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Capacity Planning and Learning in the Airline Industry

Commercial aviation is a notoriously risky business. While the industry has proven resilient over the years, adapting to major shocks like 9/11 and the Covid-19 pandemic, it seems to exist in a state of perpetual fragility – always teetering on the edge of the next big crisis. Since deregulation in 1978, over 200 U.S. airlines have failed despite steadily growing demand for air travel. The big three U.S. carriers that lead the industry today all declared bankruptcy at least once in their history.

Even when times are good, managing a successful airline is hard. High capital intensity coupled with volatile demand patterns require airlines to engage in capacity planning, a process meant to ensure the airline makes the best use of its available resources. This multi-step process offers different levels of flexibility and commitment at different stages in the planning cycle. Decisions about aircraft acquisition and fleet composition establish long-term capacity constraints, followed by medium-term network and route planning, and finally short-term inventory management. Each downstream decision is limited by the upstream choices made months or even years earlier.

In this modeling project, I would like to investigate the impact of the planning process on organizational learning. Each stage of the process has its own planning horizon and informational cues. Downstream decision-makers use close-in information to adjust for the uncertainties faced by those upstream. While these compensatory actions help the airline get closer to the right capacity "answer", they may also foreclose important learning opportunities as they make it hard to pinpoint exactly which steps of the planning process may have gone wrong and how.

How can planners be confident they made the best decision with the information they had available at the time? Does the structure of the planning process itself properly account for feedback effects from previous planning cycles?

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