R. Bachmann, K. Carstensen, S. Lautenbacher, M. Schneider Uncertainty is More Than Risk — Survey Evidence on Knightian and Bayesian Firms

Discussion by Jaroslav Borovička (NYU)

Expectations in Macroeconomic and Financial Models: June 2020

SURVEYING MACROECONOMIC UNCERTAINTY

Macro surveys ask questions about

- point estimates
- probability distributions

This may by design attribute too much knowledge to respondents.

- look for (rare) questions soliciting information about Knightian uncertainty
- use other proxies (confidence, cross-sectional dispersion)
- design own survey

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2012
design

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2012	2013
design	start

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2012	2013	2014
design	start	wait

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2012	2013	2014	2015
design	start	wait	wait

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2012	2013	2014	2015	2016
design	start	wait	wait	wait

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2012	2013	2014	2015	2016	2017
design	start	wait	wait	wait	wait

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2012	2013	2014	2015	2016	2017	2018
design	start	wait	wait	wait	wait	wait

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2012	2013	2014	2015	2016	2017	2018	2019
design	start	wait	wait	wait	wait	wait	write paper

FINDINGS

- A nontrivial share of firms where a decision maker prefers expressing uncertainty using a set of models rather than a single probability distribution.
  - *28% of responses on average, 76% of 'ever-Knightian' firms in a subsample of firms with at least 5 responses*
- Evidence against lack of sophistication as an explanation
  - *providing an interval in a survey is actually a pretty sophisticated mental process*
- Relationship to idiosyncratic uncertainty
  - *interval answers more likely when business environment has changed, and firms are more cautious*
- Comovement with aggregate uncertainty
  - *19 quarterly observations*

QUESTIONS ABOUT DESIGN

Survey uses a very specific design to divide respondents into categories:

- *Probability is ____ %* $\Longrightarrow$ Savagean (Bayesian) type
- *Probability lies between ____ % and ____ %* $\Longrightarrow$ Knightian type
- *Don't know* $\Longrightarrow$?

In reality, we are all Knightians. The question is, to which extent is a Savagean model a good approximation of people's behavior.

1. First option is a special case of the second option. What if it is dropped?
2. For the purposes of modeling, can a response with a 1% interval width be classified as Savagean?
3. Can we reject a compound lottery argument? If Knightians were asked about a probability distribution over the interval, would they refuse to give an answer?
4. Isn't 'Don't know' the ultimate Knightian answer? :-)

HOW CAN THE FINDINGS BE USED?

Paper provides qualitative and quantitative evidence about perceptions of uncertainty.

- Ideally, we would like to use these data as an input into quantitative models.

What do we need?

1. A theory of decision making of households/firms.
2. A theory of how decision makers answer surveys.
3. A link between the two.

EXAMPLE: MODELS OF AMBIGUITY AVERSION

We utilize a range of models of aversion to Knightian uncertainty.

- Multiple prior model (Gilboa and Schmeidler (1989))

$$\min_{\pi \in \Delta} \int_S u(f)\, d\pi$$

- Robust preference model (Hansen and Sargent (2001))

$$\min_{\pi} \int_S u(f)\, d\pi \quad \text{s.t.} \quad \int_S \left(\log \frac{d\pi}{d\pi^B} \right) d\pi \leq \kappa$$

- Smooth ambiguity aversion (Klibanoff, Marinacci, Mukerji (2005))

$$\int_\Delta \phi \left(\int_S u(f)\, d\pi \right)$$

These decision theories provide representations that feature a set of models and either a minimization operator or concave averaging.

DISCIPLINE IMPOSED ON THE SET OF MODELS

Some examples

1. Ilut and Schneider (2014) use dispersion in SPF forecasts to discipline Δ.
   - More dispersion in SPF forecasts $\Longrightarrow$ more ambiguity among households $\Longrightarrow$ larger set Δ
   - Free parameter linking magnitude of dispersion to size of Δ disciplined by implied macro dynamics.
2. Bhandari, Borovička, and Ho (2019) use household survey data.
   - Assume that households answer surveys under the worst-case model.
   - A model of a (typically) pessimistic belief inspired by robust control.

How can the new survey help further?

LINKING Δ TO THE 'KNIGHTIAN INTERVAL'

Should models be calibrated so that Δ in the objective function implies the same probability interval as found in the survey?

- Not clear.
- But this can be tested.

Recall Δ is implied by decision-maker's attitudes to ambiguous acts.

- A special module (meta-survey) testing exactly this?
- Ask respondents to rank acts in order to solicit information about Δ.
- Find the link between Δ and the Knightian interval.

Similarly, attempt to link these attitudes to actual firms' choices.

SOME MINOR DETAILS

1. In the categorization, respondents who assign probability 0 or 1 are singled out.
    - This does not seem to be necessary, the difference between 0.99 and 1 is only qualitative, they are still Savagean.
2. Seasonality in forecasting positive Q/Q growth?
    - No information on this in the paper.
3. Discussion about the connection between bounds of the Knightian interval and scenarios unclear.
    - Are scenarios meant to represent alternative models/probability distributions?
    - Or are they different conditional distributions from the same model, conditioned on alternative events?

CONCLUSION

1. The survey is a very useful endeavor, deepening our understanding of firms' attitudes to uncertainty.
2. A new basis for improving calibration of decision-theoretical models.
3. Aggregate time series perhaps not very convincing yet, due to a short sample.