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Apêndice A

Considere o seguinte sistema:

(A1) $w_i = \boldsymbol{a}' X_i + \boldsymbol{j}' Y_i + e_i \qquad i = 1,...,n$

(A2) $Y_i^* = \Gamma Z_i + v_i \qquad i = 1,...,n$

Para obtermos estimadores consistentes dos parâmetros do modelo tomemos a esperança condicional em Y_i :

(A3) $E(w_i \setminus Y_i) = \boldsymbol{a}' E(X_i \setminus Y_i) + \boldsymbol{j}' E(Y_i \setminus Y_i) + E(e_i \setminus Y_i)$

(A4) $E(Y_i^* \setminus Y_i) = \Gamma E(Z_i \setminus Y_i) + E(v_i \setminus Y_i)$

Os erros condicionais são erros generalizados no sentido de Cox e Snell (1968). Denote-os de $\boldsymbol{e}_i$ e $\boldsymbol{J}_i$. Como mostrou Vella (1993), utilizando a lei das expectativas iteradas e as hipóteses abaixo, podemos reescrever $\boldsymbol{e}_i$.

Hipótese 1: (X_i, e_i, v_i) são independentes e identicamente distribuídos

Hipótese 2: e_i e v_i são, condicionais em X_i, conjuntamente normalmente distribuídas com média zero e matriz de covariância

$$\begin{bmatrix} \boldsymbol{s}_e^2 & \sum_{ev} \\ \sum_{ve} & \sum_{vv} \end{bmatrix}$$

(A5) $$e_i = E(E(e_i \setminus v_i) \setminus Y_i) = \sum_{ev} \sum_{vv}^{-1} E(v_i \setminus Y_i)$$

$$= \sum_{ev} \sum_{vv}^{-1} J_i$$

$$= \boldsymbol{l}' \boldsymbol{J}_i$$

Substituindo a expectativa das variáveis por seus valores observados, podemos reescrever a equação estrutural numa forma estimável:

(A6) $$w_i = \boldsymbol{a}' X_i + \boldsymbol{j}' Y_i + \boldsymbol{l}' E(v_i \setminus Y_i) + \boldsymbol{h}_i$$

Como por construção o erro com média zero $\boldsymbol{h}_i$ é não correlacionado com os regressores, podemos estimar os parâmetros por Mínimo Quadrados Ordinários após obtermos estimativas para o termo expectacional. Neste arcabouço, um teste de endogeneidade é verificar se $\boldsymbol{l}$ é igual a zero, uma vez que este parâmetro captura a dependência entre o erro da equação estrutural e o erro da forma reduzida.

Apêndice B

Considere o seguinte sistema de equações:

(B.1) $$Var(e_t) = \alpha_0 + \alpha_1 IntervSpot_t + \alpha_2 SpreadHY_t + u_t$$

(B.2) $$IntervSpot_t^* = \gamma_0 + \gamma_1 (r - r^*) + \gamma_2 Var(e_t) + z_t$$

Em linha com o trabalho de Almekinders (1995), encontraremos a forma reduzida do sistema. Para tal, devemos substituir primeiramente a equação (B.1) em (B.2):

$$IntervSpot_t^* = \gamma_0 + \gamma_1 (r - r^*) + \gamma_2 \alpha_0 + \gamma_2 \alpha_1 IntervSpot_t + \gamma_2 \alpha_2 SpreadHY_t + \gamma_2 u_t + z_t$$

$$IntervSpot_t^* - \gamma_2 \alpha_1 IntervSpot_t = \gamma_0 + \gamma_1 (r - r^*) + \gamma_2 \alpha_0 + \gamma_2 \alpha_2 SpreadHY_t + \gamma_2 u_t + z_t$$

Temos então que:

Se $IntervSpot_t^* > 0$ e para $(1 - \gamma_1 \alpha_1) \neq 0$

$$IntervSpot_t^* = \frac{1}{1 - \gamma_2 \alpha_1} [\beta_0 + \beta_1 (r - r^*) + \beta_2 SpreadHY_t + v_t]$$

Se $IntervSpot_t^* \leq 0$

$$IntervSpot_t^* = \beta_0 + \beta_1 (r - r^*) + \beta_2 SpreadHY_t + v_t$$

onde $\beta_0 = \gamma_0 + \gamma_2 \alpha_0$, $\beta_1 = \gamma_1$, $\beta_2 = \gamma_2 \alpha_2$ e $v_t = \gamma_2 u_t + z_t$