

Balanced Trade Reduction for Dual-Role Exchange Markets

Dengji Zhao¹

Sarvapali Ramchurn¹

Enrico Gerding¹

Nick Jennings¹

Thanks: David Parkes²

¹University of Southampton, UK

²Harvard University, USA

Dual-Role Exchanges

Dual-role examples:



- people with cars can both **drive** and **ride**,
 - electric vehicles can be **charged** and **discharged**,
- ▶ but not at the same time.

The model:

- a set of traders exchanging one kind of commodity.
- each trader has two valuations (v_i^b , v_i^s) for **buying** and **selling** respectively.

The mechanism:

- who is going to buy/sell
- how much they pay/receive
- *goals*: efficient, IC, IR, **non-deficit**

Balanced Trade Reduction

VCG:

- efficient, IC and IR, but runs a **huge deficit**
- $v_i^b - x_i^{vCG} \geq v_i^s - \hat{x}_i^{vCG}$ (if i is allocated to buy)

McAfee's Trade Reduction [McAfee, 1992]:

- remove one pair from VCG, increase payments
- $v_i^b - (x_i^{vCG} + \delta_1) \not\geq v_i^s - (\hat{x}_i^{vCG} + \delta_2)$, where $\delta_1 \neq \delta_2$
- not efficient, **not IC**

Our solution: **Balanced Trade Reduction**

- remove $k \geq 1$ pairs, balance the payment increases
- $v_i^b - (x_i^{vCG} + \delta) \geq v_i^s - (\hat{x}_i^{vCG} + \delta)$, where $\delta = \min(\delta_1, \delta_2)$
- not efficient, **IC**, deficit control, requires k "backups"