Analytic Modelers: Who Needs Them Anyway?

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True Confession
I have some academic crushes.
What is the Attraction?

- Clear Thinking!
- You have to love a control freak.
- They offer a beautiful, parsimonious framework for organizing what we know about (managerial) accounting.

My Proposal

Accounting scholarship will benefit if empirical research ties (more explicitly) to existing analytic models.
What I do and don’t mean

• What I mean
  - Synergy.
  - Modelers and Empiricists each bringing to the table what we uniquely can provide.

• What I don’t mean
  - “Agency theory predicts that people only care about wealth and leisure. This paper shows that they are wrong.”

The First Crush
Agency Theory (ala Holmstrom 1979)

“. . . a principal-agent relationship, where the agent privately takes an action $a \in A \subseteq \mathbb{R}$, $A$ being the set of all possible actions, and $a$ together with a random state of nature $\theta$, determines a monetary outcome or payoff $x = x(a, \theta)$. The problem is to determine how this payoff should be shared optimally between the principal and the agent. The principal's utility function is $G(w)$, defined over wealth alone, and the agent's utility function is $H(w, a)$, defined over wealth and action.”
Holmstrom 1979 in Pictures

Decision Inputs  \[\text{Decision Outputs}\]

\[\text{Effort} \quad \$\$\$\$\]

Holmstrom 1979 in Pictures

Principal

Agent

I want money.
(And I'm lazy.)

I want money.
In Holmstrom’s World

• “Performance” is a function of:
  - Random Noise.
  - The Agent’s Effort Choice.

• And How does the Agent Choose Effort?
  - By choosing the effort level that will lead to the highest expected utility.

• So the principal manages the agent by manipulating the menu of alternatives and the utility associated with each one.

What is the Decision “Process”? 

• For both principal and agent
  - Alternatives are ordered in terms of expected utility.
  - Alternative with highest expected utility is selected.

Ordered Alternatives
Simple but Powerful

- Informativeness Principal (Holmstrom 1979).
- Optimal performance measure weighting (e.g., Feltham & Xie 1994).
- Decentralization & cost-based transfer-pricing (e.g., Vaysman 1996).
- Non-financial performance measures (Dikolli, 2001).
- etc.
- etc.
- etc.

What does the modeler bring to the table?

S/he helps us separate the driving forces from the peripheral noise.
What does the empiricist bring to the table?

An Algorithm:
Tying Empirical Research to Models

- Start with the discipline, organization, and framework of the model.
- Open one or more black boxes.
- Goal: A more coherent body of literature.
Caveats

• I don’t want to turn you into a modeler.
• I do want to appeal to you as a consumer of models.
• I do want to demonstrate the potential usefulness of models to inspire empirical research.
• Experimentation vs. Other Empiricism.
• I'll focus primarily on my own work.

A Couple of Examples

• Taking the Agent out of the Black Box
• Taking the Principal out of the Black Box
Taking the Agent Out of the Black Box: Working on More than One Thing

Principal

Agent

The Analytic Solution

• “Partial Incentives” will reduce performance on unrewarded tasks.

• Thus, flat-wage contracts can be preferable (e.g., Holmstrom & Milgrom, 1991, JLEO).

• Note: H&M depart from most basic model by assuming some level of “intrinsic motivation.”
A Disconnect as Inspiration

- Prior laboratory studies suggest that paying people based on quantity does not necessarily reduce quality.
- Could the model be wrong? Or incomplete?

Opening the Agent’s Black Box

I want money.

(And I’m somewhat lazy.)

And my performance depends on factors beyond my effort choice and random noise.
Where do we get these insights?

- Often, fields other than economics.
- Psychology, sociology, etc.
- Neuroscience?

Neuroscience!

Performance also depends on Brain Activation

- Incentives on one task light up the brain.
- This activation can “spill over” to other tasks.
- Activation improves performance (on both tasks).

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Questioning an Assumption

• “Partial Incentives” actually might NOT reduce performance on unrewarded tasks.
• But only if they are performed at the same time, so that activation spills over.

Insight from Empirical Study
(and bringing in a little neuroscience)

• Hecht, Tafkov, Towry 2012 (CAR)
  - Yes, partial incentives increase the disparity in performance.
**Insight from Empirical Study (and bringing in a little neuroscience)**

- Hecht, Tafkov, Towry 2012 (CAR)
  - Yes, partial incentives increase the disparity in performance.
  - BUT . . . when tasks are simultaneous, partial incentives can increase performance on unrewarded tasks.

**Synergies Across Methods**

- What did the model do for me?
  - It was the inspiration!
  - Got to the heart of the multi-task setting.
  - Clarified the driving forces in that setting.
  - Formalized / clarified intuition.
  - Provided a benchmark against which to compare empirical results.

- How did the empirical study contribute?
  - Opened the agent’s black box.
  - Demonstrated a way in which performance is affected by something other than the effort choice.
  - Reconciled two disparate bodies of literature.
  - Identified a “boundary condition” for a perfectly intuitive analytic prediction.
Taking the Principal Out of the Black Box: Weighting Multiple Performance Measures

The Analytic Solution

- Contracting weights are a function of the measure’s attributes (e.g., congruence and precision, Feltham and Xie, 1994, TAR).

- Why does the principal care about these attributes?
  - Because they affect how the agent will respond to the measures.
  - Requires assumptions about the agent’s utility function.
A Disconnect as Inspiration

• Between a set of models and my understanding of the real world.
• These models focus on discretionary bonus pools, but model the use of discretion as an “ex ante” process.
• In the real world, discretion happens “ex post.”
• Should that matter?

Opening the Principal’s Black Box

I want money.
And the framing of the situation might change how I think the agent will respond to my choices.

I want money. (and I’m lazy.)
What about Framing?

- “...the decision-maker's conceptions of the acts, outcomes, and contingencies associated with a particular choice.”
  - Tversky & Kahneman, 1981, Science

- It’s how the decision-maker “sees” the situation.

- Once we understand that the frame matters, it means all kinds of seemingly irrelevant contextual factors might make a difference. . . .

  . . . like TIMING!

Why Study Timing?

- Because it varies in the real world.
  - ex ante contracts vs. ex post evaluations.

- And why would it matter?
  - Because of framing.
The Framing Connection

- Short-term focus may be different, depending on timing.
- Framing
  - Ex ante: Motivational frame => congruence.
  - Ex post: Evaluative frame => precision.

The Framing Connection (2)

<table>
<thead>
<tr>
<th>Timing</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex ante</td>
<td>Weighting decision is one intended to motivate employees to take preferred actions in the coming accounting period.</td>
</tr>
</tbody>
</table>
Timing                      Frame

Ex post weighting decision  Weighing decision is one intended to evaluate employees’ performance in the current (i.e., past) period in a fair and justifiable manner.

Ex ante                      Motivate employees       Congruity

Ex post                      Evaluate employees
The Framing Connection (2)

Timing | Frame | Measure Attribute
--- | --- | ---
Ex ante | Motivate employees | Congruity
Ex post | Evaluate employees | Precision
Insight from Empirical Study (and bringing in a little psychology)

- Deason, Hecht, Tayler, Towry (Working Paper)
  - Weight on congruent measures is higher in *ex ante* weighting decisions.
  - Weight on precise measures is higher in *ex post* weighting decisions.

Synergies Across Methods

- What did the model do for me?
  - It was the inspiration!
  - Got to the heart of the multi-task setting.
  - Clarified the driving forces in that setting.
  - Provided a framework for organizing thinking.
  - Formed the “backbone” of the theory.
    - Congruence & precision.

- How did the empirical study contribute?
  - Opened the principal’s black box.
  - Helped identify an important factor missing from the model.
What’s Inside Those Boxes?

• Easiest:
  - Preferences other than those in the traditional model
    • Fairness, Intrinsic Motivation, Norm Compliance, Reciprocity, etc.
    • And how do the two players anticipate those preferences? (e.g., trust)
    • Easiest because it's just a refined utility function.
      ▪ Don't get sucked into the “It’s Not Rational” argument.
  - Low-hanging fruit is picked and pickled.

What’s Inside Those Boxes?

• Harder:
  - Decision Processes (Choice is not just a matter of ordered alternatives.)
    • Heuristics and Biases (e.g., anchoring and adjustment)
    • Decision Frames, Affect, Social Identity, etc.
  - Harder because it's not just a modification to the utility function.
  - Lots of low-hanging fruit remains.
    ▪ But it gets messy.
    ▪ Popularity of behavioral economics (to the exclusion of hard core psychology) is an impediment.
What’s Inside Those Boxes?

- Even Harder
  - How the brain operates (fMRI)
  - Contribution to the field remains to be seen.

Summary of Synergies

- Models bring a lot to the table.
  - Getting to the heart of the problem.
  - Clarifying the Driving Forces of the Situation
  - Providing a framework for organizing thinking.
  - Formalizing intuition.
  - Providing a benchmark against which to compare empirical results.

They force discipline & precision in thinking.
Summary of Synergies

- Empiricism also brings a lot to the table.
  - Opening two black boxes.
  - Identifying additional preferences.
  - Examining processes.
  - Identifying boundary conditions.
  - Distinguishing among alternate analytic solution concepts.
  - Assessing the reasonableness of model assumptions.

Obvious Question: Shouldn’t It Go Both Ways?

A challenge to the modelers:
You have something to learn from us, too.
What Does It Take?

• Do you have to understand the math?
  - No!

• Do you have to understand the econ?
  - Yes.
  - But the economic intuition isn’t too complicated.
  - Basic “set up” is always the same.

• Does this advice apply to other theories (e.g., transaction cost economics)?
  - Yes.
  - But the rich array of Agency Theory-based models in Managerial Accounting is unique.

Take-Aways

• Go ahead – dive in!

• Analytic Models based on Agency Theory can teach us SO MUCH.
  - But only so much.
  - Bring in a little something.

• Open those black boxes and see how much more we can learn!
Who Needs Analytic Modelers?

We do!

Thank you!