# Calibration in macroeconomics : Project

## Last review

Check for Home and Foreign to always have capital letter

## Questions for Kieran

Calibration

* Correct approach for income shock based on income growth between 1996 and 2000?
* Correct approach for targeted debt-to-GDP ratio based on average between 1996 and 2000?
* Main limitation is g\_h not symmetric to g\_l

Documents to hand-in

* Do I need to write down the mathematical steps, such as the home hh FOC and optimality conditions used
* Structure of document: summary of paper with important points for calibration + description of calibration
* Submit folder with data and VS code?

Concepts in paper

* Nash bargaining problem: weird to multiply two surpluses derived from differences in utility because utility is an ordinal and not cardinal concept. Here for theta < 1, much more weight given to U of the foreign

## Content

Theoretical paper: Capital flow freezes (Udara Peiris, Sokolova, Tsomocos, 2024)

* The paper focuses on crises from private-sector generating external debt that is collectively renegotiated by the sovereign
* In this setting, there is an important pecuniary externality: debtor households do not internalize how the quantity of debt they issue would affect the anticipated default rate and the bond price
* For low and moderate levels of bargaining power, the quantity of debt issued is positive but suboptimally low. When bargaining power is sufficiently high, international lending may cease or freeze.
* They develop a small open economy model with incomplete markets that incorporates:

1. private sector cross border flows modelled as decentralized borrowing:

two countries: Home and Foreign

three time periods, t = {0,1,2} and uncertainty on income in t={1,2} is realized between t=0 and t=1, so no uncertainty anymore in period 1

two states, s={H,L} with probability 0.5

timeline:

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Description générée automatiquement

In t=0, Home households can issue debt b\_0 that would be purchased by the Foreign households – to be repaid in t=1

In t=1, household not wishing to repay the full debt due may send a request to the government to bargain with lenders on a reduced final payment. This would be seen as bail-outs of the financial sector by the sovereign. The outcome of this debt renegotiation, the default rate delta\_1, is determined via the Nash Bargaining Solution. The default rates are reported to households who decide whether to accept and repay the negotiated debt, or decline and fully default. Households that fully default cannot access the foreign debt market in t=1 and incur a loss of endowment in t=2.

The Home household problem is given by:

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Description générée automatiquement

Subject to:

Une image contenant Police, typographie, texte, calligraphie

Description générée automatiquement

Une image contenant Police, texte, calligraphie, écriture manuscrite

Description générée automatiquement

Foreign households are risk-neutral

1. renegotiation of private debt handled by the government modelled as Nash Bargaining.

The Nash Bargaining problem determines the default rate outcome by maximizing a weighted product of welfare surpluses gained by each party participating in bargaining. As we have a representative agent at home, the distrinction between the sovereign and private sector is only important in the bond price schedule: ex-ante households take bond prices as given, whereas a sovereign would internalize the relationship between the bond price and anticipated default rates.

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Description générée automatiquement

These surpluses are assigned weights that represent relative bargaining power of each party, with 0 < theta < 1 corresponding to the bargaining power of the borrower, and 1 – theta to the bargaining power of the lender. For each party, the surplus is given by the difference between the value function of repayment, and the value function that would arrive if there is full default.

* Competitive equilibrium with rationale expectation – definition:

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Description générée automatiquement

* Equilibrium analysis

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Description générée automatiquement

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Description générée automatiquement

Calibration

* Plan in overleaf

## Quantification

* Solve V for grid of 100 b and 100 B and 3 S with guesses B’ = and delta = 0
* From maximization of V, find b’ and update B’
* use CRRA utility with credible parameters
* Find delta\_1(s) by isolating delta\_1(s) from first derivative (between equation 21 and 22)
* I feel I need optimal c\_1 from max U to solve bargaining problem, but I feel that to solve max U I need to solve bargaining problem to get delta\_1
* What to solve first?

Solve HH problem for any default rate

Plug solutions into Nash bargaining

* Q\_0 and q\_1 from B and delta\_1(s)
* For levels c\_0 and b\_0 and low and high states, compute what happens if they fully repay, if the state negotiates, if they default
* Should I simulate both Home and Foreign countries?

Think of foreign households as a big country like the US

* Should I simulate decentralized maximization and planner maximization?
* What is the main prediction to test?
* If low bargaining power, positive debt but lower than planner
* If high bargaining power, no debt and planner would choose small debt
* Put reasonable values on GDP growth rate, bargaining power by varying it and finding the one that find the most reasonable interest rate and default rate
* Timeline calibration

Choose parameters set externally : risk aversion, discounting factor-> decision on time frame

Exogenous income parameters to find numbers on y (ex: Argentina vs US) and default rate

Think of unknown parameters: bargaining power

Aim: debt / GDP and spread

## Comment on paper

* Application? Useful for a future calibration to have a specific context to exploit (ex: Greece 2011 or 2008, but then I feel it’s a problem of overborrowing and not underborrowing or an example of a country that cannot borrow because the country has too much negotiation power maybe Argentina?)
* Assumption: people do not internalize that their debt can be renegotiated through the sovereign -> low levels of debt and default rates
* Does it make sense in practice?
* The story could go the other way around: agents know that their debt will be renegotiated -> high levels of debt and default rates
* Ex: too big to fail

## Read code (old)

* Need to understand better Markov processes: <https://intro.quantecon.org/markov_chains_I.html> done