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## APPENDIX

Expected value of stock and bond excess returns given the information set at time  $t-1$  ( $\Omega_{t-1}$ ) are calculated as follows;

$$E(R_{\text{stock},t} | \Omega_{t-1}) = \alpha_1 + (\beta_{10} + \beta_{11} \hat{I}_t^A) * E(h_{\text{stock},t} | \Omega_{t-1}) + (\delta_1 + \delta_{11} \hat{I}_t^A) * E(h_{\text{stock.bond},t} | \Omega_{t-1})$$

$$E(R_{\text{bond},t} | \Omega_{t-1}) = \alpha_2 + (\beta_{20} + \beta_{21} \hat{I}_t^A) * E(h_{\text{bond},t} | \Omega_{t-1}) + (\delta_2 + \delta_{21} \hat{I}_t^A) * E(h_{\text{stock.bond},t} | \Omega_{t-1})$$

Since,

$$H_t = \begin{bmatrix} h_{\text{stock},t} & h_{\text{stock.bond},t} \\ h_{\text{stock.bond},t} & h_{\text{bond},t} \end{bmatrix} = C'C + A'H_{t-1}A + B'\varepsilon_{t-1}\varepsilon_{t-1}'B$$

$$= \begin{bmatrix} c_{11} & 0 \\ c_{21} & c_{22} \end{bmatrix} \begin{bmatrix} c_{11} & c_{21} \\ 0 & c_{22} \end{bmatrix}$$

$$+ \begin{bmatrix} a_{11} & 0 \\ 0 & a_{22} \end{bmatrix} \begin{bmatrix} h_{\text{stock},t-1} & h_{\text{stock.bond},t-1} \\ h_{\text{stock.bond},t-1} & h_{\text{bond},t-1} \end{bmatrix} \begin{bmatrix} a_{11} & 0 \\ 0 & a_{22} \end{bmatrix}$$

$$+ \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_{\text{stock},t-1} \\ \varepsilon_{\text{bond},t-1} \end{bmatrix} \begin{bmatrix} \varepsilon_{\text{stock},t-1} & \varepsilon_{\text{bond},t-1} \end{bmatrix} \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix}$$

$$= \begin{bmatrix} c_{11}^2 & c_{11}c_{21} \\ c_{11}c_{21} & c_{21}^2 + c_{22}^2 \end{bmatrix} + \begin{bmatrix} a_{11}^2 h_{\text{stock},t-1} & a_{11} a_{22} h_{\text{stock.bond},t-1} \\ a_{11} a_{22} h_{\text{stock.bond},t-1} & a_{22}^2 h_{\text{bond},t-1} \end{bmatrix}$$

$$+ \begin{bmatrix} b_{11}^2 \varepsilon_{\text{stock},t-1}^2 & b_{11} b_{22} \varepsilon_{\text{stock},t-1} \varepsilon_{\text{bond},t-1} \\ b_{11} b_{22} \varepsilon_{\text{stock},t-1} \varepsilon_{\text{bond},t-1} & b_{22}^2 \varepsilon_{\text{bond},t-1}^2 \end{bmatrix}$$

$$h_{\text{stock},t} = c_{11}^2 + a_{11}^2 h_{\text{stock},t-1} + b_{11}^2 \varepsilon_{\text{stock},t-1}^2$$

$$h_{\text{bond},t} = (c_{21}^2 + c_{22}^2) + a_{22}^2 h_{\text{bond},t-1} + b_{22}^2 \varepsilon_{\text{bond},t-1}^2$$

$$h_{\text{stock.bond},t} = c_{11}c_{21} + a_{11}a_{22} h_{\text{stock.bond},t-1} + b_{11}b_{22} \varepsilon_{\text{stock},t-1} \varepsilon_{\text{bond},t-1}$$

$$\begin{aligned}
E(h_{\text{stock},t} | \Omega_{t-1}) &= c_{11}^2 + a_{11}^2 E(h_{\text{stock},t-1} | \Omega_{t-1}) + b_{11}^2 E(\varepsilon_{\text{stock},t-1}^2 | \Omega_{t-1}) \\
&= c_{11}^2 + a_{11}^2 h_{\text{stock},t-1} + b_{11}^2 \varepsilon_{\text{stock},t-1}^2
\end{aligned}$$

$$\begin{aligned}
E(h_{\text{bond},t} | \Omega_{t-1}) &= (c_{21}^2 + c_{22}^2) + a_{22}^2 E(h_{\text{bond},t-1} | \Omega_{t-1}) + b_{22}^2 E(\varepsilon_{\text{bond},t-1}^2 | \Omega_{t-1}) \\
&= (c_{21}^2 + c_{22}^2) + a_{22}^2 h_{\text{bond},t-1} + b_{22}^2 \varepsilon_{\text{bond},t-1}^2
\end{aligned}$$

$$\begin{aligned}
E(h_{\text{stock.bond},t} | \Omega_{t-1}) &= c_{11}c_{21} + a_{11}a_{22} E(h_{\text{stock.bond},t-1} | \Omega_{t-1}) + b_{11}b_{22} E(\varepsilon_{\text{stock},t-1} \varepsilon_{\text{bond},t-1} | \Omega_{t-1}) \\
&= c_{11}c_{21} + a_{11}a_{22} h_{\text{stock.bond},t-1} + b_{11}b_{22} \varepsilon_{\text{stock},t-1} \varepsilon_{\text{bond},t-1}
\end{aligned}$$

Then,

$$\begin{aligned}
E(R_{\text{stock},t} | \Omega_{t-1}) &= \alpha_1 + (\beta_{10} + \beta_{11} I_t^A) * [c_{11}^2 + a_{11}^2 h_{\text{stock},t-1} + b_{11}^2 \varepsilon_{\text{stock},t-1}^2] \\
&\quad + (\delta_1 + \delta_{11} I_t^A) * [c_{11}c_{21} + a_{11}a_{22} h_{\text{stock.bond},t-1} + b_{11}b_{22} \varepsilon_{\text{stock},t-1} \varepsilon_{\text{bond},t-1}]
\end{aligned}$$

$$\begin{aligned}
E(R_{\text{bond},t} | \Omega_{t-1}) &= \alpha_2 + (\beta_{20} + \beta_{21} I_t^A) * [(c_{21}^2 + c_{22}^2) + a_{22}^2 h_{\text{bond},t-1} + b_{22}^2 \varepsilon_{\text{bond},t-1}^2] \\
&\quad + (\delta_2 + \delta_{21} I_t^A) * [c_{11}c_{21} + a_{11}a_{22} h_{\text{stock.bond},t-1} + b_{11}b_{22} \varepsilon_{\text{stock},t-1} \varepsilon_{\text{bond},t-1}]
\end{aligned}$$

## BIOGRAPHY

Miss Wilai Booncharoenwattana was born on July 1, 1980 in Bangkok. She completed high school education at Satri Wat Rakhang School in 1998. Upon completion of the bachelor degree of Economics from Thammasat University in 2002, she entered the Master of Science in Finance Program at Chulalongkorn University.

