

Example 5.16 Let us go back to Example 5.9 on the Hilbert matrix and solve the related system (for different values of n) by the preconditioned gradient (PG) and the preconditioned conjugate gradient (PCG) methods, using as preconditioner the diagonal matrix D made of the diagonal entries of the Hilbert matrix. We fix $\mathbf{x}^{(0)}$ to be the null vector and iterate until the relative residual (5.64) is less than 10^{-6} . In Table 5.4 we report the absolute errors (with respect to the exact solution) obtained with PG and PCG methods, as well as the errors obtained using the MATLAB command `\`. For the latter, the error degenerates when n gets large. On the other hand, we can appreciate the beneficial effect that a suitable iterative method such as the PCG scheme can have on the number of iterations. ■