1 - \beta_{n}^2}
\]

where \( \alpha_{n+2} \) and \( \beta_{n+2} \) are functions of \( \alpha_{n+1} \) and \( \beta_{n+1} \) respectively.