

MACROECONOMIC MODELS FOR CENTRAL BANKING: USEFULNESS AND CHALLENGES

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Models are like
maps...

“A map is not the territory it represents, but, if correct, it has a similar structure to the territory, which accounts for its usefulness”.

Alfred Korzybski (1933)

The Homework Questions

1. Why do we need macro models for policy making? Examples?
2. How should we bridge the gap between theory and application? What are the challenges in integrating academic models/insights into policymaking?

1. Why do we need macro models for policymaking?

Like maps, they strip out the irrelevant. They are useful organising frameworks to evaluate the effects of policy changes: they allow us

- To think through the effects of policy
 - ✓ Including scenarios or counterfactuals for which there is limited past evidence or experience (e.g., pandemic)
- To improve forecasting
- To quantify different trade-offs involved in households', firms' and policymakers' decisions, as well as general equilibrium effects
 - ✓ The direct, partial equilibrium effect of a policy estimated in the data might be different from the general equilibrium effect
- To organise and interpret complex data
 - ✓ Including labour market indicators, input output linkages
- To discipline the narrative and improve communications
 - ✓ Logical coherence in explanations

1. Why do we need macro models for policymaking?

Important to be clear about what models don't do:

❑ Models cannot predict shocks

- ... let alone shocks caused by a virus surging in a market in China or a colossal increase in energy prices triggered by an unexpected war
- Disillusion with models as people with limited model training saw large forecast errors – missing the point that shocks need to be fed into the model

But:

❑ They can help us understand/predict propagation of shocks

- Indeed, feeding the correct (tail) shocks since the pandemic, existing models did a fairly good job – Phil Lane, Nov 2024

1. Why do we need macro models for policymaking?

SOME SIMPLE EXAMPLES

Example 1: The Phillips Curve Before Covid

- ❑ Before the pandemic, policymakers and academics were noting that the statistical relation between inflation and unemployment appeared flat and inflation seemed to be following an “exogenous process, unrelated to measures of slack”.
 - ✓ Powell (2018), Draghi (2017), Carney (2017), Summers (2017), Blinder (2018), Davies (2017), Andolfatto (2017), Uhlig (2018), Atkeson and Ohanian (2001), Stock and Watson (2007, 2009), Dotsey, et al. (2017), Cecchetti et al. (2017), Forbes et al. (2017), Ball and Mazumder (2011), IMF (2013), Blanchard, Cerutti and Summers (2015), Hall (2011)
- ❑ Many inferred that this disconnect between inflation slack implied aggregate demand stimulus would have little impact on inflation
 - ✓ It also posed a challenge to New Keynesian models, for which the Phillips curve is a key building bloc.
- ❑ Having a structural macroeconomic model was useful to interpret the data and correct the flawed inference ([McLeay and Tenreyro, 2019](#))

Optimal Inflation and the Phillips Curve (McLeay and Tenreyro, 2019)

Policy maker's mandate:

$$\min \pi_t^2 + \lambda x_t^2$$

s.t.:

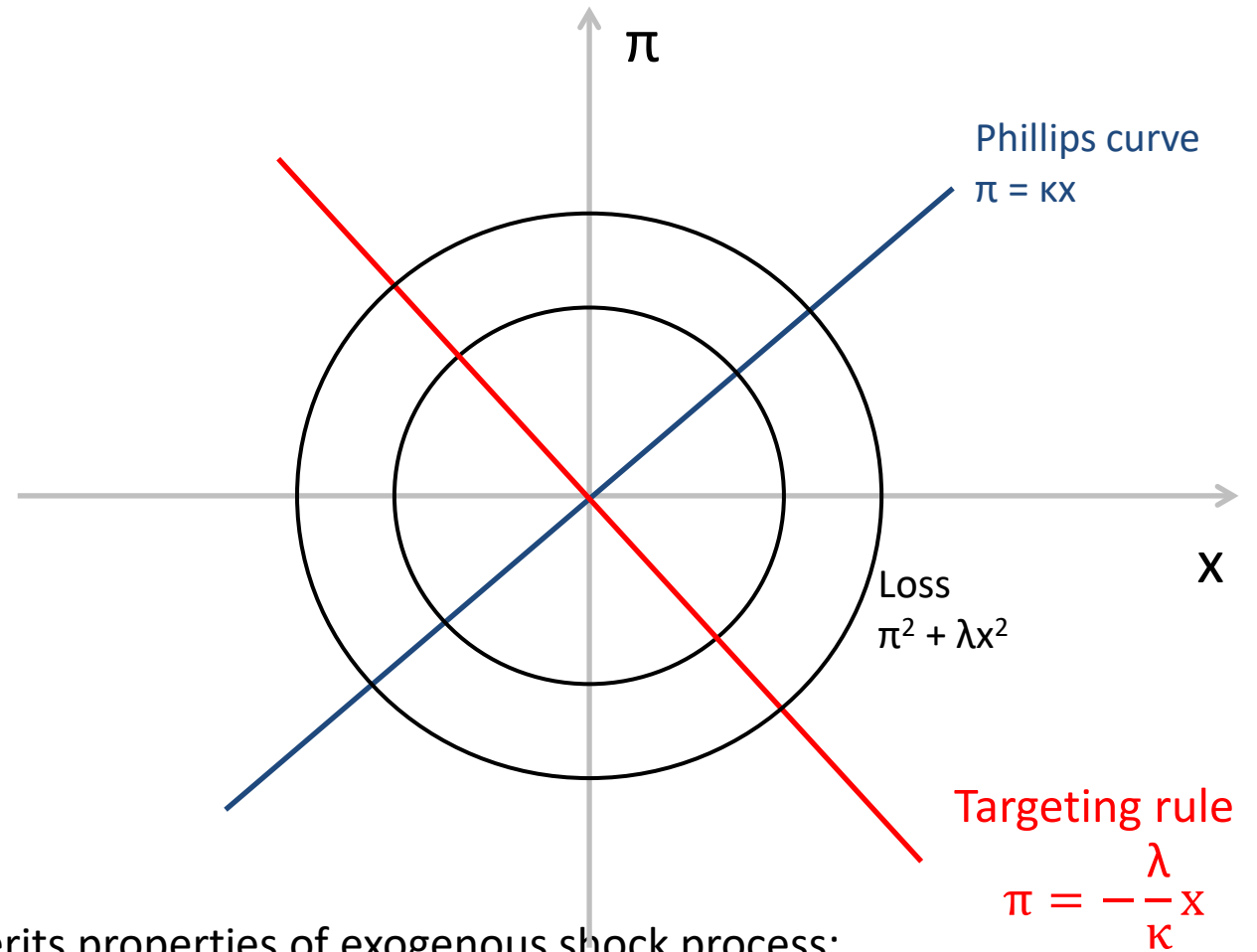
$$\pi_t = E_t \pi_{t+1} + \kappa x_t + \epsilon_t \quad (\text{PC})$$

Solution: Targeting rule

$$\pi_t = -\frac{\lambda}{\kappa} x_t \quad (\text{TR})$$

Observed inflation: inherits properties of exogenous shock process:

$$\pi_t = f(\epsilon_t)$$



Optimal Inflation and the Phillips Curve

$$\min \pi_t^2 + \lambda x_t^2$$

s.t.:

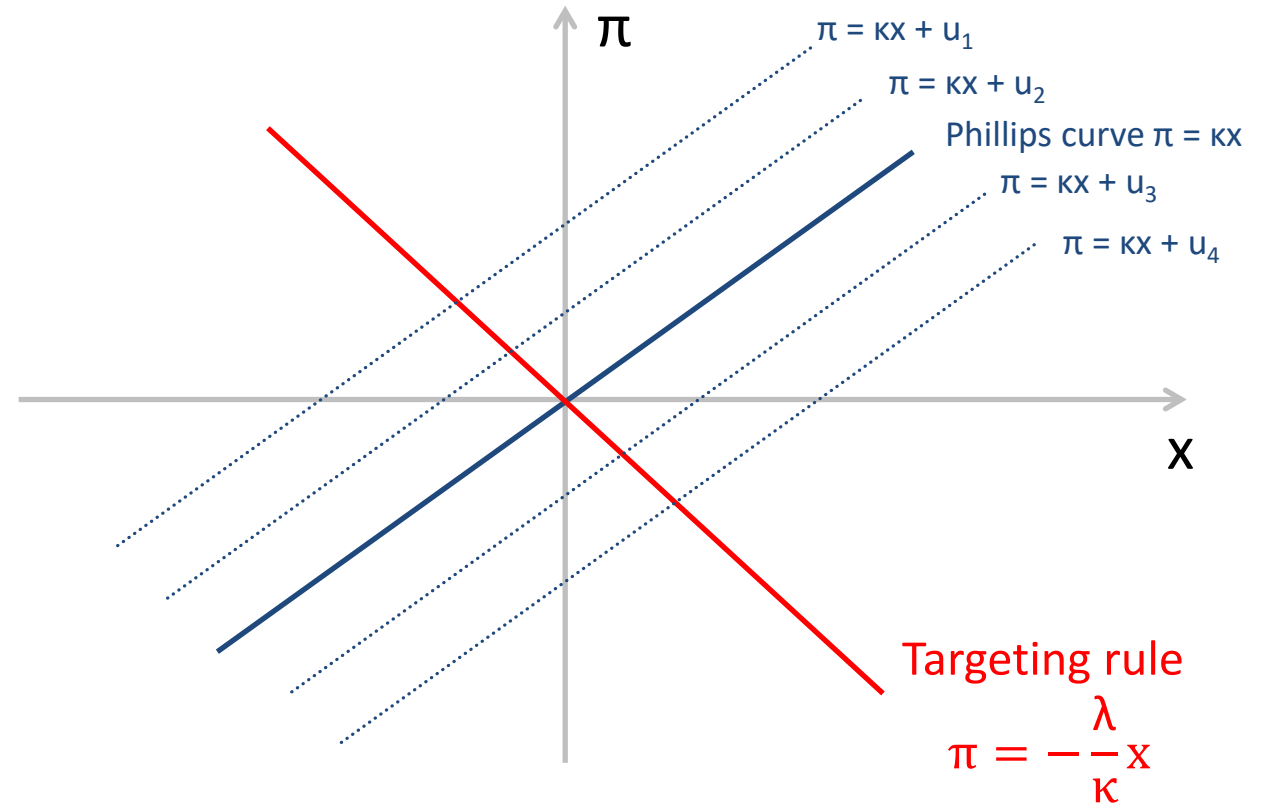
$$\pi_t = E_t \pi_{t+1} + \kappa x_t + \epsilon_t \quad (\text{PC})$$

Solution: Targeting rule

$$\pi_t = -\frac{\lambda}{\kappa} x_t \quad (\text{TR})$$

Inflation inherits properties of exogenous shock process:

$$\text{If } \epsilon_t = \rho \epsilon_{t-1} + v_t, \quad \pi_t = \frac{\lambda}{\kappa^2 + \lambda(1-\beta\rho)} \epsilon_t$$



Example 1: The Phillips Curve before Covid

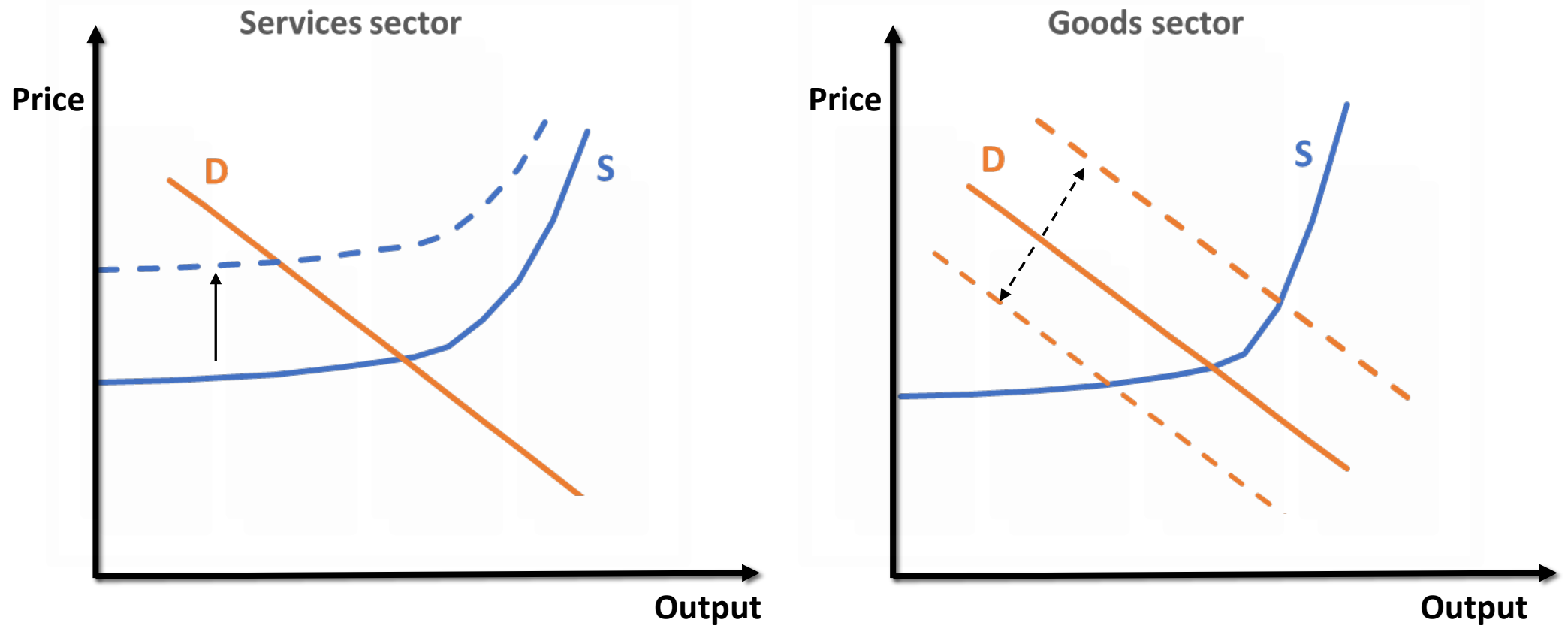
- ❑ Running regressions of inflation on slack, without an underlying demand/supply model and proper identification is problematic
- ❑ Monetary policy by design offsets demand shocks, preventing variation along the supply curve and making it difficult to identify it
- ❑ Framework implies that equilibrium inflation rates should reflect the cost-push shock, as long as central banks are doing a sensible job
- ❑ Challenge for econometricians
 - ✓ Well identified studies find a healthy PC slope. E.g. disaggregated data (regions, countries within a monetary union) show that the PC is 3-4 times larger than the one obtained from unidentified regressions

Example 2: The Phillips Curve during Covid and the War

- ❑ Tail events of enormous magnitude
- ❑ Affecting sectors in a dramatically uneven way
- ❑ Not sufficient to use aggregate Phillips curves when the sectoral dynamics were so different. Need to understand sectoral linkages

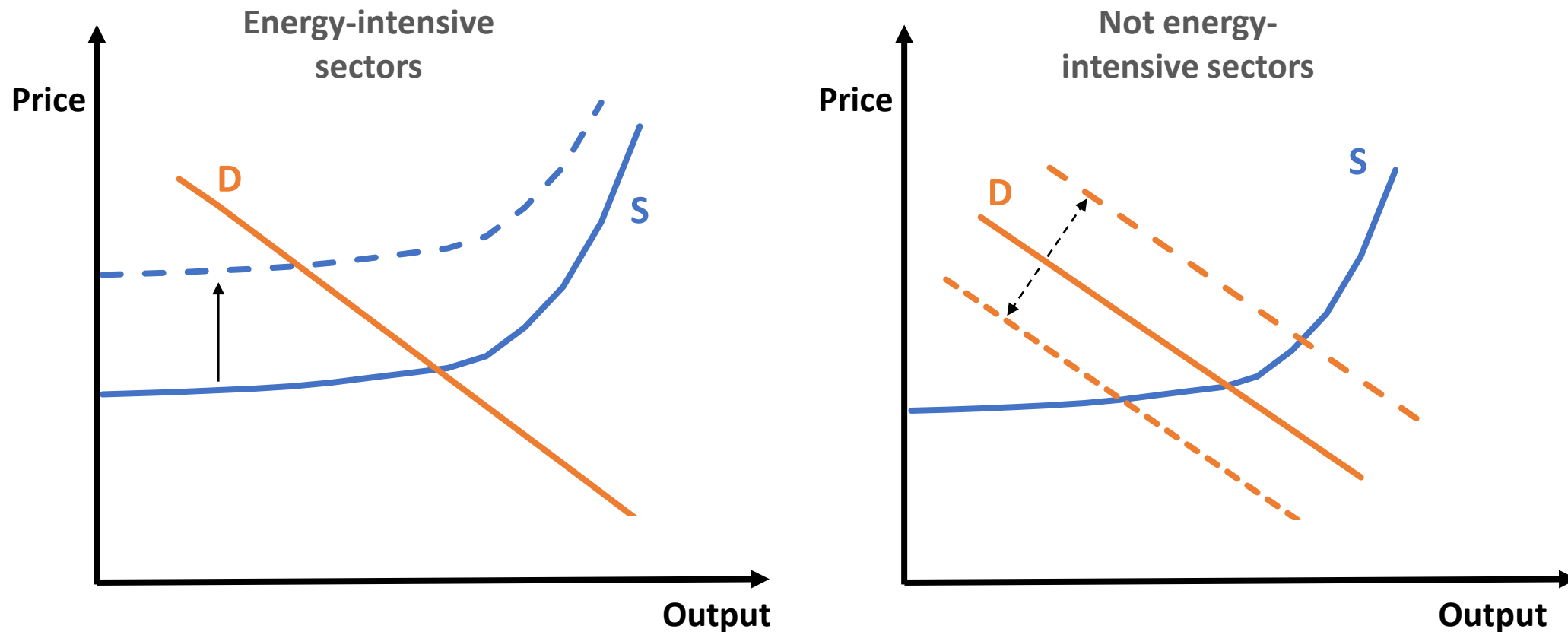
[Guerrieri, Lorenzoni, Straub and Werning \(2021\)](#), [Baqaee and Farhi \(2022\)](#)

Relative price and real income effects of an energy price shock



References: Guerrieri et al (2021), Guerrieri et al (2023), Auclert et al (2023), Fornaro and Romei (2022), Tenreyro (2022), Barnes et al (2023).

Relative price, substitution and real income effects of an energy price shock



References: Guerrieri et al (2021), Guerrieri et al (2023), Auclert et al (2023), Fornaro and Romei (2022), Tenreyro (2022), Barnes et al (2023).

Example 3: Search and matching models post pandemic

- ❑ Vacancies played a key role in deciding the tightness of the labour market
- ❑ Also important to assess changes in restrictiveness of monetary policy
- ❑ Just looking at unemployment was not enough to gauge tightness and slack.

Example 4: Consumption post pandemic

- ❑ Large Savings
- ❑ HANK models: interaction between different MPC and savings distribution important to refine the Consumption forecast

Example 5: SIR models

- ❑ Highlighted some of the difficulties in predicting behaviour and contagion during the pandemic
- ❑ Helpful in putting some bounds on uncertainty

2. How should we bridge the gap between theory and application? What are the challenges in integrating academic models/insights into policymaking?

Challenge of integrating all the research: complexity

- ❑ Models offer a useful organising framework for the evaluation of policies
- ❑ But they cannot map reality 1:1, otherwise they stop being models
 - ✓ Asset pricing and financial frictions
 - ✓ Labour market frictions
 - ✓ Sectoral disaggregation, input-output linkages
 - ✓ HANK features and distributional channels
 - ✓ Interactions between fiscal and monetary policy. Political economy considerations that could interact with i) unconventional policies; ii) distributional effects taking centre stage in the political debate
- ❑ While it might be tempting to enlarge the map, that is not free of cost

When the map
becomes the
(size of the)
territory

The model is no longer useful to
organise, analyse, describe

Judgment is important in deciding
what are the important factors
needed at a given time to explain a
phenomenon and organise the
narrative – i.e., which map to use

“All models are wrong, some are useful”

George Box, 1976

- ❑ **Models cannot predict shocks**

- ❑ Role for economists to communicate the limitations of models
 - Having said that... models can also help to think ahead, and put policies in place to prevent shocks or mitigate their impact

- ❑ Main challenge to integrate macro models with policymaking: Complexity – model may become too hard to understand by its very users (policymakers)

On Exactitude in Science Jorge Luis Borges, *Collected Fictions*,
translated by Andrew Hurley.

“...In that Empire, the Art of Cartography attained such perfection that the map of a single Province occupied the entirety of a City, and the map of the Empire, the entirety of a Province. In time, those unconscionable maps no longer satisfied, and the Cartographers Guilds struck a map of the Empire whose size was that of the Empire, and which coincided point for point with it. The following generations, who were not so fond of the study of Cartography as their forebears had been, saw that that vast map was useless, and not without some pitilessness was it, that they delivered it up to the inclemencies of sun and winters. In the deserts of the West, still today, there are tattered ruins of that map, inhabited by animals and beggars; in all the Land there is no other relic of the disciplines of Geography.

—Suarez Miranda, *Viajes de varones prudentes*, Libro IV, Cap. XLV, Lerida, 1658”