Discussion of "Macroeconomic and financial interactions in Chile: An estimated DSGE approach" by J. García-Cicco, M. Kirchner and S. Justel

Anella Munro
Reserve Bank of New Zealand

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What the paper does

Add financial frictions to Banco Central de Chile model (MAS, Medina and Soto 2007)

- Gertler and Karadi (2011) moral hazard problem
  $\rightarrow$ collateral constraint on bank
- Bernanke Gertler and Gilchrist (1999) costly state verification
  $\rightarrow$ external finance premium on entrepreneur borrowing
- try to characterize macro and financial fluctuations in Chile

Overall comment

A considerable model building exercise:

- start with a medium-sized open economy DSGE model
- add GK and BGG frictions
  - double financial accelerator
- estimation for a range of models and data sets
- analytics
  model moments vs data moments
  impulse responses
  variance decomposition

Main conclusion

No conclusion in paper (still preliminary).

Here is my interpretation ...

- Adding the GK friction alone
  - ... helps explain investment variance, but
  - ... but similar likelihood with/without GK friction (for same dataset)
  - ... and investment too volatile with GK alone
- GK amplification appears to be offset by inv. efficiency shock or BGG risk shock in full model (little residual effect on investment).

Lack of traction in terms of model fit, in contrast to estimated models where financial frictions improve model fit eg. Christensen & Dib 2008, Christiano, Motto & Rostagno 2013, Villa 2013. Further work is needed to resolve data fit issue.

Authors' objectives are well ordered:

The main goal of this paper is to characterize macroeconomic and financial interactions in Chile using a framework that can eventually be used for policy analysis.

Assessing the empirical relevance ...is important before implementing any policy exercise.

Comments

1. Some thoughts on lack of traction in terms of model fit
2. Motivation for model structure

Entrepreneur and bank balance sheets

Entrepreneur		GK Bank	
Assets	Liabilities	Assets	Liabilities
$Q_t K_t = \chi N_t^e$	L_t	$L_t = \frac{\varrho^N}{\mu_t - \varrho_t^L} N_t$	D_t
	N_t^e		N_t

Baseline entrepreneur: leverage is fixed, $\chi = 1/(1 - \alpha^K)$
BGG entrepreneur: leverage time varying $\chi = f(X_t, \sigma_{w,t})$

Financial frictions closely connected via balance sheets.
Financial frictions closely connected to investment via law of motion for capital.

Financial frictions and model fit

Baseline Entrepreneur		GK Bank	
Assets	Liabilities	Assets	Liabilities
$Q_t K_t$	$L_t = \alpha^K Q_t K_t$	$L_t = \frac{\varrho^N}{\mu_t - \varrho_t^L} N_t$	D_t
	N_t^e		N_t

GK only bank has price-sensitive assets:
(eg marked-to-market RBMS)

- Price-sensitivity of assets leads to balance sheet volatility
- In practice, I expect that Chilean banks' assets are mainly loans to HH and firms that are not immediately marked-to-market (eg. houses revalued only on refinancing)
- Unless loans are non-performing, loan value = PV(repayments) rather than direct link to entrepreneur's balance sheet
- In data, L_t is a persistent stock variable

Financial frictions and model fit

Baseline Entrepreneur		GK Bank	
Assets	Liabilities	Assets	Liabilities
$Q_t K_t$	$L_t = \alpha^K Q_t K_t$	$L_t = \frac{\varrho^N}{\mu_t - \varrho_t^L} N_t$	D_t
	$N_t^e = (1 - \alpha^K) Q_t K_t$		N_t

This bank has no liquid assets

- Liquid assets provide a potential buffer before reducing loans
- Chilean banks have liquid assets of about 15% of assets

Financial frictions and model fit

Baseline Entrepreneur		GK Bank	
Assets	Liabilities	Assets	Liabilities
$Q_t K_t$	$L_t = \alpha^K Q_t K_t$	$L_t = \frac{\varrho^N}{\mu_t - \varrho^L_t} N_t$	D_t
	$N^e_t = (1-\alpha^K) Q_t K_t$		N_t

The bank and entrepreneur completely refinance each period
(D_t is one-period deposit; L_t is one period loan)

- That means that marginal costs affect all of funding/lending
- In practice, term deposits and debt securities $\simeq$ 50% of Chilean banks' funding (IMF2012)
  .. in model bank depositors look more like MM mutual funds
- maturity of loans to HH and firms $>$ 1 quarter

Financial frictions and model fit

Baseline Entrepreneur		GK Bank	
Assets	Liabilities	Assets	Liabilities
$Q_t K_t$	$L_t = \alpha^K Q_t K_t$	$L_t = \frac{\varrho^N}{\mu_t - \varrho_t^L} N_t$	D_t
	$N_t^e = (1 - \alpha^K) Q_t K_t$		N_t

Here the **collateral constraint always binds**.

- In practice, Chilean banks remained well capitalized through the crisis and non-performing loans remained low (IMF2012).
- buffers of capital above minimum requirement
- Sale of some Spanish bank equity in Chilean subsidiaries had minor effect IMF (2012)

Financial frictions and model fit

Putting these all together....

Are the authors trying to fit a model with too much GK amplification to data from a remarkably stable economy and financial system?

Evidence of excess volatility

Standard deviations

variable	Data	Baseline u_t	GK u_t, μ_t	GK-BGG $\mu_t, \sigma_{w,t}$	GK-BGG $u_t, \mu_t, \sigma_{w,t}$
Inv. growth	3.8	3.9	9.2	9.7	3.3
Spread	0.26		2.00	2.57	0.44

u_t: investment efficiency shock
μ_t: fraction of divertable funds (shock to bank leverage ratio)
$\sigma_{w,t}$: std. dev of entrepreneurs' capital productivity

- most direct effect of frictions is on investment (amplify effect of demand shocks on investment Christensen and Dib 2008)
- even more direct link between bank and borrower balance sheets via loans.
- does risk shock or inv. efficiency shock absorb excess volatility in full model?

Evidence of excess volatility

Variance decomposition of investment growth

variable	Baseline u_t	GK u_t, μ_t	GK-BGG $\mu_t, \sigma_{w,t}$	GK-BGG $u_t, \mu_t, \sigma_{w,t}$
Inv. Shock	0.60	0.33	–	0.86
μ_t	–	0.29	0.25	0.00
σ_{w-t}	–	–	0.54	0.01

Evidence of excess volatility

Estimated parameters

Parameter	Baseline	GK	GK-BGG	GK-BGG
	u_t	u_t, μ_t	$\mu_t, \sigma_{w,t}$	$u_t, \mu_t, \sigma_{w,t}$
γ	1.98	0.29	0.55	10.05
ρ_u	0.74	0.99		0.17
ρ_μ		0.54	0.84	0.81
ρ_{σ_w}			0.29	0.80
σ_u	0.029	0.014		0.305
σ_μ		0.026	0.087	0.004
σ_{σ_w}			1.237	0.007
$\mathfrak{L}$	-952	-952		
		-1160	-1158	-1148

Potential solutions

Reduce leverage?: Chilean banks may be observationally equivalent to a less leveraged model bank. Sometimes existing information about a parameter isn't all that useful when applied at face value. Villa 2013: bank leverage 3-5. Here 9.

BGG alone? Models with $u_t, \sigma_{w,t}$ perform relatively well.
Keep GK dormant for analysis of potential financial amplification?
(you might have to wait a long time in Chile).

Sticky adjustment to loan and deposit rates: eg. Gerali et al 2010 JMCB: bank capital is helpful in fitting the 2008 Euro area data. Gerali et al estimate leverage to be around observed value, but sticky deposit/loan rate adjustment moderates amplification (like having partially refinancing).

Variable capacity utilisation? (Villa 2013)

Motivation for model structure

One valid objective is to use financial frictions to help fit data during the crisis to reduce model misspecification.

Going a step further, it would be nice to motivate model design, with potential financial stability risks for Chile or potential policy interventions.

- Exposures that became apparent during crisis?
- Changes in prudential policy?
- Exposures of Chilean system more generally
  eg prolonged period of low world real interest rate post crisis (Mendoza)

Future work

Once the parameterisation/structure resolved, a lot of interesting policy questions...

- Macro-prudential policies such as LVR, counter-cyclical buffers that offset financial frictions.
- Interaction with monetary policy
- Policies such as LOLR to ease funding pressures, and reduce risk of ZLB associated with endogenous MP response.

Summary

Considerable modeling exercise.

- I suspect the model structure/parameterisation has too much amplification for Chilean data
- It would be nice to see structure motivated by existing/potential Chilean exposures or policies