Algorithm for Gaussian elimination with scaled partial pivoting

I1: Find scaling factors
Do for $i = 1, \ldots, n$
    $s_i = \max_{1 \leq j \leq n} |a_{ij}|$.
I2: Check whether a non-zero s_i can be found
If $s_i = 0$ for some i no unique solution exists
Gaussian elimination
Do for $i = 1, \ldots, n-1$ (Use row 1 to $n-1$ as pivoting row)
    G1: Find pivot element
    Find the smallest integer p ($i \leq p \leq n$) so that $\dfrac{|a_{pi}|}{s_p} = \max\limits_{i \leq j \leq n} \dfrac{|a_{ji}|}{s_j}$
    If $a_{pi} = 0$ a unique solution does not exist.
    Else if $p \neq i$ interchange row i and p: $E_p \leftrightarrow E_i$.
    G2: Perform the Gaussian elimination with the non-zero pivot.
    Do for $j = i+1, \ldots, n$ (On all rows below the pivot element)
        $m_{ji} = \dfrac{a_{ji}}{a_{ii}}$
        Do for $k = i+1, \ldots, n$ (For all columns on the right of the pivot element)
            $a_{jk} = a_{jk} - m_{ji} a_{ik}$
        End Do (k-loop)
        $b_j = b_j - m_{ji} b_i$
    End Do (j-loop)
End Do (i-loop)

Backward substitution
B1: Check whether backward substitution is possible.
If $a_{nn} = 0$ no unique solution exists
B2: Perform backward substitution.
Do for $i = n, \ldots, 1$ (From the last row back to the first)
    Do for $j = i+1, \ldots, n$ (Subtract contributions from known values x_j)
        $b_i = b_i - a_{ij} x_j$
    End Do (j-loop)
    $x_i = \dfrac{b_i}{a_{ii}}$
End Do (i-loop)

Remarks:

- Gaussian elimination with scaled partial pivoting is more robust than Gaussian elimination with partial pivoting.
- Gaussian elimination with scaled partial pivoting requires a little bit more work than Gaussian elimination with partial pivoting.