Discussion
Valuing Financial Data

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SFS Cavalcade, Austin
May 24, 2023

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  How much is an investor willing to pay for some data?

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  2. Measurement exercises

     Emphasis on role of wealth and risk aversion
     - Value of median analyst forecasts
     - Value of realized GDP

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- Underexplored topic $\Rightarrow$ Very important exercise

Outline of Discussion

1. Theoretical Framework
2. Measurement
3. Comments/Remarks/Questions

Framework

- Standard OLG-AR(1)-REE model with N assets
  - Competitive and strategic

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  - Competitive and strategic
- Second-order approximation to utility (critical)

$$\mathbb{E}\left[U\left(c_{it+1}\right)|\mathcal{I}_{it}\right] = \rho_i \mathbb{E}\left[c_{it+1}|\mathcal{I}_{it}\right] - \frac{\rho_i^2}{2}\mathbb{V}\left[c_{it+1}|\mathcal{I}_{it}\right]$$

  - Absolute RA: $\rho_i = -\frac{U''}{U'}$, so $\rho_i = \frac{RRA}{w_{it}}$

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  - Absolute RA: $\rho_i = -\frac{U''}{U'}$, so $\rho_i = \frac{RRA}{w_{it}}$
- Standard REE with information set: $\mathcal{I}_{it} = \left\{\mathcal{I}_t^-, s_{it}, p_t\right\}$

Key Result

- **Lemma 1**: (competitive case)

$$\underbrace{\mathbb{E}\left[U\left(c_{it+1}\right)|\mathcal{I}_{it}\right]}_{=\tilde{U}(\mathcal{I}_{it})} = \frac{1}{2}\mathbb{E}\left[\Pi_{it}\right]'\mathbb{V}\left[\Pi_{it}|\mathcal{I}_{it}\right]^{-1}\mathbb{E}\left[\Pi_{it}\right]$$

$$+\frac{1}{2}Tr\left[\mathbb{V}\left[\Pi_{it}\right]^{-1}\mathbb{V}\left[\Pi_{it}|\mathcal{I}_{it}\right]^{-1}-I\right]+r\rho_i\overline{w}_{it}$$

- "Excess payoff": $\Pi_{it} = \theta_i\left[p_{t+1}+d_{t+1}-rp_t\right]$

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- "Excess payoff": $\Pi_{it} = \theta_i\left[p_{t+1} + d_{t+1} - rp_t\right]$

$$\boxed{\text{Value of data} = \frac{1}{\rho_i}\left(\tilde{U}\left(\mathcal{I}_{it} + \text{data}\right) - \tilde{U}\left(\mathcal{I}_{it}\right)\right)}$$

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- **Remarks**
  1. Sufficient statistics: $\mathbb{E}\left[\Pi_{it}\right]$, $\mathbb{V}\left[\Pi_{it}\right]$, $\mathbb{V}\left[\Pi_{it}|\mathcal{I}_{it}\right]^{-1}$ (and ρ_i)
  2. Note that ρ_i is key for magnitudes
     high wealth ⇒ high value; given RRA
  3. Money-metric (in $) ⇒ Linear-quadratic is quasilinear
  4. Paper also allows for price impact
     high price impact ⇒ less value of information

Measurement

- Switch to returns for measurement: $\Pi_{it} \Rightarrow R_t$
  - $\mathbb{E}[\Pi_{it}]$ and $\mathbb{V}[\Pi_{it}]$ estimated via unconditional moments
  - $\mathbb{V}[\Pi_{it}|\mathcal{I}_{it}]^{-1}$ estimated via

$$\begin{aligned} R_t &= \overbrace{\beta_1 X_t}^{\text{data}} + \overbrace{\beta_2 Z_t}^{\text{existing info.}} + \varepsilon_t^{XZ} \\ R_t &= \underbrace{\gamma_2 Z_t}_{\text{existing info.}} + \varepsilon_t^{Z} \end{aligned}$$

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- Exercise #1: X_t is I/B/E/S forecasts
  - Variation in wealth, investment styles, existing data, etc.
  - Headline willingness-to-pay:
    - For $500k investor: ~$3,000
    - For $250m investor: ~$1m
- Exercise #2: realized GDP

Comments/Remarks/Questions

1. **Why is information valuable?**
   - Can investors trade more/better?
   - Is it because of preferences for early resolution of uncertainty?
     Implied by linear-quadratic preferences
   - Can underlying sources of value be decomposed?
   - No role for production

Comments/Remarks/Questions

2. **Why do we need the equilibrium structure?**
   - Lemma 3 in Appendix:

$$\underbrace{\mathbb{E}\left[U\left(c_{it+1}\right)|\mathcal{I}_{it}\right]}_{=\tilde{U}(\mathcal{I}_{it})} = \frac{1}{2}\mathbb{E}\left[\Pi_{it}|\mathcal{I}_{it}\right]'\mathbb{V}\left[\Pi_{it}|\mathcal{I}_{it}\right]^{-1}\mathbb{E}\left[\Pi_{it}|\mathcal{I}_{it}\right]+r\rho_i\overline{w}_{it}$$

   - This expression requires fewer assumptions than Lemma 1
   - Why not using $\mathbb{E}\left[\Pi_{it}|\mathcal{I}_{it}\right]'$ and $\mathbb{V}\left[\Pi_{it}|\mathcal{I}_{it}\right]$ as sufficient statistics?
   - Small aside: finance/asset pricing "invented" sufficient statistics!
     - CAPM, SDF, etc.
     - Makes sense to use this approach!

Comments/Remarks/Questions

3. **How does the "big K, little k" issue with information manifests here?**
   - The value of data for one investor depends on the information of others and how they respond:

$$V_i\left(\mathcal{I}_i;\{\mathcal{I}_j\}_{j\in I}\right)$$

   - How can we see this in the measurement?
     - Can we decompose the value holding fixed behavioral responses and then reacting?
     - Can we compute the willingness to pay of one investor if everyone gets the information?
   - Easy to compute these counterfactuals in the model (connects to comment #1)
     - Sufficient statistics as intermediate objects for modeling

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4. **Distinction between private and social value?**
    - Welfare question remains open

Conclusion

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  - Nice way to connect theory and measurement
- There is scope to dig deeper into the sources of value...
- ... while qualifying the role of some of the assumptions
- I conjecture much work will follow