Improved Lower Bounds for the Single Machine Earliness/Tardiness Scheduling Problem with Release Dates

Jorge M. S. Valente[*]

Faculdade de Economia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-464 Porto, Portugal

Abstract—In this paper, we consider the single machine earliness/tardiness scheduling problem with different release dates and no unforced idle time. The most effective lower bound uses multiplier adjustment procedures that require an initial sequence. We investigate the sensitivity of the lower bounding procedure to the initial sequences, and experiment with different scheduling rules and dominance conditions. The computational results show that it is possible to obtain improved lower bounds by using better initial sequences. The lower bounds are also incorporated in a branch-and-bound algorithm, and the new lower bounds were clearly superior for the larger instances. The new procedures were also much more consistent than the existing method, and the improvement they provided became larger as the instance difficulty increased.

Keywords—Scheduling earliness/tardiness, Release dates, Lower bounds, Branch-and-bound

[*] Corresponding author's email: jvalente@fep.up.pt