



# 2-for-2 Slot Trading in GDPs



Michael Ball

R.H. Smith School of Business & Institute for Systems Research

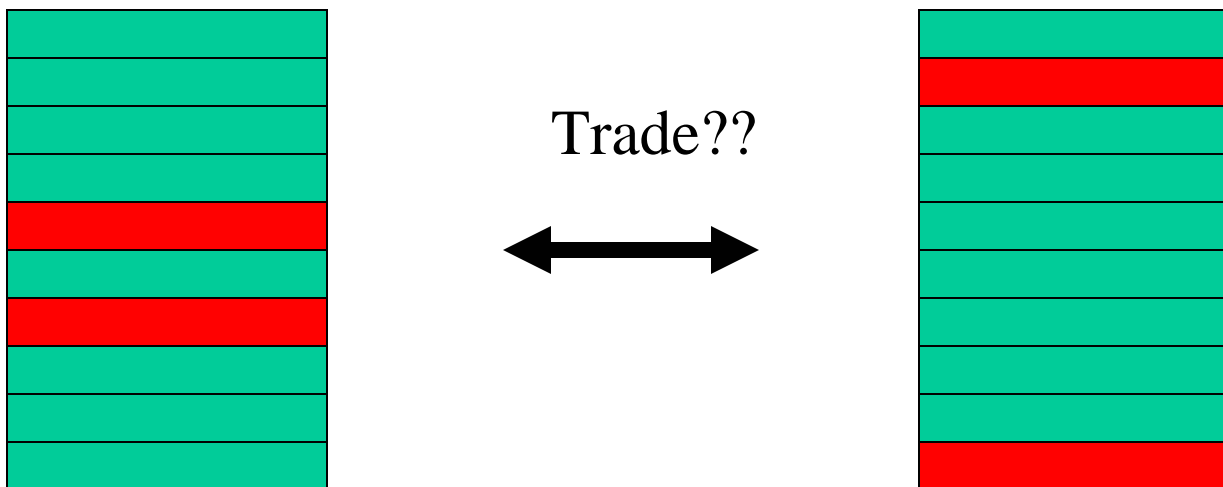
University of Maryland

College Park, MD

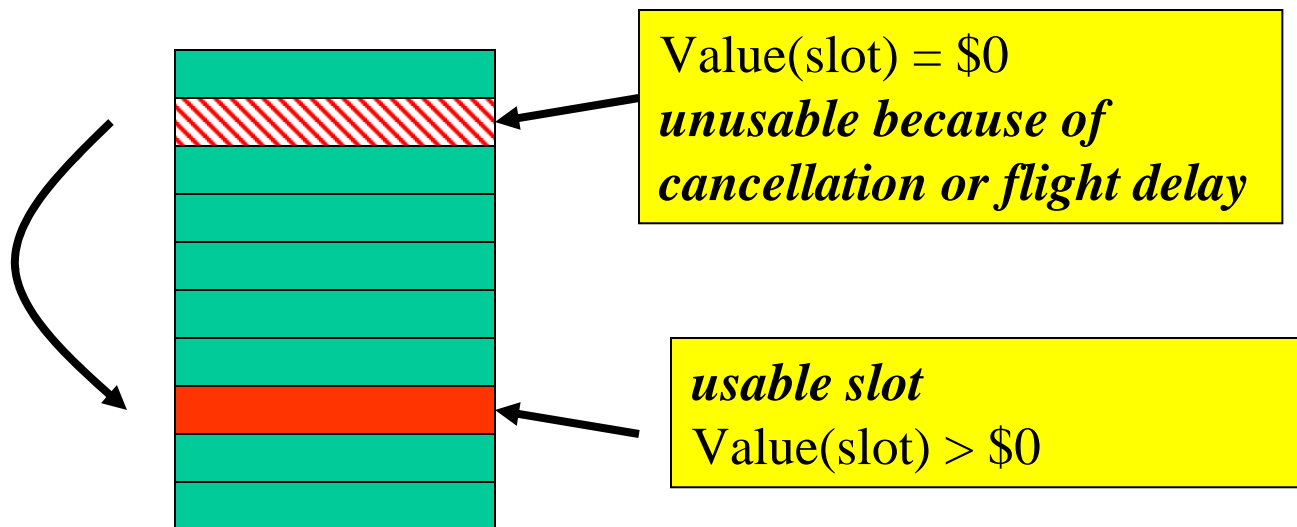
joint work with Thomas Vossen

# 1-for-1 trades to 2-for-2 trades

- Compression and/or slot credit substitution can be interpreted as a 1-for-1 trading system, i.e. offers involve giving up one slot and getting one in return (many offers are processed simultaneously)
- What about k-for-k or k-for-n offers, e.g. 2-for-2:



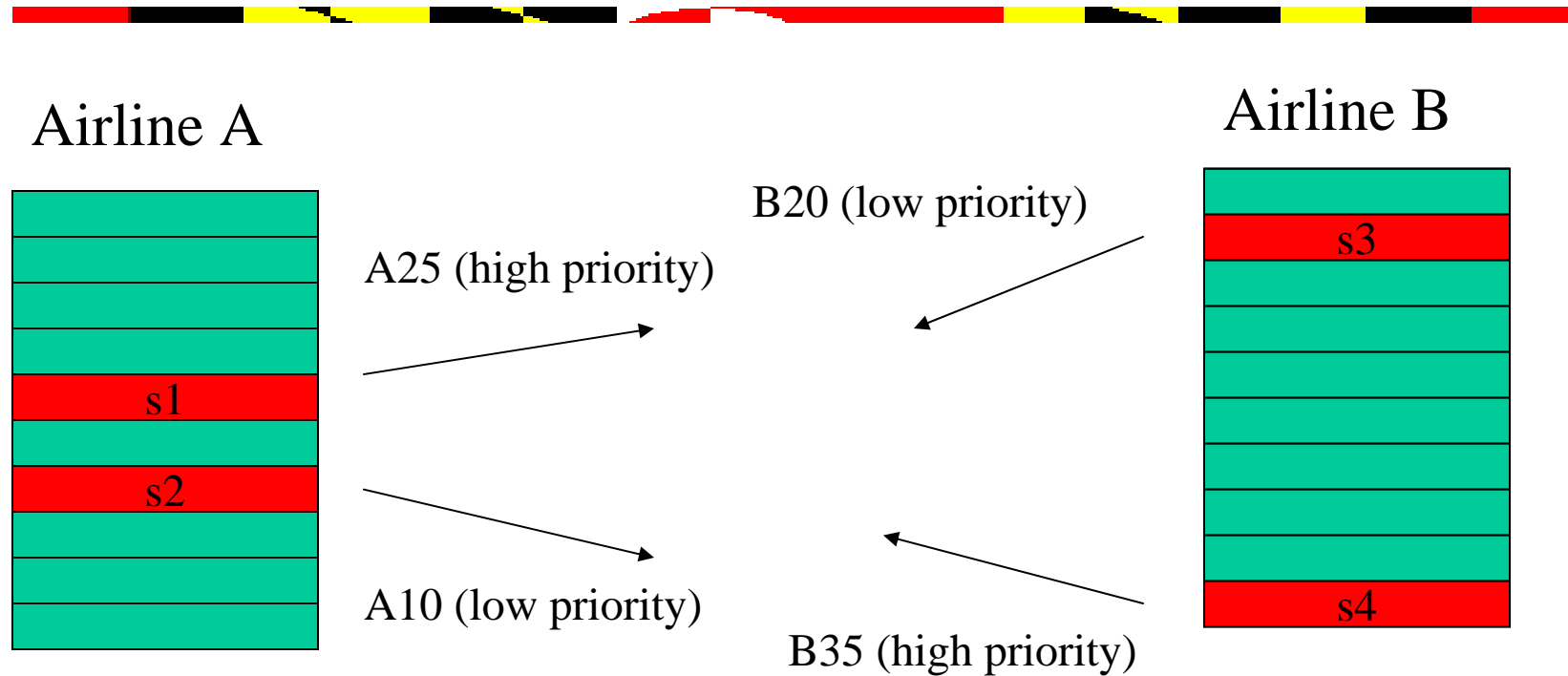
# Value proposition for compression & SCS



SCS/Compression "trades" are always driven by the exchange of a slot with value 0 and a slot with value > 0!!



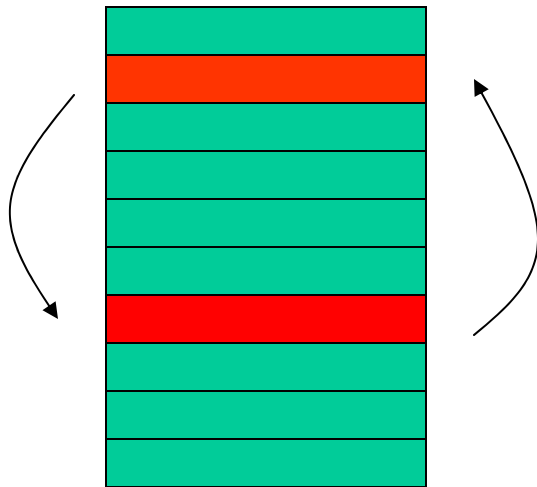
2-for-2 trades enable airlines to profit by exchanging pairs of usable slots that result in an increase in overall value to the carrier.



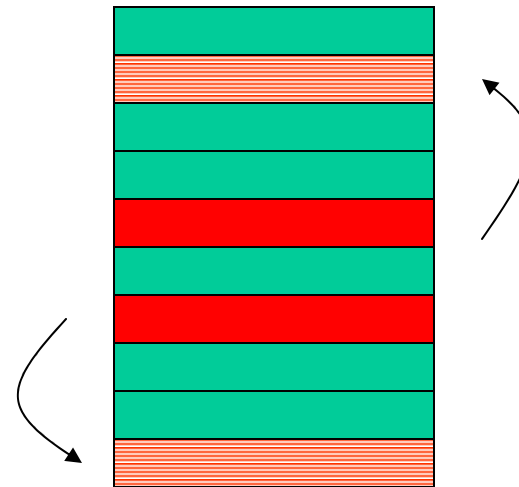
$$\begin{aligned} \text{A's value proposition: } & \text{val}_A(s3) - \text{val}_A(s1) + \text{val}_A(s4) - \text{val}_A(s2) = \\ & 2000 - 1500 + 300 - 500 = \$300 \end{aligned}$$

$$\begin{aligned} \text{B's value proposition: } & \text{val}_B(s1) - \text{val}_B(s3) + \text{val}_B(s2) - \text{val}_B(s4) = \\ & 500 - 800 + 2500 - 1800 = \$400 \end{aligned}$$

# Another view of 2-for-2 trading: generalized substitutions



Normal Sub

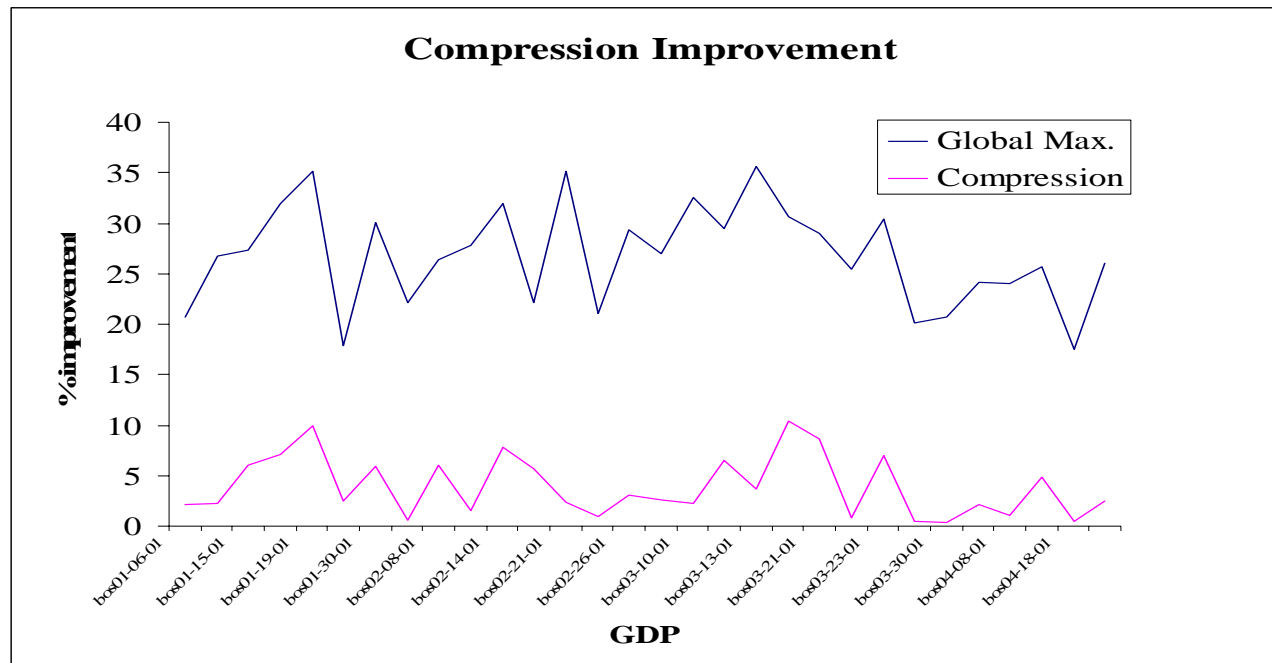


Generalized Sub



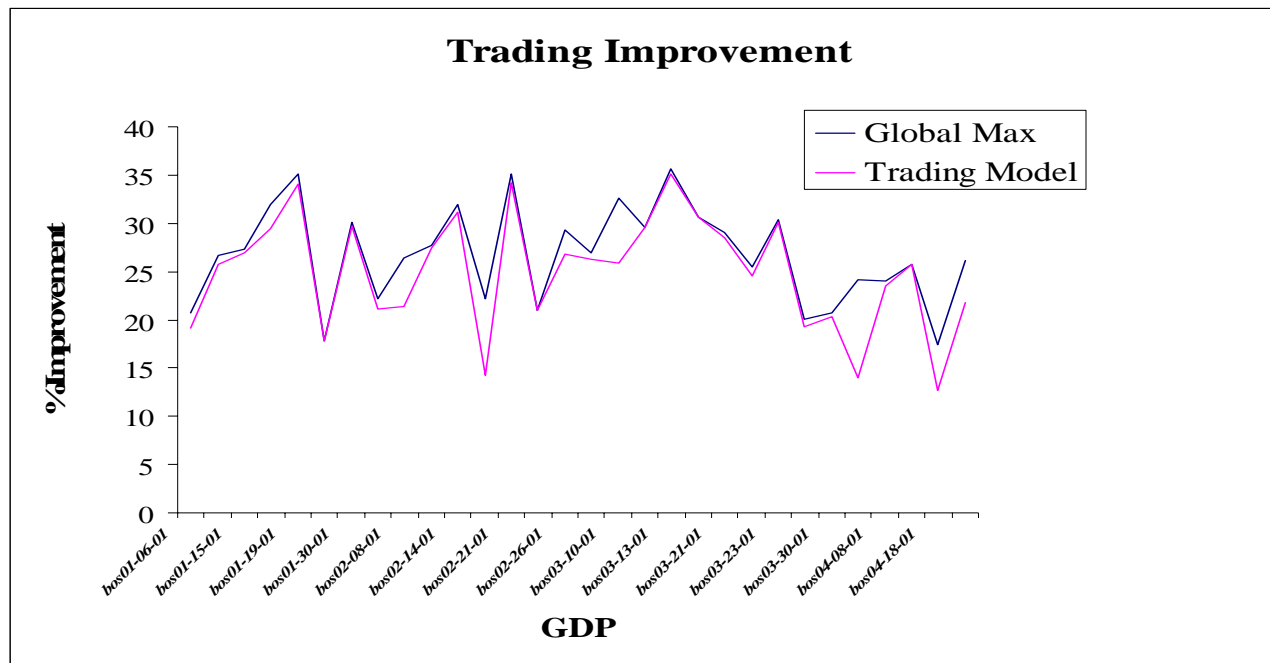
# Sample airline performance function: On-Time (Flight) Performance

- Compression Benefits
  - performance improvement if compression executed after flts with excessive delay (>2hrs) are canceled



# Improvement Using 2-for-2 Trading System

- 2-for-2 Trading Model:
  - proposed offers: all at-least, at-most pairs that improve on-time performance

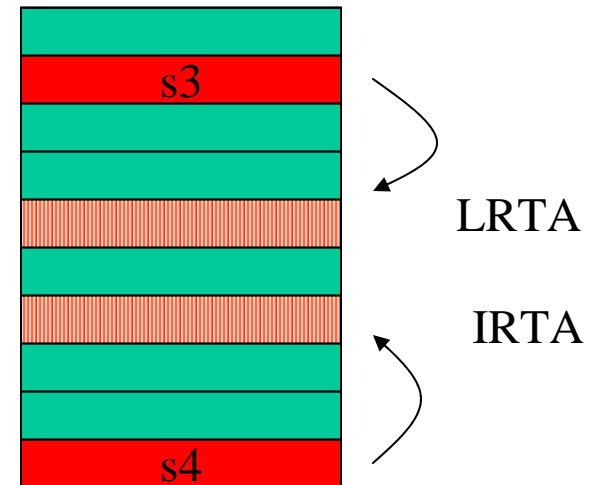


Computational Efficiency:

- 13sec avg.
- 67% solved by LP relaxation

# Implementation

- Airlines specify for each flight:
  - Ideal runway time of arrival (IRTA)
  - Latest runway time of arrival (LRTA)
  - High priority flights:
    - $LRTA = CTA$ ;  $IRTA < CTA$
  - Low priority flights:
    - $IRTA = CTA$ ;  $LRTA > CTA$



Compression (or SCS) –like procedure looks for groups of mutually beneficial exchanges