Access Distortion in Economic World Models

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Why Aggregate Evaluation Is Not Enough

The Setup

- Economic world models support **prediction, simulation, and decision-making**
- Agents may act on the same public economic environment
  - Prices
  - Macro releases
  - SEC filings
  - Earnings calls
- But agents do not observe that environment equally
  - **Different features**
  - **Different timing**
  - **Different noise**
  - **Different interpretive capacity**

The Gap

- Evaluation usually reports **one aggregate score**
  - Accuracy
  - Calibration
  - Simulated return
- That can hide large differences across access conditions
- A model may look reliable overall while being much less useful for some agents
- The relevant variable, the **access profile**, is usually not recorded during evaluation

The Question

Can the same economic world model look reliable overall while producing much worse decisions under weaker access to the same public environment?

Access Distortion

- We call this failure mode **access distortion**
- Aggregate performance looks acceptable
- Yet the **worst access condition performs materially worse**
- The gap can appear in both:
  - **Prediction quality**
  - **Realized decision utility**

Controlled Access-Conditioned Evaluation

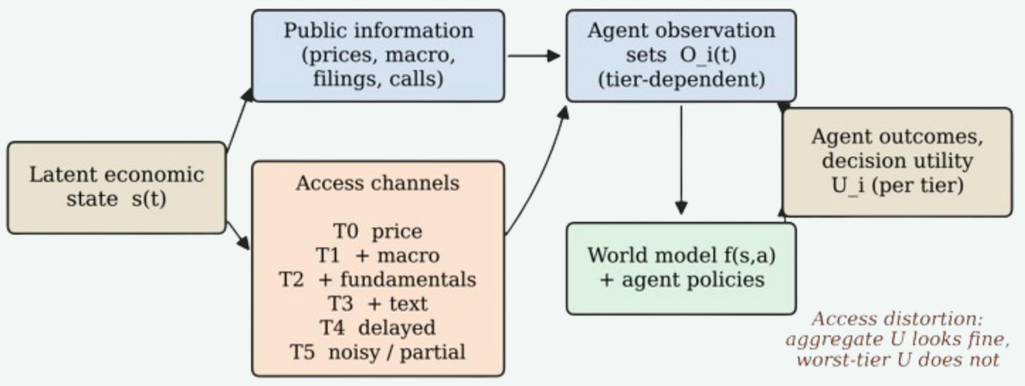

Figure 1. An economic world model with tiered access. A latent economic state generates public information, but agents observe it through access channels that vary in feature completeness, latency, and noise. These tier-dependent observations lead to different decision outcomes, creating access distortion even when the underlying information is public.

Design
- Start from a latent economic state
- It generates a stream of public information
- Each agent observes that information through a different access channel
- Outcomes and decision utility are evaluated by access tier

Prediction Task
- Predict post-event abnormal return direction
- Public data only
  - Price history
  - Macro indicators
  - SEC Fundamentals
  - Earnings-call information

Access Tiers
- T0 price, T1 + Macro, T2 + Fundamentals, T3 Full, T4 Delayed, T5 Noisy
- T3 and T4 use the same information (only timing changes)

Models and Measures
- Models: logistic regression, random forest, gradient-boosted trees
- Balanced Accuracy: predictive performance
- Decision Utility: realized value from acting on the prediction
- Access Metrics: access gap and aggregate-hidden distortion

Results

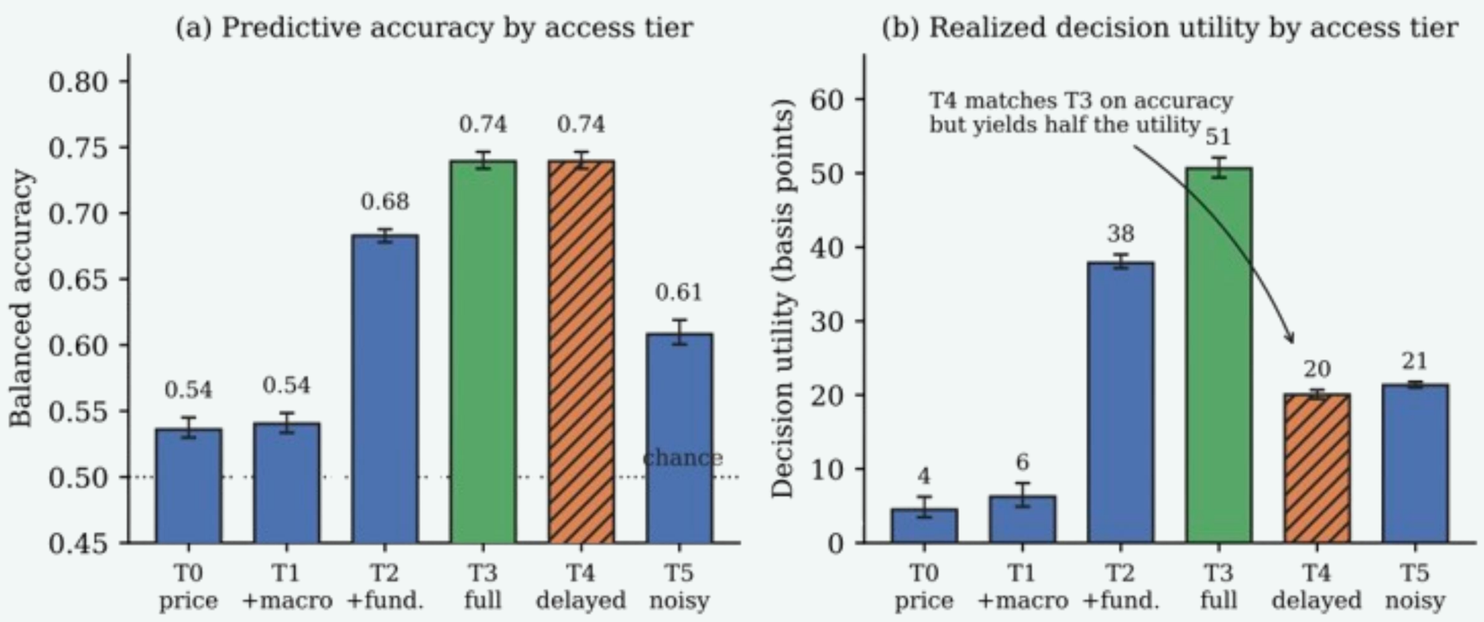

Figure 2. Predictive accuracy and decision utility by access tier. T3 Full and T4 Delayed have the same mean balanced accuracy, but delayed access realizes substantially lower utility.

Why This Matters for Economic World Models

What the figures show

- **More complete access improves prediction:** balanced accuracy rises from **0.54 to 0.74** as fundamentals and earnings-call information are added.
- **Delay is invisible to accuracy:** T3 Full and T4 Delayed both reach **0.74 balanced accuracy**, since they use the same predictive information.
- **Delay is not invisible to decisions:** utility falls from **50.7 bps to 20.0 bps** when the same information arrives too late to fully act on.
- **Noise hurts both:** T5 drops to **0.61 accuracy and 21.3 bps utility**, showing a different failure pattern from delay.

Takeaway

- **Accuracy alone cannot certify decision quality:** two access conditions can look equally accurate while producing very different realized value.
- **Access should be part of world-model evaluation:** reporting performance by access condition reveals failures that a single aggregate score can hide.
- **Access distortion is the evaluation failure:** the problem is not simply that some agents have weaker access, but that standard evaluation may **fail to show the resulting gap**.

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