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Feature-Based Online Bilateral Trade

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0. Abstract

- *Bilateral trade* - problem of facilitating trade between a buyer and seller, each of whom have private valuations of the item for sale.
- *Online bilateral trade* - the learner is presented a new buyer-seller pair at each timestep and must post a price without knowledge of their valuations.
- Augment the online bilateral trade problem by presenting the learner with a feature vector characterizing the item for sale.
- Give the buyer and seller linear valuation functions that take the feature vector as input.
- **Idea** - the learner should be able to leverage previous transactions in order to estimate private evaluations.
- Regret definition - use the best context-dependent prices in hindsight as the baseline.
- Results:
  1. Two-bit feedback setting - propose an algorithm with $O(\log T)$ bounded regret.
  2. Two-bit feedback with noisy valuations - propose an algorithm with $O(T^{2/3})$ bounded regret.
  3. One-bit global budget balance setting -
     - Loosening budget balance constraints allows the learner to operate under more restrictive feedback.
     - **Idea** - there's a fundamental trade-off between the quality of feedback and strictness of the budget constraints.