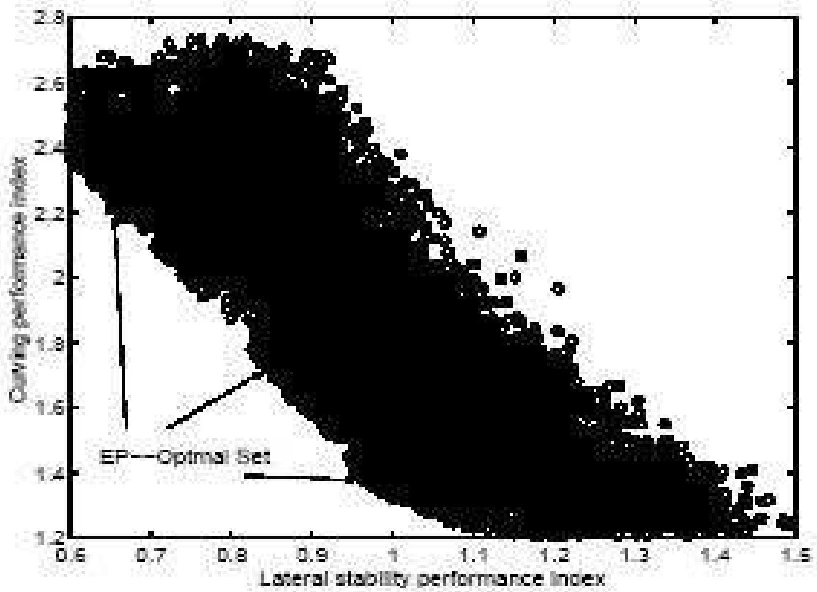

Figure 7.7: Relationship between lateral stability and curving performance

method used at subdiscipline level, is used to optimize a complex rail vehicle model with respect to lateral stability, curving performance, and vertical ride quality. The hybrid MDO method combines the lateral stability model with 17 DOF, the nonlinear dynamic curving performance model with 21 DOF, the vertical ride quality model with car body flexibility and with 36 DOF, and the optimization techniques used in Chapter 4, 5, and 6 into a synergistic whole that is greater than the sum of its parts.

Numerical results demonstrate that this synergy is an effective approach to resolve the conflicting requirements for lateral stability, curving performance, and vertical ride quality in the design of rail vehicles with passive and active suspensions. The optimization method offered in this chapter is especially suitable for design optimization where realistic complex nonlinear vehicle models available from multibody dynamics software are used, more than a few design variables including active parameters are taken into account, and discontinuities in the objective function and constraints and a lot of local optima exist.

Using the hybrid MDO optimization method, one can find EP-optimal solutions that show possible trade-offs between multiple criteria. For example, there is a trade-off between