Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$	
1a	$\{C = \widehat{C}\}$	}
4	$C \to \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_T \\ \hline A_B \end{array}\right), B \to \left(\begin{array}{c c} B_T \\ \hline B_B \end{array}\right)$ where $C_{TL}$ is $0 \times 0$ , $A_T$ has 0 rows, $B_T$ has 0 rows	
2	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$	
3	while $m(C_{TL}) < m(C)$ do	
2,3	$\left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C)$	
5a	$ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \rightarrow \left(\begin{array}{c c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \rightarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ B_2 \end{array}\right) $ where $\gamma_{11}$ is $1 \times 1$ , $a_1$ has 1 row, $b_1$ has 1 row	
6	$ \begin{cases} \begin{pmatrix} C_{00} & * & * \\ c_{10}^T & \gamma_{11} & * \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ b_1^T A_0^T + \widehat{c}_{10}^T & \gamma_{11} & * \\ B_2 A_0^T + \widehat{C}_{20} & c_{21} & C_{22} \end{pmatrix} $	
8	$ \gamma_{11} := a_1^T b_1 + b_1^T a_1 + \gamma_{11}  c_{10}^T := a_1^T B_0^T + c_{10}^T  c_{21} := B_2 a_1 + c_{21} $	
7	$ \begin{cases} \begin{pmatrix} C_{00} & * & * \\ c_{10}^T & \gamma_{11} & * \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ a_1^T B_0^T + b_1^T A_0^T + \widehat{c}_{10}^T & a_1^T b_1 + b_1^T a_1 + \widehat{\gamma}_{11} & * \\ B_2 A_0^T + \widehat{C}_{20} & B_2 a_1 + \widehat{c}_{21} & C_{22} \end{pmatrix} $	
5b	$ \left(\begin{array}{c c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c c c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \leftarrow \left(\begin{array}{c c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \leftarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array}\right) $	
2	$ \left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $	
	endwhile	
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C))$	
1b	$\{[C] = \operatorname{syr}2k \ln(A, B, \widehat{C})$	}

Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$
1a	<b>\{</b>
4	where
2	$igg  \left\{$
3	while do
2,3	
5a	where
6	
8	
7	
5b	
2	
	endwhile
2,3	$\left  \left\{ \begin{array}{c} \\ \\ \end{array} \right. \right. $
1b	

Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$
1a	$\{C=\widehat{C}$
4	where
2	
3	while do
2,3	
5a	where
6	
8	
7	
5b	
2	
	endwhile
2,3	$\left\{ \qquad \qquad \land \neg ( \qquad \qquad ) \right\}$
1b	$\left\{ [C] = \operatorname{syr}2k \ln(A, B, \widehat{C}) \right\}$

Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$
1a	$\{C = \widehat{C}\}$
4	where
2	$ \left\{ \begin{pmatrix} C_{TL} & * \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix} \right\} $
3	while do
2,3	$\left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \right.$
5a	where
6	
8	
7	
5b	
2	$ \left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
	endwhile
2,3	$ \left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg ( )  $
1b	$\left\{ [C] = \operatorname{syr}2k_{-}\ln(A, B, \widehat{C}) \right\}$

Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$
1a	$\{C = \widehat{C} $
4	where
2	$ \left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \begin{array}{c c} \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) \end{array} \right\}$
5a	where
6	
8	
7	
5b	
2	$\left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
	endwhile
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \neg (m(C_{TL}) < m(C))$
1b	$\{ [C] = \operatorname{syr}2k \ln(A, B, \widehat{C}) $

Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$
1a	$\{C = \widehat{C}$
4	$C \to \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_T \\ \hline A_B \end{array}\right), B \to \left(\begin{array}{c c} B_T \\ \hline B_B \end{array}\right)$ where $C_{TL}$ is $0 \times 0$ , $A_T$ has 0 rows, $B_T$ has 0 rows
2	$ \begin{cases} \left( \begin{array}{c c} C_{TL} \text{ is } 0 \times 0, \ A_T \text{ has } 0 \text{ rows}, B_T \text{ has } 0 \text{ rows} \\ \hline \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right\} = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) $
5a	where
6	
8	
7	
5b	
2	$\left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
	endwhile
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C)) $
1b	$\left\{ [C] = \operatorname{syr}2k \ln(A, B, \widehat{C}) \right\}$

Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$
1a	$\{C = \widehat{C}$
4	$C \to \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_T \\ \hline A_B \end{array}\right), B \to \left(\begin{array}{c c} B_T \\ \hline B_B \end{array}\right)$ where $C_{TL}$ is $0 \times 0$ , $A_T$ has 0 rows, $B_T$ has 0 rows
2	$ \left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
3	while $m(C_{TL}) < m(C)$ do
2,3	$ \left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) $
5a	$ \begin{pmatrix} C_{TL} & * \\ C_{BL} & C_{BR} \end{pmatrix} \rightarrow \begin{pmatrix} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ C_{20} & c_{21} & C_{22} \end{pmatrix}, \begin{pmatrix} A_T \\ A_B \end{pmatrix} \rightarrow \begin{pmatrix} A_0 \\ a_1^T \\ A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ B_B \end{pmatrix} \rightarrow \begin{pmatrix} B_0 \\ b_1^T \\ B_2 \end{pmatrix} $ where $\gamma_{11}$ is $1 \times 1$ , $a_1$ has 1 row, $b_1$ has 1 row
6	
8	
7	
5b	$oxed{igcup_{CBL}ig _{C_{BR}}}ig/ igcup_{C_{20}}ig _{C_{22}}ig/ ig _{A_B}ig/ ig _{A_2}ig/ ig _{B_2}ig/$
2	$ \left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
	endwhile
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C))$
1b	$\{[C] = \operatorname{syr}2k \ln(A, B, \widehat{C}) $

Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$
1a	${C = \widehat{C}}$
4	$C \to \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_T \\ \hline A_B \end{array}\right), B \to \left(\begin{array}{c c} B_T \\ \hline B_B \end{array}\right)$ where $C_{TL}$ is $0 \times 0$ , $A_T$ has 0 rows, $B_T$ has 0 rows
2	$ \left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) $
5a	$ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \to \left(\begin{array}{c c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \to \left(\begin{array}{c c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \to \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ B_2 \end{array}\right) $ where $\gamma_{11}$ is $1 \times 1$ , $a_1$ has 1 row, $b_1$ has 1 row
6	$ \left\{ \begin{pmatrix} C_{00} & * & * \\ c_{10}^T & \gamma_{11} & * \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ b_1^T A_0^T + \widehat{c}_{10}^T & \gamma_{11} & * \\ B_2 A_0^T + \widehat{C}_{20} & c_{21} & C_{22} \end{pmatrix} $
8	
7	
5b	$\begin{pmatrix} C_{BL} \mid C_{BR} \end{pmatrix} \qquad \begin{pmatrix} \overline{C_{20} \mid c_{21} \mid c_{22} \end{pmatrix}} \qquad \begin{pmatrix} A_B \end{pmatrix} \qquad \begin{pmatrix} \overline{A_2} \end{pmatrix} \qquad \begin{pmatrix} B_B \end{pmatrix} \qquad \begin{pmatrix} \overline{B_2} \end{pmatrix}$
2	$ \left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
	endwhile
2,3	$ \left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C)) $
1b	$\left\{ [C] = \operatorname{syr}2k \ln(A, B, \widehat{C}) \right\}$

Step	Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$	
1a	$\{C=\widehat{C}$	}
4	$C \to \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_T \\ \hline A_B \end{array}\right), B \to \left(\begin{array}{c c} B_T \\ \hline B_B \end{array}\right)$ where $C_{TL}$ is $0 \times 0$ , $A_T$ has 0 rows, $B_T$ has 0 rows	
2	$ \left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $	$\left. \right\}$
3	while $m(C_{TL}) < m(C)$ do	
2,3	$\left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C)$	$\left. \right\}$
5a	where $\gamma_{11}$ is $1 \times 1$ , $a_1$ has 1 row, $b_1$ has 1 row	
6	$ \begin{cases} \begin{pmatrix} C_{00} & * & * \\ c_{10}^{T} & \gamma_{11} & * \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_{0}B_{0}^{T} + B_{0}A_{0}^{T} + \widehat{C}_{00} & * & * \\ b_{1}^{T}A_{0}^{T} + \widehat{c}_{10}^{T} & \gamma_{11} & * \\ B_{2}A_{0}^{T} + \widehat{C}_{20} & c_{21} & C_{22} \end{pmatrix} $	
8		
7	$ \begin{cases} \begin{pmatrix} C_{00} & * & * \\ c_{10}^T & \gamma_{11} & * \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ a_1^T B_0^T + b_1^T A_0^T + \widehat{c}_{10}^T & a_1^T b_1 + b_1^T a_1 + \widehat{\gamma}_{11} & * \\ B_2 A_0^T + \widehat{C}_{20} & B_2 a_1 + \widehat{c}_{21} & C_{22} \end{pmatrix} $	$\left. \begin{array}{c} \\ \end{array} \right\}$
5b	$ \left(\begin{array}{c c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \leftarrow \left(\begin{array}{c} A_0 \\ a_1^T \\ \hline A_2 \end{array}\right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \leftarrow \left(\begin{array}{c} B_0 \\ b_1^T \\ \hline B_2 \end{array}\right) $	
2	$ \left\{ \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $	$\left. \right\}$
	endwhile	
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C))$	
1b	$\{[C] = \operatorname{syr}2k \ln(A, B, \widehat{C})$	}

```
Step
                       Algorithm: [C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)
                      {C = \widehat{C}}
   1a
                    C 	o \left( \begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \,,\, A 	o \left( \begin{array}{c|c} A_T \\ \hline A_B \end{array} \right) \,,\, B 	o \left( \begin{array}{c|c} B_T \\ \hline B_B \end{array} \right)
    4
                              where C_{TL} is 0 \times 0, A_T has 0 rows, B_T has 0 rows
     2
                       while m(C_{TL}) < m(C) do
     3
                                                2,3

\left(\begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \rightarrow \left(\begin{array}{c|c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \rightarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array}\right)

   5a
                                           where \gamma_{11} is 1 \times 1, a_1 has 1 row, b_1 has 1 row

\begin{pmatrix}
C_{00} & * & * \\
c_{10}^{T} & \gamma_{11} & * \\
C_{20} & c_{21} & C_{22}
\end{pmatrix} = \begin{pmatrix}
A_{0}B_{0}^{T} + B_{0}A_{0}^{T} + \hat{C}_{00} & * & * \\
b_{1}^{T}A_{0}^{T} + \hat{c}_{10}^{T} & \gamma_{11} & * \\
B_{2}A_{0}^{T} + \hat{C}_{20} & c_{21} & C_{22}
\end{pmatrix}

     6
                                     \gamma_{11} := a_1^T b_1 + b_1^T a_1 + \gamma_{11}
     8
                                     c_{10}^T := a_1^T B_0^T + c_{10}^T
                                     c_{21} := B_2 a_1 + c_2

\begin{pmatrix}
C_{00} & * & * \\
c_{10}^T & \gamma_{11} & * \\
C_{20} & c_{21} & C_{22}
\end{pmatrix} = \begin{pmatrix}
A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\
a_1^T B_0^T + b_1^T A_0^T + \widehat{c}_{10}^T & a_1^T b_1 + b_1^T a_1 + \widehat{\gamma}_{11} & * \\
B_2 A_0^T + \widehat{C}_{20} & B_2 a_1 + \widehat{c}_{21} & C_{22}
\end{pmatrix}

     7

\left(\begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{C0} & c_{21} & C_{C0} \end{array}\right), \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \leftarrow \left(\begin{array}{c|c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \leftarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array}\right)

   5b
                                                    \frac{C_{TL} \quad *}{C_{BL} \quad C_{BR}} = \begin{pmatrix} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix} 
     2
                       endwhile
                                                                                \overline{ } = \left( \begin{array}{c|c} A_T B_T^T + \overline{B}_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C)) 
  2,3
                       \{ [C] = \operatorname{syr}2k \ln(A, B, \widehat{C}) \}
   1b
```

Algorithm: $[C] := \text{SYR}2\text{K\_LN\_UNB\_VAR}4(A, B, C)$
$C \to \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_T \\ \hline A_B \end{array}\right), B \to \left(\begin{array}{c c} B_T \\ \hline B_B \end{array}\right)$ where $C_{TL}$ is $0 \times 0$ , $A_T$ has 0 rows, $B_T$ has 0 rows
while $m(C_{TL}) < m(C)$ do
$ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \rightarrow \left(\begin{array}{c c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \rightarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ B_2 \end{array}\right) $ where $\gamma_{11}$ is $1 \times 1$ , $a_1$ has 1 row, $b_1$ has 1 row
$ \gamma_{11} := a_1^T b_1 + b_1^T a_1 + \gamma_{11}  c_{10}^T := a_1^T B_0^T + c_{10}^T  c_{21} := B_2 a_1 + c_{21} $
$ \left(\begin{array}{c c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c c} C_{00} & * & * \\ c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \leftarrow \left(\begin{array}{c} A_0 \\ a_1^T \\ \hline A_2 \end{array}\right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \leftarrow \left(\begin{array}{c} B_0 \\ b_1^T \\ \hline B_2 \end{array}\right) $
endwhile

Algorithm:  $[C] := SYR2K_LN_UNB_VAR4(A, B, C)$ 

$$C \to \left(\begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c|c} A_T \\ \hline A_B \end{array}\right), B \to \left(\begin{array}{c|c} B_T \\ \hline B_B \end{array}\right)$$

where  $C_{TL}$  is  $0 \times 0$ ,  $A_T$  has 0 rows,  $B_T$  has 0 rows

while  $m(C_{TL}) < m(C)$  do

$$\left(\begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right) , \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \rightarrow \left(\begin{array}{c|c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right) , \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \rightarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array}\right)$$

where  $\gamma_{11}$  is  $1 \times 1$ ,  $a_1$  has 1 row,  $b_1$  has 1 row

$$\gamma_{11} := a_1^T b_1 + b_1^T a_1 + \gamma_{11}$$

$$c_{10}^T := a_1^T B_0^T + c_{10}^T$$

$$c_{21} := B_2 a_1 + c_{21}$$

$$\left(\begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c} C_{00} & * & * \\ \hline c_{10}^T & \gamma_{11} & * \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right) , \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \leftarrow \left(\begin{array}{c|c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right) , \left(\begin{array}{c} B_T \\ \hline B_B \end{array}\right) \leftarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array}\right)$$

endwhile