Why Estimating Bank Efficiency is a Real Challenge

Jaap Bos - NAPW X - Miami University
To the young researchers in the audience
Do you want to analyze and critically (!) study and write about a sector that ...

- ... goes through the biggest shock in nearly 80 years ... and does not **fundamentally change**?
- ... arguably **contributes very little** to overall productivity growth?
- ... is **difficult to compare** to other sectors?
- ... is **highly regulated**, in a complex manner?
- ... is arguably **overstudied** as a result of (seemingly) easily available data
- ... is the topic of many studies led by **industry ‘insiders’**?
- ... **may not fit many of the paradigms** you were taught in growth/productivity classes?
Let’s set the stage
Are we studying a sector that matters, from a productivity point of view?
An example of an anomaly

Chart 15 Historical 'excess' wage in the US financial sector\(^{(a)}\)

\(\text{\textquoteleft Excess\textquoteright wage} \)

Source: Philippon and Reshef (2009).
Returns to Talent and the Finance Wage

Premium

Claire Célériet † Boris Vallée ‡

This Draft: October 11, 2017

Abstract

We study the role of talent in the distribution of pay in the finance industry, by exploiting a special feature of the French higher education system. Returns to talent are significantly higher in the finance industry than in other sectors, leading to the finance wage premium being disproportionately allocated to the most talented workers in this industry. Returns to talent have also increased dramatically faster in finance than in the rest of the economy since the 1980s, driving up the skweness of finance pay. Our empirical findings are consistent with a higher talent scalability in the finance industry.

That anomaly has gone largely unnoticed by us … but not by others
Systemic risk in banking ecosystems

Andrew G. Haldane & Robert M. May

In the run-up to the recent financial crisis, an increasingly elaborate set of financial instruments emerged, intended to optimize returns to individual institutions with seemingly minimal risk. Essentially no attention was given to their possible effects on the stability of the system as a whole. Drawing analogies with the dynamics of ecological food webs and with networks within which infectious diseases spread, we explore the interplay between complexity and stability in deliberately simplified models of financial networks. We suggest some policy lessons that can be drawn from such models, with the explicit aim of minimizing systemic risk.

Meanwhile, the discussion about banking sector efficiency is taking place … in other places

Yep, that’s the same guy…
What are the challenges?
What are the challenges?

- Risk, risk, risk (and uncertainty)
- Competition (Schumpeterian view, monopolistic competition)
- ‘Threats’ to multiple output model (fintech, scope, regulatory)
- Systemic risk (and the efficiency of a system)
- A productivity puzzle (finance wage premium, tech. change)
- Regulation (impact, optimality, duality)
A critical look ... at ourselves
tie-in sales
transformation of non-linear payoffs
monopolistically competitive innovation
dynamic lack of optimization
inefficiency inertia
the scope phantom
scale economies with nonlinear expansion paths
What I wish I understood

- scope economies in banking
- how to compare banking with other sectors
- a dual approach to regulation
- risk, risk, risk
What I am starting to understand

- a system view of efficiency
- alternative models of banking
- a behavioral approach to bank efficiency
Let’s look at some models
The empiricist’s workhorse model
An accounting model of a bank

- A balance sheet
- A profit and loss account
- Some stuff that is not on either
The baseline productivity model
Now let's move to the second model, the one most of us know best...
A cost model of a bank

\[ C = f( L, I, OB ) \]

3 outputs… 3 input prices…

Tip #1: check out the presentation by Paulo Rodrigues in the next session to see what happens when you confront this model with some asset pricing and corporate finance insights.
A cost model of a bank

What do we do with these? =>

What happened to the composition of these? =>
A matching model, from labor economics
A loan growth model of a bank

\[ \frac{\Delta L}{L} = f(\% D + B, \% D + B, \text{deadweight, a special tax})\]

actual versus equilibrium rates
Figure 1.: A graphical illustration of the model

Notes: is the extra tax burden for the buyer when the seller charges \( R'_{ij} + \tau \); is the buyer’s tax burden when the seller charges \( R_{ij} + \tau \); is the seller’s tax burden when the seller charges \( R_{ij} + \tau \); is the extra deadweight loss from charging \( R'_{ij} + \tau \); is the deadweight loss from charging \( R_{ij} + \tau \).
Now we can:

- Look at the impact of an exogenous shock on X-inefficiency and deadweight loss
- Focus on the intermediation role of banks
- Study the lemons problem in banking
And we find

Tip #2: check out the great ReStat (1991) by Ronald Warren as well as the work Hung-Jen Wang has done on identification.
A system model, from asset pricing
Fixed assets
Deposits
Loans
Interbank
Interbank
Equity
Investments
Bonds
Bonds
Interbank
Interbank
Equity
Investments
Bonds
Bonds
Equity
Equity

Interest expense
Interest income
Fee income
Fee expense
Personnel expense
Trading income
Depreciation
Profits
Costs
Off-balance sheet items
People
A model of a banking system

\[ E \left[ \frac{w'}{TA} - \frac{w'}{2} \right] \]
$$\text{argmax}_w E [ w' \frac{\text{Pr}}{\text{TA}} - \frac{w'}{2} \frac{\text{Pr}}{\text{TA}} ]$$

s.t.

$$w \leq 0$$

$$1'w = 1$$

$$w' \leq 0$$
Figure 1: The supervisory view: Markowitz efficient frontier and risk aversion

Expected return: $\mu = w^T r$

Expected risk: $\sigma^2 = w^T \Sigma w$
Carrying the (Paper) Burden: A Portfolio View of Financial Stability and Optimal Bank Size

with Martien Lamers and Victoria Purice

Now we can:

• Study the efficiency of the banking system ...
• ... in risk and return space
• with counterfactuals
Carrying the (Paper) Burden: A Portfolio View of Financial Stability and Optimal Bank Size

with Martien Lamers and Victoria Purice

And we find

![Figure: Return and Risk](image)

Tip #3: check out the papers Antonio Peyrache has been writing on system efficiency
An output distance model with learning, from evolutionary computing
An output distance frontier with a ‘twist’

$L$ $I$ $OB = f(\%$ $Dep$ $P \rightarrow ETA$

3 outputs… 3 inputs  risk
An output distance frontier with a ‘twist’

\[ \text{OB} = f(\text{L}, \text{I}, \% \text{Dep}, P) \]

\[ Y + qY \]
1. (Initialization)
   - $PS_{it} = (Y_y, X_x)$, where $y = 1, 2, 3$ and $x = 1, 2, 3$

2. Fitness assessment
   - $E|PS_{it}$

3. Parent selection
   - $Y_y + q_y$
   - $q \leq \max \Delta Y_y$
     - A: relevant set is own set over last 4 quarters
     - B: relevant set is state set over last 4 quarters
     - C: relevant set is size peers over last 4 quarters
     - D: relevant set is firms with similar input mix
     - E: relevant set is firms with similar output mix

4. Recombination
   - $PS'_{it} = (PS, q_y) \forall y = 1, 2, 3$

5. Mutation
   - $E'|PS'_{it}$

6. Survivor selection
   - $\max (E' - E) \forall q \leq \max \Delta Y_y$

7. (Termination)
   - $(E' - E)/E \leq r\%$ or step=max(steps)
Money left on the table: large bank failures during the crisis

Now we can:

- **Study dynamic efficiency in a different manner**
- **Validate the choice of a counterfactual efficiency**
- **Study the importance of the choice of peers**
Money left on the table: large bank failures during the crisis

And we find
Takeaways...
Takeaways

**Know** the accounting model, it is the basis for what we do (whether we like it or not…)

**Use** the cost (and profit, and production) model, but connect it to inequality issues

**Assess** where shocks affect DMUs

**Compare** the actual banking system with counterfactual systems

**Understand** the impact of strategic output decisions on efficiency and survival
More takeaways

- **Study regulation** and understand how it affects balance sheet structures
- **Use insights** from corporate finance/IO
- **Look for identification** clues in the labor literature
- **Explore the power** of counterfactuals
- **Learn to use** computing power to enhance your analyses
Sort of a wish list

1. A paper on the **efficiency of banking regulation**

2. A paper on the **development of scope** economies in banking

3. A **monopolistic competition** paper, for example about mortgage lending

4. A paper on the impact of the **sources of financing** on firms’ production decisions

5. A paper on the (non-linear) impact of **risk taking** on bank efficiency

6. A **comparative paper** that puts banks next to other types of firms
A final wish...
A final wish...

Let’s write the critical papers that the banking sector deserves