Memory, Collateral and Emerging Market Crisis

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Motivation

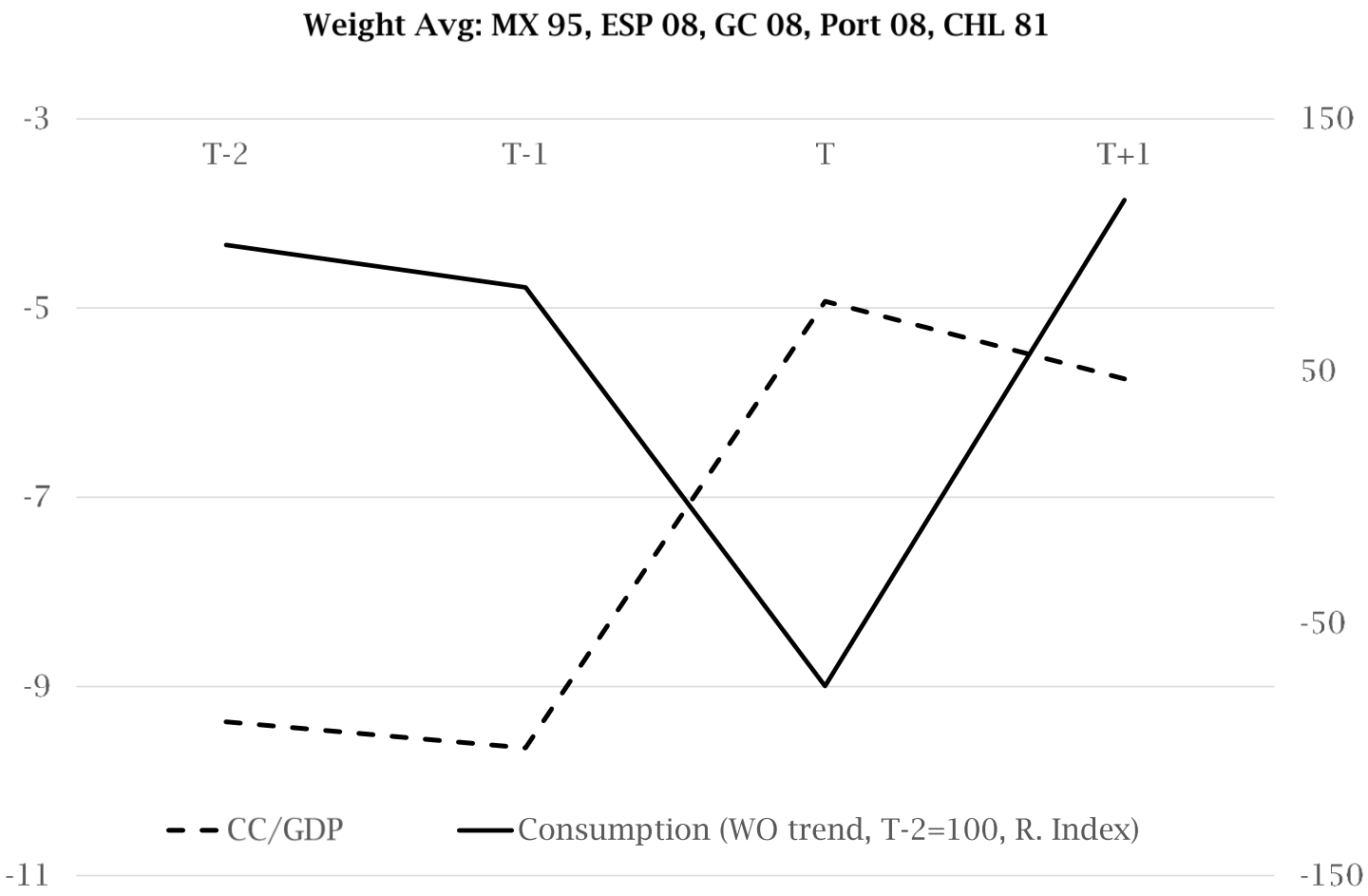
- How is the anatomy of macroeconomic crises?
- Pre-phase, crises, recovery/spill over/stagnation, each of them with different time spells.
- We need a flexible equilibrium notion to keep track of the 3 phases.

- Is there a connection between the long and short run behavior of a small open economy? Does the long run affect the short run? Is it the other way around?
- We need a stationary, a non-stationary and an ergodic equilibrium to test this difference

Motivation

- Due to the disruptive nature of a crises and multiple equilibria, we may lose continuity.
- Technical challenge. Standard tools do not work.
- 1) Is it possible to:
    - replicate the anatomy of a crises and
    - match stylized facts with a stochastic steady state?
    - Are they connected?
    - **YES!!**

Anatomy of the Crises



Anatomy of the crises

- Pierri, Montes Rojas, Mira (2021): Pre-phase
    - Emerging economies can accumulate up to 25% of the GDP in external debt in 3-5

- Seoane and Yurdagul (2018): Post crises phase:
    - Heterogeneity after the crash

- **Evidence suggests that the time spell of the crises is more than 3 periods.**

- **We need "memory" in the model to condition on these facts to model a crisis.**

Anatomy of the crises

- Canonical models using **standard minimal state space (MSS) equilibrium notions** cannot replicate all the phases of the crises and match the long run. However, they can generate computable and multiple self-fulfilling stationary equilibrium.

- While standard equilibrium definitions have “limits” to their predictive capacity, we show that,:

    - **by changing the definition of equilibrium,**
    - **a canonical model not only replicates the short and long run during an EMC but also represents the interaction between the 2 of them.**

Model Selection

- Our theoretical results apply to models with:
  - ***1 dynamic equation,***
  - inequality / equality constraints,
  - price dependent / independent constraints
  - representative agents
  - intra-temporal optimality conditions.

- We left for future research models with
  - **2 dynamic equations**
  - 2 assets,
  - heterogeneous agents,
  - optimal policies.

Model Selection

- Our results can be applied to models satisfying jointly 2 conditions:

Condition A

$$Max_{\{k_t^1\}} E_0 \sum_{t=0}^{\infty} u([k_t, k_{t+1}])$$

Subject to

$$g([k_t, k_{t+1}]) \geq 0$$

Condition B

$$F([k_t, k_{t+1}]) = 0$$

  - k=[endogenous states, prices, exogenous states]
  - $g([k_t, k_{t+1}])$ is the collateral constraint
  - $F([k_t, k_{t+1}])$ contains intra-temporal optimality
  - Feasibility is implicit in A and B

Sequential Equilibrium

- We apply our results to a workhorse model: Bianchi (2011).
- Financial crises in a SOE: a sudden stop.

- Additional assumptions wrt Bianchi (2011) and SG-U (2018) to ensure compactness.

- 2 goods: tradable and non-tradable

- 1 non-contingent real asset with fixed price

- 1 price: RER. An increase implies appreciation

- Endowments: non-tradable, fixed. Tradable, i.i.d

$$c_t^T + p_t c_t^N + d_t = y_t^T + p_t y_t^N + \frac{d_{t+1}}{R}$$

Sequential Equilibrium

- Distinctive feature in the literature: collateral

$$d_{t+1} \leq \kappa(p_t y_t^N + y_t^T)$$

- Intuition: debt to GDP has an upper bound, κ
- Problem: κ is not observed. Callibration? Does it change?
- Distinctive feature of this paper: on preferences
- Besides additive separability across time and states (not across goods), we add ***uniform marginal utility*** (Braido 2013).
- Coupled with collateral, this preferences insure ***compactness of the sequential equilibrium. Critical for both types of RE.***

What is new?

- We propose a Markov equilibrium notion, Generalized Markov Equilibria (GME), which:
  - is constructed directly from the Sequential equilibrium correspondence
  - captures a larger fraction of the sequential equilibrium with respect to the MSS,
  - contains it,
  - **have more "memory" and**
  - **is more "flexible"**.

- Memory and flexibility are essential to replicate, at the same time, long run /ergodic and short run dynamics.

What is new?

- The tools presented in this paper:
  - allow us to derive global stochastic dynamics,
  - an ergodic invariant measure and
  - several type of stationary equilibria.

- A GME represent a systematic way to handle
  - **price dependent inequality constraints,**
  - **incomplete markets,**
  - **financial crises and**
  - **spiralized recessions**.

What is new?

- A GME is ergodic and robust to the presence of multiple discontinuous equilibrium.
- **Ergodicity is a selection mechanism.**

- The simulated dynamics for a stationary, non-stationary and ergodic equilibrium are different not only quantitatively, but also qualitatively.

- The invariant measure is **connected with the frequency of crises and disciplines the short run dynamics.**

What is new?

- We compute:
  - an ergodic,
  - a stationary
  - and a non-stationary GME.
- The algorithm is efficient because it exploits the speed of the contained MSS equilibrium between crises.

- We found that the:
  - ergodic equilibrium has smoother consumption paths (i.e., is less financially constrained) and generates a crisis endogenously
  - non-stationary equilibrium matches a wide range of macroeconomic crises.

What is new?

- We provide sufficient conditions to show existence of the SCE and MSSRE.
- These conditions imply compactness, non-homotheticity of preferences and bounded marginal utilities.

- For the MSSRE we derive a:
  - monotone 2 step operator which requires weaker conditions with respect to the literature.
  - constructive existence proof
  - algorithmic procedure.
  - robust comparative statics.

What is new?

- The constructive existence proof contains a theoretically based initial condition and an updating rule for a convergent algorithm.

- A MSSRE replicates the spiralized recession of an EMC.

- **For the MSSRE we found 2 stationary equilibria**:
  - one with low/under borrowing and
  - one with high/over borrowing.
- **Under rational expectations these equilibria are self-fulfilling**.

Thank you!!