

**ON THE EXISTENCE OF PRICING STRATEGIES IN THE HETEROGENEOUS  
SINGLE BOTTLENECK MODEL AND ITS EXTENSIONS**

By

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## **ABSTRACT**

This thesis formulates the dynamic system optimal conditions for the single bottleneck model with heterogeneous commuters. This formulation contributes to the literature by solving the system optimal problem with heterogeneous network users. The existence and uniqueness of the problem are shown and discussed. Apart from a rigorous system optimal formulation, this thesis develops feasible toll strategies for the single bottleneck problem. The necessary and sufficient conditions for the existence of tolls strategies within the single bottleneck are also developed. Extensive computational results are conducted to demonstrate the results in this thesis. In the second section, the models with flexible arrival time for both homogeneous and heterogeneous commuters are formulated. It is shown that the system optimal for heterogeneous commuter model might be obtained with a proper toll scheme. Finally, the linear complementarity formulation is extended to study the elastic capacity problem for the homogeneous case. The result shows that, in the particular condition, the existence and uniqueness for homogeneous model with elastic capacity can be guaranteed.