Consumption Dynamics, Housing Collateral and Stabilisation Policy

A Way Forward for Macro-Prudential Instruments?

Effective Macroprudential Instruments - CFCM-MMF-MMPM Conference

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Overview

- 'One Club' monetary policy has not only insufficient to prevent booms and busts but may have played a role in nurturing volatility.
- The newly formed FPC at the BoE has asked for extra instruments countercyclical capital, sectoral capital, leverage ratio.
- No liquidity or LTVs, yet...
    - See Chadha and Corrado (JBus 2012) and Chadha, Corrado and Meaning (BIS WP 66) on welfare and output enhancing role of liquidity because it can reduce the volatility of the external finance premium.
- MPIs are 'untested and with little evidence' - no established models or data
- House of Commons Treasury Committee Evidence, see

http://www.publications.parliament.uk/pa/cm201213/cmselect/cmtreasy/writev/macropru/mpt13.htm

- Square 1: consider role of bank behaviour and consumption-housing dynamics.

Consumption Dynamics

- Representative agent paradigm has difficult dealing with financial frictions and asset prices
- Kiyotaki-Moore emphasize role of collateral constraints in investment cycles
- Much current focus on banking, which intermediate between borrowers and savers and endogenise the external finance premium e.g. Christiano et al, (2007), Goodfriend and McCallum (2007) and Chadha *et al* (2013) with some violation of Modigliani-Miller
- Natural to consider heterogeneous agents who are either saver or borrowers
- Use of micro-founded model allows some welfare analysis of monetary-fiscal-financial policies
- Creditor-Borrower dynamics exacerbate intra and intertemporal volatility.

Main Results

- Chadha, Corrado and Corrado (2013) explore the link between house prices, borrower consumption, LTVs and the lending rate via collateral constraints NOT wealth or common shock
- We can match the house price-consumption correlation
- Higher order consumption processes for household type c.f. aggregate consumption
- Borrower-payback lending cycle for borrower households has spillovers for savers over time
- Consider the nexus of monetary-fiscal-financial policies
- A more restrictive set of rules for bank lending over the business cycle seem to reduce welfare losses

Corollary

Not clear that our commercial bank can arrive at the best set of intermediation policies for the representative household or creditor and borrower households in the absence of a policy intervention.

$$U(\bar{c}) = \frac{\bar{c}^{1-\rho}}{1-\rho}$$

where $\bar{c} = c + c^b$ and ρ is the CRRA parameter.

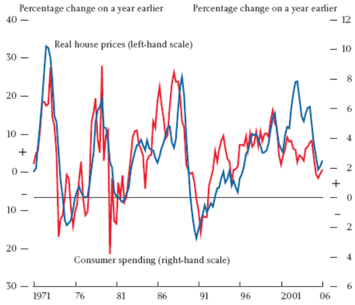
$$E\left[U(\bar{c})\right] \approx \frac{\tilde{c}^{1-\rho}}{1-\rho} - \frac{\rho}{2}\tilde{c}^{-\rho-1}\sigma_{\bar{c}}^2$$

$$\frac{\rho}{2}\left(\frac{\sigma_{\bar{c}}}{\tilde{c}}\right)^2 = \frac{\rho}{2}\frac{\sigma_c + \sigma_{c^b} + 2\sigma_{c,c^b}}{\tilde{c}^2}$$

- Obviously aggregate business cycle costs are small *if* covariances are negative
- But **what if** this covariation drives the business cycle?

Real House Prices and Consumption (UK)

Chart 1
Real house prices(a) and consumer spending



Sources: Nationwide and ONS.

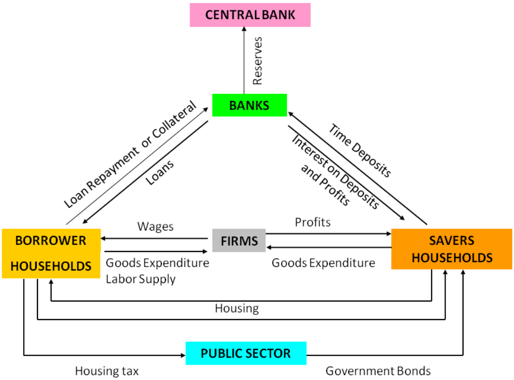
(a) Nationwide house price index deflated by the consumer expenditure deflator.

Consumption and House Values

	Borrower	Saver	All
Levels:*	0.709	-0.452	0.602
Growth:*	0.453	0.080	0.391

- LHS: BoE QB and RHS: our calculations of correlation between house prices and consumption from BHPS

Model Structure



- Stylised representation of the sectors in our model. [Many arbitrary choices!]

The Household Problem: Creditor

Creditor Household Utility

$$\max U = E_0 \sum_{t=0}^{\infty} \beta^t \log C_t + \chi_B \log B_t$$

Resource constraint

$$\begin{aligned} C_t + (\omega m_{t+1} + d_{t+1} + B_{t+1})\, \pi_{t+1} \quad = \quad & \omega m_t + R_t^D d_t + R_t^B B_t \\ & + q_t (H_t - H_{t-1}) + \Theta_t + \Pi_t - Tax_t \end{aligned}$$

Cash-in-Advance constraint

$$C_t \leq \omega m_t$$

Creditor Household Euler Equation and Bond Demand

$$\frac{1}{C_t} = \frac{\beta R_t^D}{\pi_{t+1} C_{t+1}} \qquad \frac{\chi_B}{B_t} = \left(\frac{1}{C_t} - \frac{\beta R_t^B}{\pi_{t+1} C_{t+1}} \right)$$

The Household Problem: Workers (Borrowers)

Borrower Household Utility

$$\max U^b = E_0 \sum_{t=0}^{\infty} \beta^t \left[\log C_t^b + \chi \log H_t - \frac{N_t^{1+\varsigma}}{1+\varsigma} \right]$$

Resource Constraint

$$\begin{aligned} & C_t^b + q_t(H_t - H_{t-1}) + (1-\omega)\, m_{t+1}\pi_{t+1} + \frac{R_{t-1}^L l_{t-1}}{\pi_t} \\ = \quad & l_t + (1-\omega)\, m_t + w_t N_t - \tau_h q_t H_t \end{aligned}$$

Cash-in-Advance constraint

$$C_t^b \leq (1-\omega)\, m_t + w_t N_t$$

Borrowing constraint

$$l_t \leq \kappa_t q_{t+1} \pi_{t+1} H_t$$

Borrower Consumption Plans

Borrower Consumption Goods Demand

$$\frac{\breve{\beta}}{C^b_{t+1}\pi_{t+1}} - \frac{\breve{\beta}^2 R^L_t}{C^b_{t+2}\pi_{t+2}\pi_{t+1}} = \nu_t$$

Residential Goods Demand

$$\frac{\chi}{\breve{\beta} H_t} = \frac{q_t}{C^b_{t+1}\pi_{t+1}}\left(1+\tau_h\right) - q_{t+1} J\left(\bullet\right)$$

with $J\left(\bullet\right) = \kappa_t \left(\frac{1}{C^b_{t+1}} - \frac{\breve{\beta} R^L_t}{C^b_{t+2}\pi_{t+2}}\right) + \frac{\breve{\beta}}{C^b_{t+2}\pi_{t+2}}$.is the shadow price of housing demand in terms of consumption units.

Labor Supply:

$$N^{\varsigma}_t C^b_t = w_t$$

Bank Balance Sheet

Bank lending constraint and critical threshold for house price:

$$l_{j,t} \leq \delta\kappa_t q_t H_t \quad q_t = \frac{C^b_{t+1}\pi_{t+1}}{(1+\tau_h)}\left(\frac{\chi}{\breve{\beta}} + q_{t+1}J(\bullet)\right)$$

Ex ante profits:

$$\begin{aligned}\Pi_{j,t} &= \int_0^{s(\bar{\kappa}_t)} \delta\kappa_t q_t H_t \phi(\kappa_t) d\kappa_t + \int_{s(\bar{\kappa}_t)}^{\infty} l_{j,t} R^L_{j,t} \phi(\kappa_t) d\kappa_t \\ &\quad - R^D_{j,t} d_{j,t} + R^M_t rr_{j,t}\end{aligned}$$

Bank Balance Sheet:

$$r_{j,t} + l_{j,t} = d_{j,t}$$

Price of Risk (where lambda is the failure rate priced into loans):

$$\hat{R}^L_t = \hat{R}^M_t + \frac{\lambda}{1-\delta}\left[\hat{l}_t - \delta\left(\hat{\kappa}_t + \hat{q}_t + \hat{H}_t\right)\right]$$

Macroprudential Instruments

Definition

time varying (state-contingent) requirements placed on financial intermediaries by the monetary authorities that constrain the scale or set of available tools

- E.g. capital requirements or leverage ratios or LTVs or liquidity covers
- We consider three that emerge from this model:
  1. λ - the perception of the risk of loan default - benchmark 20%
  2. δ - the fraction collateral capital that can be seized in the event of default - can be interpreted as firesale value - 0.5
  3. κ - the loan to value ratio limit to which banks can lend - 0.6
- A fourth is not considered here i.e. reserve requirements, rr, see Chadha and Corrado (2012).

Real Sector and Monetary-Fiscal Policy Rules

Phillips Curve:

$$\hat{\pi}_t = \beta\hat{\pi}_{t+1} + \eta_w \left(\hat{w}_t + \hat{X}_{\psi,t}\right) - \eta_a A_t + \eta_y \hat{Y}_t$$

where $\eta_w = \frac{1}{\varrho}$, $\eta_a = \frac{1}{\varrho\gamma}$, $\eta_y = \frac{1-\gamma}{\varrho\gamma}$.
Aggregate Supply:

$$\hat{Y}_t = \vartheta_{ya} A_t - \vartheta_{yc} \left[\hat{C}^b_{t+1} + \hat{\pi}_{t+1}\right]$$

where $\vartheta_{ya} = \frac{1+\varsigma}{1+\varsigma-\gamma}$ and $\vartheta_{yc} = \frac{\gamma}{1+\varsigma-\gamma}$.
Monetary Policy:

$$\hat{R}^M_t = \rho\hat{R}^M_{t-1} + (1-\rho)\left[\alpha_\pi E_t\hat{\pi}_t + \alpha_y\hat{y}_t\right] + \xi_t$$

Fiscal Policy:

$$\frac{B}{Y}\hat{B}_t = \frac{B}{Y}R^B\left(\hat{R}^B_{t-1} + \hat{B}_{t-1} - \hat{\pi}_t\right) + \frac{G}{Y}\hat{G}_t - \frac{T}{Y}\hat{T}_t - \frac{m}{Y}\left(\Delta\hat{m}_t + \hat{\pi}_t\right)$$

Welfare Criterion

Welfare function:

$$U_t = \frac{C}{Y}\left(\log C_t + \chi_B \log B_t\right) + \frac{C^b}{Y}\left(\log C_t^b + \chi \log H_t - \frac{N_t^{1+\varsigma}}{1+\varsigma}\right) + \frac{G}{Y}\left(\log G_t\right)$$

Second-order Taylor series expansion of U_t around steady-state (C_t, C_t^b, H_t):

$$\left(U_t - U\right) \simeq \frac{1}{2}\left[\begin{array}{c}\left(1 - \frac{1+\varsigma}{1-\gamma}\right)\hat{Y}_t^2 - \left(\frac{C}{Y}\hat{C}_t^2 + \frac{C^b}{Y}\left(\hat{C}_t^b\right)^2 + \frac{G}{Y}\hat{G}_t^2\right) \\ -\frac{C}{Y}\chi_B \hat{B}_t^2 - \frac{C^b}{Y}\chi \hat{H}_t^2 - \frac{\psi}{\eta}\hat{\pi}^2\end{array}\right] + t.i.p. + O\left(\|a\|^3\right)$$

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(U_t - U\right) = -\frac{1}{2} E_0 \sum_{t=0}^{\infty} \beta^t \left(\begin{array}{c}\varphi_Y \sigma_Y^2 + \varphi_C \sigma_C^2 + \varphi_{C^b} \sigma_{C^b}^2 + \varphi_G \sigma_G^2 \\ + \varphi_B \sigma_B^2 + \varphi_H \sigma_H^2 + \varphi_\pi \sigma_\pi^2\end{array}\right)_{t+} + t.i.p + O\left(\|a\|^3\right)$$

Solution Technique

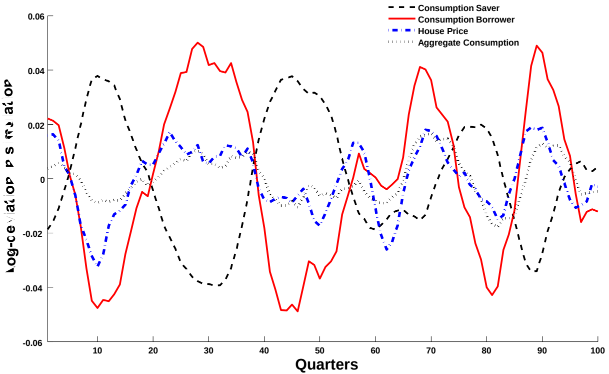
$$\mathbf{A}E_t\mathbf{y}_{t+1} = \mathbf{B}\mathbf{y}_t + \mathbf{C}\varepsilon_t \qquad \forall t \geq 0, \qquad \text{(dynamic system)}$$

$$\begin{aligned} \mathbf{y}_t &= \Pi \mathbf{s}_t \qquad \text{(state space form)} \\ \mathbf{s}_t &= \mathbf{M}\mathbf{s}_{t-1} + \mathbf{G}\mathbf{e}_t, \end{aligned}$$

$$\begin{aligned} E_t\mathbf{y}_{t+k} - E_{t-1}\mathbf{y}_{t+k} &= \Pi\left(E_t\mathbf{s}_{t+k} - E_{t-1}\mathbf{s}_{t+k}\right) \\ &= \mathbf{M}^k\mathbf{G}\mathbf{e}_t. \qquad \text{(Impulse Responses)} \end{aligned}$$

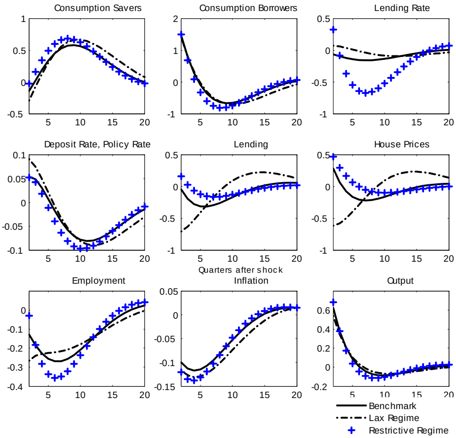
$$vec\left(\mathbf{V}_{ss}\right) = \left(\mathbf{I} - \mathbf{M} \otimes \mathbf{M}\right)^{-1} vec\left(\mathbf{G}\mathbf{V}_{ee}\mathbf{G}^T\right). \qquad \text{(Variances)}$$

$$L = \varphi_Y\sigma_Y^2 + \varphi_C\sigma_C^2 + \varphi_{C^b}\sigma_{C^b}^2 + \varphi_G\sigma_G^2 + \varphi_B\sigma_B^2 + \varphi_H\sigma_H^2 + \varphi_\pi\sigma_\pi^2 \qquad \text{(Loss function)}$$



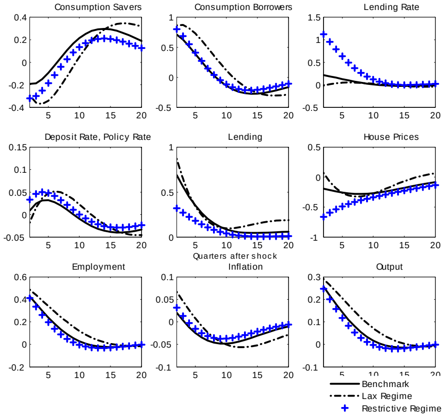
- creditors and savers are negatively correlated but average consumption is closely tied to house prices

Productivity



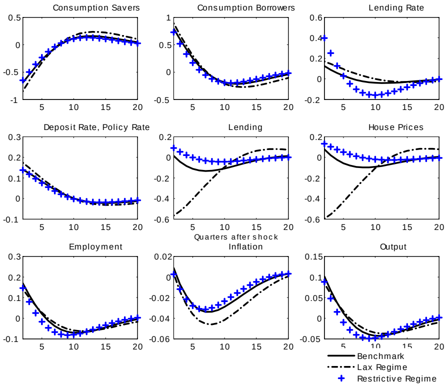
- unbundled Supply Shock - borrowers increase consumption now but pay

Loan to Value



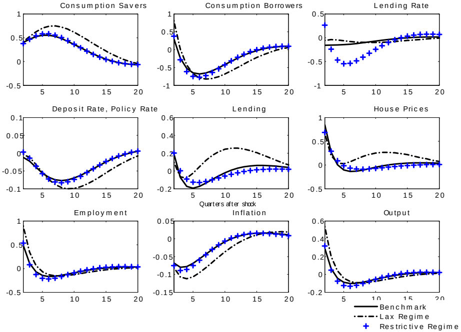
- unbundled demand shock - under lax regime is amplified

Monetary Policy



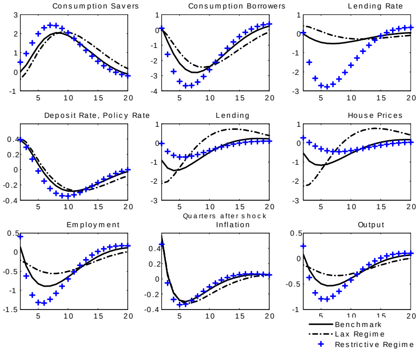
- classical monetary policy shock - attenuated by offsetting sectors

House Prices



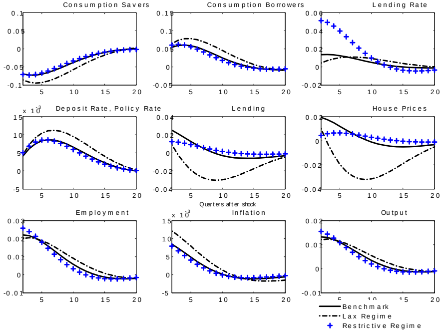
- temporary impact on output growth but not permanent impact on level so subsequent negative adjustment

Cost Push



- may want relaxed MPIs in case of cost-push shocks

Government Spending



- small output response.

Model Moments

Table 4. Moments		
	Rel stdev (Y)	Corr (Y)
	Benchmark Policy	
C^*	1.18	0.99
C	2.50	-0.61
C^b	3.81	0.90
G	0.09	0.07
I	1.91	0.40
R^L	0.71	0.43
R^M, R^D	0.59	0.24
EFP	0.69	0.24
q	2.05	0.45
π	1.16	0.01

- All shocks and standard calibration. Note procyclical EFP. High volatility of households consumption cf aggregate

Optimal Policy Parameters

TABLE 5. OPTIMAL POLICY PARAMETERS

Default Rate		Optimal Policy Parameters			
		f_y	f_T	f_m	α_q
$\lambda = 1$	Fiscal Policy	-1.02	1.03	0.10	–
	Monetary Policy	–	–	–	0.1
$\lambda = 5$	Fiscal Policy	-1.06	1.27	0.10	–
	Monetary Policy	–	–	–	0.3

- Higher perception of default imply more active fiscal policy (more countercyclical) and a greater role for monetary policy to offset house prices (collateral).

Welfare Losses

Table 6. Welfare Losses

		Loss
Lax Regime		$\lambda = 1,\ \delta = 0.9, \kappa = 0.9$
	Benchmark Policy	0.0628
	Monetary Policy	0.0586
	Fiscal Policy	0.0631
Restrictive Regime		$\lambda = 5,\ \delta = 0.2, \kappa = 0.4$
	Benchmark Policy	0.0531
	Monetary Policy	0.0529
	Fiscal Policy	0.0543

- A given monetary-fiscal nexus leads to lower losses under more restrictive MPIs

Main Results

- When we split up consumption into saver and borrower households - we clearly locate consumption cycles
- Borrowers use houses as collateral and are able to smooth shocks and experience similar levels of volatility as savers
- Savers observe standard Euler equations but also face spillovers as they fund borrower demand
- The bank perception of risk, increases consumption variance, as the EFP becomes more sensitive to the loans function
- When banks do not price risk, welfare can be enhanced by more active fiscal policy
- Monetary policy can stabilise inflation (price of money) but fiscal policy has a role in pricking excessive bank lending (quantities)
- In general MPIs seem to lead to a more efficient outcome in terms of volatility frontier.

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