Disclosure Issues in Conducting Empirical and Theoretical Research: A Provocative View

Paul Pfleiderer  |  Stanford GSB

August 2019
Dynamic Bank Capital Regulation in Equilibrium

Douglas Gale        Andrea Gamba        Marcella Lucchetta*

February 11, 2018

Abstract

We study optimal bank regulation in an economy with aggregate uncertainty. Bank liabilities are used as “money” and hence earn lower returns than equity. In laissez faire equilibrium, banks maximize market value, trading off the funding advantage of debt against the risk of costly default. The capital structure is not socially optimal because external costs of distress are not internalized by the banks. The constrained efficient allocation is characterized as the solution to a planner’s problem. Efficient regulation is procyclical, but countercyclical relative to laissez faire. We show that simple leverage constraints can get the decentralized economy close to the constrained efficient outcome.

Keywords: Banking, Bank capital regulation, General equilibrium, Aggregate uncertainty

JEL classification: G21, E32, E58.
Abstract

We study optimal bank regulation in an economy with aggregate uncertainty. Bank liabilities are used as “money” and hence earn lower returns than equity. In laissez faire equilibrium, banks maximize market value, trading off the funding advantage of debt against the risk of costly default. The capital structure is not socially optimal because external costs of distress are not internalized by the banks. The constrained efficient allocation is characterized as the solution to a planner’s problem. Efficient regulation is procyclical, but countercyclical relative to laissez faire. We show that simple leverage constraints can get the decentralized economy close to the constrained efficient outcome.

Disclosure from Paul Pfleiderer
I am psychologically predisposed to like the authors’ conclusions.
Figure 1: No aggregate shock - Constrained efficient and laissez faire allocation. For the model with no aggregate uncertainty, we show the equilibrium allocation, $(z_{t}, c_{t+1}, I_{t+1})$ for a unit of capital stock, for the constrained efficient (black lines) and the laissez faire (blue lines) cases, against the state variable $k_t$.

Figure 2: No aggregate shock - Equilibrium dynamics. For the model with no aggregate uncertainty starting from the lowest value of capital towards the steady state, we show the evolution of the equilibrium allocation, for the constrained efficient (black lines) case and the laissez faire (blue lines) case.
Figure 8: Capital structure dynamics in the business cycle. For the model with aggregate uncertainty, this figure shows the steady-state evolution of bank leverage in response to aggregate shock $A_t$ (upper panel) for the constrained efficient case (black line) and the laissez faire (blue line) equilibrium. In the bottom panel, we report the path of the ratio $x^{CN}/x^{NF}$. The simulation is done for the baseline parameters.

Figure 9: Capital structure dynamics in the business cycle with regulation. For the model with aggregate uncertainty, this figure shows the steady-state evolution of bank leverage of the model in response to the systematic shock $A_t$ for the laissez faire economy (blue lines), the regulated equilibrium with non-contingent restrictions on deposits (for this case, we assume either $\Upsilon = 0.55$ - solid magenta line or $\Upsilon = 0.53$ - dotted magenta line), and the regulated equilibrium with state-contingent restrictions on deposits (green line). The simulation is done for the baseline parameters.
Knowledge and Understanding

Empirical Research

Theoretical Research

Knowledge and Understanding
Knowledge and Understanding

Empirical Research

Theoretical Research

Knowledge and Understanding
Dynamic Bank Capital Regulation in Equilibrium

Douglas Gale  Andrea Gandha  Marcela Lucchetta
February 11, 2018

Abstract

We study optimal bank regulation in an economy with aggregate uncertainty. Bank liabilities are used as "money" and hence earn lower returns than equity. In laissez faire equilibrium, banks maximize market value, trading off the funding advantage of debt against the risk of costly default. The capital structure is not socially optimal because external costs of distress are not internalized by the banks. The constrained efficient allocation is characterized as the solution to a planner’s problem. Efficient regulation is procyclical, but countercyclical relative to laissez faire. We show that simple leverage constraints can get the decentralized economy close to the constrained efficient outcome.

Keywords: Banking, Bank capital regulation, General equilibrium, Aggregate uncertainty

JEL classification: G21, E22, E36.
A model becomes a chameleon when it is built on assumptions with dubious connections to the real world but nevertheless has conclusions that are uncritically (or not critically enough) applied to understanding our economy.
Dynamic Bank Capital Regulation in Equilibrium

Douglas Gale       Andrea Gamba       Marcella Lucchetta*

February 11, 2018

Critical Assumptions
Bankers control the technology for producing [perishable] consumption goods.
Producers

- Producers use a neoclassical technology to produce capital goods.
- Since production takes place *instantaneously* and *does not involve capital as an input*, there is no need for the producers to finance their operations with debt and equity.
Producers

Instantaneously
Produced
Capital Good!

Produced
Without
the use of
Capital!!!

Neoclassical
Producer
Morning of period \([t; t + 1)\):

- The aggregate productivity shock and the bankers' idiosyncratic shocks are realized;
- Bankers' cash flows are realized;
- Consumers withdraw deposits from banks;
- Deposits that are not used for consumption can be held until the afternoon;
Afternoon of period \([t; t + 1)\):

- Solvent banks pay dividends to shareholders;
- Failed banks are liquidated and their debts settled;
- New capital goods are produced and sold to banks;
- Banks issue debt and equity to finance the purchase of new capital goods and to optimize their capital structures;
- Consumers purchase new debt and equity and rebalance their portfolios.
A key assumption in our model is that markets and activities are segmented.

A consumer who receives dividends in the afternoon of period $t$, cannot consume them immediately. Instead, the dividends must be converted into deposits, which cannot be consumed until the morning of period $t + 1$.\textsuperscript{6}

\textsuperscript{6} Consumption goods are perishable and cannot be stored between periods. In any case, deposits are more efficient than storage, because bankers invest deposits in productive capital goods, which are productive.
A short story with a happy ending

This is Mary.
A short story with a happy ending

Mary is an Englishwoman of a Certain Age
A short story with a happy ending

Currently it is the afternoon of Period $t$. 
A short story with a happy ending

Mary wants her afternoon tea.
Mary is told that “a consumer who receives dividends in the afternoon of period $t$, cannot consume them immediately. Instead, the dividends must be converted into deposits, which cannot be consumed until the morning of period $t + 1$.”
A short story with a happy ending

Mary is in a state of despair!
A short story with a happy ending

Afternoon tea consumed in the morning is just NOT done!
A short story with a happy ending

Fortunately Mary remembers some very special things she has in her purse.
A short story with a happy ending

She orders tea and charges everything on her American Express® Card.
A short story with a happy ending

Voila!
Tea in the afternoon!
A short story with a happy ending

She can use her American Express® Card any time of the day, any day of the week.
A short story with a happy ending

Note: Mary orders champagne to celebrate having afternoon tea at the proper time.
THE END
Many of the WORDS appearing in GG&L relate to things in our world.
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Consumption Goods
(not so perishable)

Many of the WORDS appearing in GG&L relate to things in our world.
MARKETS

Many of the WORDS appearing in GG&L relate to things in our world.
Many of the WORDS appearing in GG&L relate to things in our world.
Using familiar words is not enough. What is important is how the words are put together to make key assumptions.
<table>
<thead>
<tr>
<th>Assumption</th>
<th>Real World</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is a continuum of traders on [0,1].</td>
<td>The number of traders is large and each has small impact.</td>
</tr>
<tr>
<td>Assumption</td>
<td>Real World</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Corporations Pay Taxes at Rate $T$.</td>
<td>The tax code may be complicated, but <em>(many)</em> corporations pay taxes.</td>
</tr>
<tr>
<td>Assumption</td>
<td>Real World</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>There are two outcomes, High (H) and Low (L). Pr(H) is increasing in the agent’s unobserved effort.</td>
<td>Principal/agent problems are everywhere.</td>
</tr>
</tbody>
</table>
Assumptions may be stylized and unrealistic,
but they should capture the essence of something we see on planet Earth.
They should not take us into a realm of Complete Fantasy.
What about the assumptions in GG&L?
Capital Good Produced Instantaneously and Without the use of Capital

Neoclassical Producer
Planet “X203-76ABH(b)"

A Distant Galaxy

Neoclassical Producer

Capital Good Produced Instantaneously and Without the use of Capital
Dynamic Bank Capital Regulation in Equilibrium

Douglas Cloke, Andrea Gamba, Melinda Lucchetta

February 11, 2023

We study optimal bank capital regulation in an economy with aggregate uncertainty. Bank liabilities are used to finance the economy's capital and equity, leading to the funding advantage of debt capital and the cost of equity. The capital structure is not socially optimal because the social costs of the capital structure are internalized by the banks. The constrained equilibrium is characterized by a subsidy to a planner's problem. Efficient regulation is possible, but not optimal relative to planner's fair. Weak capital/margin requirements can generate a sub-optimal outcome close to the constrained efficient outcome.

Keywords: Banking, Bank capital regulation, General equilibrium, Aggregate uncertainty

JEL classification: G21, S22, E32.
“You are being grossly unfair!”
“Theoretical modeling is hard.”
“It’s easy to take pot shots at someone else’s work.”
“It’s easy to take pot shots at someone else’s work.”

“I’d like to see you do better!”
“This guy is a total jerk!”
My defense:

An Analogy Between

Empirical Research & Theoretical Research
Empirical Research
Psychology’s Replication Crisis Is Running Out of Excuses

Another big project has found that only half of studies can be repeated. And this time, the usual explanations fall flat.

Ed Yong
Nov 19, 2018

Over the past few years, an international team of almost 200 psychologists has been trying to repeat a set of previously published experiments from its field, to see if it can get the same results. Despite its best efforts, the project, called Many Labs 2, has only succeeded in 14 out of 28 cases. Six years ago, that might have been shocking. Now it comes as expected (if still somewhat disturbing) news.
3.2.1. p-value reporting
Both the significant and non-significant results have increased over time (Fig. 3). In 1990, 0.019% of papers (107 out of 561,194 papers) reported a p-value between 0.051 and 0.060. This has risen about 4.3 fold to 0.082% (956 out of 1,161,405 papers) in 2014. Positive results, on the other hand, have increased 13.9-fold in the same period: from 0.031% (175 out of 561,194 papers) in 1990 to 0.432% (5,018 out of 1,161,405 papers) in 2014. In other words, the ratio of significant to non-significant results has increased from 1.6 (i.e., 175/107 papers) in 1990 to 5.2 (i.e., 5,018/956 papers) in 2014 (Fig. 4).

Figure 3. Number of papers reporting a p-value between 0.040 and 0.049 (blue) or a p-value between 0.051 and 0.060 (red) divided by the total number of papers per publication year.
Data and Code Availability Policy

It is the policy of the American Economic Association to publish papers only if the data and code used in the analysis are clearly and precisely documented, and access to the data and code is clearly and precisely documented and is non-exclusive to the authors.

Authors of accepted papers that contain empirical work, simulations, or experimental work must provide, prior to acceptance, information about the data, programs, and other details of the computations sufficient to permit replication, as well as information about access to data and programs.

Data and programs should be archived in the AEA Data and Code Repository. Authors will provide access to editors and reviewers, if requested, to both data and programs prior to acceptance. The Editor should be notified at the time of submission if access to the data used in a paper is restricted or limited, or if, for some other reason, the requirements above cannot be met. The AEA Data Editor will assess compliance with this policy, and will verify the accuracy of the information prior to acceptance by the Editor.

Instructions

When requested by the Editor during the refereeing process, authors are expected to provide location and access details for their data, programs, and replication instructions. Final files may be deposited in the AEA Data and Code Repository.* The AEA Data Editor will verify all information prior to acceptance of the manuscript by the Editor.
The purpose of scientific publishing is the dissemination of robust research findings, exposing them to the scrutiny of peers. Key to this endeavor is documenting the provenance of those findings. For theoretical articles, these are the proofs of theorems and the like that the authors provide. For empirical articles, the foundations on which the findings reside are external to the article, and often to the journal, in which they are published. Many scientists, journals, learned societies, and funding agencies have called for greater transparency of research practices, and more assurance that published research is reproducible (Stodden et al. 2016, Fuentes 2016, Moffitt 2016, Camerer et al. 2016, Bollen et al. 2015, Joskow 2015, Christensen and Miguel 2018). Our scientific community faces increasingly complex issues of privacy and confidentiality that prevent “open” access to those same sources (Anderson and Seltzer 2009, Abowd and Schmutte 2019). Large and mission. It also highlights some of the short- and medium-term changes that economists might expect when publishing their research.¹

I. The Current Environment

The American Economic Association’s (AEA) data and code posting policy (AEA 2008), as well as that of other societies and journals, are a reaction to earlier calls to increase transparency (McCullough, McGeary, and Harrison 2006; Anderson et al. 2008), and are intended to create a minimal framework from which to replicate empirical findings, by requiring the data and code to be available to others. In practice, enough reproduction and replication attempts fail (Camerer et al. 2016; Chang and Li 2015, 2017), and this is not just in economics (Baker 2015, Collaboration 2015) (I will comment on our own efforts later). It remains an open question who should be tasked with con-
Design your research like it's 2019: Preregister your study and analysis plans

What is Preregistration?
When you preregister your research, you're simply specifying to your plan in advance, before you gather data. Preregistration separates hypothesis-generating (exploratory) from hypothesis-testing (confirmatory) research. Both are important. But the same data cannot be used to generate and test a hypothesis, which can happen unintentionally and reduce the credibility of your results. Addressing this problem through planning improves the quality and transparency of your research, helping others who may wish to build on it.

For additional insight and context, you can read The Preregistration Revolution.
The World of Data
- Public
- Hand collected
- Proprietary
- Fabricated

Selection
Processing

Estimation and Testing

The World of Hypotheses
- Previously Proposed
- Original

Statistical Model

Code

Results

Selection

Interpretation

The Empiricist has Discretion over Everything Appearing in RED
The World of Data
- Public
- Hand collected
- Proprietary
- Fabricated

Cherry Picking

The World of Hypotheses
- Previously Proposed
- Original

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Interpretation

Shouldn’t All Results Be Reported?

“Tweaking”
The World of Data
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Statistical Model

HARKing “hypothesizing after results are known”
My defense:

An Analogy Between

Empirical Research & Theoretical Research
The World of Hypotheses

Previously Proposed

Original

Assumptions

Natural

Unrealistic but Necessary

Absurd

Selection

Refining

Equilibrium Model

Proofs

Deductive Argument

Propositions

Selection

Interpretation
The World of Hypotheses
Previously Proposed
Original

Selection

Deductive Argument

Proofs

Deductive Argument

Propositions

Selection

Interpretation

Reverse Engineering to target a Deductive Conclusion

Equilibrium Model

Selection

Refining

Assumptions
Natural
Unrealistic but Necessary
Absurd
Disclosing Code Used in Estimation is Good
Data Selection

Hypotheses

Assumptions

Hypotheses

Code

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Equilibrium Model
The Data Selection

Hypotheses

Assumptions

Hypotheses

The Data

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Equilibrium Model
• **Robustness Tests**
  o Different data transformations
  o Different control variables, fixed effects
  o Etc. Etc. Etc.

• Adjust significance criteria to account for *p*-hacking

• Out of sample
• Robustness Tests on Assumptions
  o Possible but costly to do and difficult to summarize

• We should adjust “significance threshold” and be more skeptical to account for assumption-hacking

• What would “out of sample” mean?
Parsimony

Perhaps *simple* models are less likely to be "assumption-Hacked"
Author: To establish causality, we use $Z_t$ as an instrument.

Audience member: But $Z_t$ is not exogenous! The exclusion restriction is clearly violated!!

Author: I know, but we chose to assume it is exogenous in order to get our results.

Audience member: That is a TOTALLY unacceptable answer.
Author: English ladies can’t consume dividends in the afternoon of period $t$. Instead, their dividends must be converted into deposits, which cannot be consumed until the next morning.

Audience member: But they can buy tea with a credit card!.

Author: I know, it is a stylized assumption we need to assume to make our model work.

Audience member: Oh. Okay.
My General View of Theory
We make assumptions based on what we see in our world.
Perhaps I am completely misrepresenting what Theoretical Models are all about.
Theory Papers Provide Existence Proofs.
Some Results

Grab Bag of Assumptions

Assumptions are carefully chosen from the Grab Bag.

Deductive Argument

Some Results
There potentially exists a planet somewhere in this (or another) universe where Proposition 1 holds.
If an existence proof is the goal, one should be upfront in stating it.
“Proof of Existence” Models...

...may be valuable and produce some useful insights if they are simple.
GREAT DISCOVERY (HOW TO OPEN A BOTTLE OF BEER WITHOUT AN OPENER.) By Goldberg

Hold lighted candle under string (A). String burns, releases ball (B) which rolls down trough (C) and knocks hammer (D) against trigger of pistol (E). Bullet (F) makes hole in pipe (G) releasing stream of water which falls on plant (H). Plant grows until it presses upward against spring (I) and lever (J) pulls string (K) which upsets shelf (L) holding potato (M). Potato falls on handle (N) which starts doll (O) winding phonograph (P). Phonograph says, in a female voice: "Good evening, beer." The bottle of beer, being polite, naturally takes off its hat and there you are!
Note that we don’t value

“Proof of Existence”
Empirical Results
Grab Bag of Made-up Data

Made-up Data.

Estimation

Target Empirical Findings
A Macroeconomic Model with Financial Panics*

Mark Gertler, Nobuhiro Kiyotaki and Andrea Prestiti
NYU, Princeton and Federal Reserve Board

October, 2018 (first version, September 2017)

Critical Assumptions
Households consists of bankers and workers.

In each period, with $i.i.d.$ probability $1-\sigma$, a banker exits and in each period, $(1-\sigma)f$ workers become bankers.

Bankers can steal from their bank by selling a fraction of assets secretly on a secondary market, but this takes time.

Households don’t deposit money in their own banks, so bankers are stealing from people they don’t care about.

Bankers don’t pay any dividends until their random exit.
New York (CNN Business)

Big banks are getting ready to reward investors with larger dividend payouts after the Federal Reserve gave them the go-ahead.

The likes of JPMorgan (JPM), Goldman Sachs (GS) and Bank of America (BAC) are able to increase their payouts after the Fed's stress test deemed them well capitalized. The approved capital plans also include room for share buybacks. One reason for a company to buyback shares is to boost its stock price.
Bank Of America's Generous Capital Return Plan Indicates A Payout Ratio Exceeding 100% For 2019
A Macroeconomic Model
with
Financial Panics*

Mark Gertler, Nobuhiro Kiyotaki and Andrea Prestipino
NYU, Princeton and Federal Reserve Board

October, 2018 (first version, September 2017)
## GN&P Calibration

### 21 Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>Impatience</td>
<td>.99</td>
<td>Risk Free Rate</td>
</tr>
<tr>
<td>$\gamma_h$</td>
<td>Risk Aversion</td>
<td>2</td>
<td>Literature</td>
</tr>
<tr>
<td>$\phi$</td>
<td>Inverse Frisch Elasticity</td>
<td>.5</td>
<td>Literature</td>
</tr>
<tr>
<td>$\epsilon$</td>
<td>Elasticity of subst across varieties</td>
<td>11</td>
<td>Markup 10%</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>Capital Share</td>
<td>.33</td>
<td>Capital Share</td>
</tr>
<tr>
<td>$\delta$</td>
<td>Depreciation</td>
<td>.025</td>
<td>$\frac{L}{K} = .025$</td>
</tr>
<tr>
<td>$\eta$</td>
<td>Elasticity of q to i</td>
<td>.25</td>
<td>Literature</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>Investment Technology Parameter</td>
<td>.53</td>
<td>$Q = 1$</td>
</tr>
<tr>
<td>$b$</td>
<td>Investment Technology Parameter</td>
<td>-.83%</td>
<td>$\frac{L}{K^*} = .025$</td>
</tr>
<tr>
<td>$G$</td>
<td>Government Expenditure</td>
<td>.45</td>
<td>$\frac{G}{Y} = .2$</td>
</tr>
<tr>
<td>$\rho^{tr}$</td>
<td>Price adj costs</td>
<td>1000</td>
<td>Slope of Phillips curve .01</td>
</tr>
<tr>
<td>$\kappa_\pi$</td>
<td>Policy Response to Inflation</td>
<td>1.5</td>
<td>Literature</td>
</tr>
<tr>
<td>$\kappa_y$</td>
<td>Policy Response to Output</td>
<td>.5</td>
<td>Literature</td>
</tr>
</tbody>
</table>

### Financial Intermediation Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma$</td>
<td>Banker Survival rate</td>
<td>.93</td>
<td>Leverage $\frac{Q_{N+}^{\sigma}}{N} - 10$</td>
</tr>
<tr>
<td>$\zeta$</td>
<td>New Bankers Endowments as a share of Capital</td>
<td>.1%</td>
<td>% $\Delta I$ in crisis $\approx 35%$</td>
</tr>
<tr>
<td>$\theta$</td>
<td>Share of assets divertible Threshold for</td>
<td>.22</td>
<td>Spread Increase in Crisis $= 1.5%$</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>HH Intermediation Costs</td>
<td>.61</td>
<td>$\frac{s^b}{S^b} = .33$</td>
</tr>
<tr>
<td>$\chi$</td>
<td>HH Intermediation Costs</td>
<td>.105</td>
<td>$ER^b - R = 2%$ Annual</td>
</tr>
<tr>
<td>$\kappa$</td>
<td>Sunspot Probability</td>
<td>.15</td>
<td>Run Probability $4%$ Annual</td>
</tr>
<tr>
<td>$\sigma(\xi)$</td>
<td>std of innovation to capital quality</td>
<td>.5%</td>
<td>std Output (C+I)</td>
</tr>
<tr>
<td>$\rho^\xi$</td>
<td>serial correlation of capital quality</td>
<td>.7</td>
<td>std Investment</td>
</tr>
</tbody>
</table>
GN&P Conclusion

One issue we save for further work is the role of macroprudential policy. As with other models of macroprudential policy, externalities are present that lead banks to take more risk than is socially efficient. Much of the literature is based on the pecuniary externality analyzed by Lorenzoni (2008), where individual banks do not properly internalize the exposure of the system to asset price fluctuations that generate inefficient volatility, but not runs. A distinctive feature of our model is that the key externality works through the effect of leverage on the bank run probability: Because the run probability depends on the leverage of the banking system as a whole, individual banks do not fully take into account the impact of their own leverage decisions on the exposure of the entire system. In this environment, the key concern of the macroprudential policy becomes reducing the possibility of a financial collapse in the most efficient way. Our model will permit us to explore the optimal design of policies qualitatively and quantitatively.
• Large sample of data that clearly measure underlying economic variables.
• Safeguards against p-hacking; HARKing, etc.
• Rock-solid identification for causality
• Robust estimation
• Fabricated or cherry-picked data
• Extreme cases of p-hacking or HARKing
These issues have been partially addressed.
The World of Data
- Public
- Hand collected
- Proprietary
- Fabricated

Selection
Processing

Hypotheses
- Previously Proposed
- Original

Assumptions About the World

Code

Estimation and Testing

Selection

Statistical Model

Selection

Interpretation

Results
The World of Data
---
Public
Hand collected
Proprietary
Fabricated

The World of Hypotheses
---
Previously Proposed
Proposed
Original

Estimation and Testing
---
Selection
Processing

Code

Statistical Model
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Selection

Assumptions About the World

Results
---
Selection
Interpretation
• Models that make assumptions that capture important aspects of OUR world.
• Models that give us insights that will help us understand the world better and make better decisions.

We should strive to move the threshold.
But we NEED Theoretical Models!

Policy makers must make decisions.

Models may have very unrealistic assumptions,...

But having a model is better than no model at all.

But we NEED Empirical Results!

Policy makers must make decisions.

We may need to make up the data,...

But having empirical results based on made-up data is better than no empirical results at all.