Part 1 Hilbert Matrix Write-Up

The use of LU or QR-factorizations is justified due to the cost of computing an inverse function through Gaussian Elimination. The cost of Gaussian Elimination is in the O(n3) range, whereas the factorizations have at most O(n2) as their costs.

So the benefits of these factorizations come from their ability to reduce the cost of solving the system. There are some considerations in choosing to use these factorizations, however. The condition number of the matrix is increased in the LU case, although this is not a concern in the QR case. Both LU and QR incur error in solving the system. This error seems to be around an order or two of magnitude in the QR case compared to the LU case.