Building better Central Bank Policy Models

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1. Introduction: New Keynesian DSGE and current semi-structural policy models.

- Why they fail to capture the financial accelerator and finance-real economy linkages.

- Defective for macro stress tests AND for capturing monetary transmission.

2. Real estate and the financial accelerator: tracking transmission mechanisms.

3. Modelling household-financial sector interactions.

(4. The consumption function example.)

New Keynesian Dynamic Stochastic General Equilibrium models

- *Not new*, based on outdated ideas made redundant by the asymmetric information revolution of Stiglitz, Akerlof, Spence.

- *Not Keynesian*, ignoring co-ordination failures, especially between real economy and finance, hence limited for understanding financial stability.

- *Not dynamic* enough, misleading on real world lag structures.

- *Hardly stochastic* (statistical distributions), missing both radical uncertainty (time dimension) and heterogeneity (cross-section dimension) of distributions.

- *Hardly GE*, missing most of system feedbacks.

- Rational expectations and inter-temporal optimization need reformulation when structural breaks and radical uncertainty are endemic, Hendry & Mizon, VOXEU 2014.

- Micro and macro evidence rejects representative agent, rational expectations life-cycle model of households w/o liquidity and credit constraints, e.g. Bunn et al. (2018), Cloyne & Surico (2017), Muellbauer (2010 BIS) .

- Heterogeneous agent research, e.g. Kaplan & Violante (2018), building on Deaton(1991) and Carroll (1992 etc.), has changed theoretical foundations.

- Evidence mounts for a *cash flow channel*, Jackman & Sutton (1982): in floating interest rate environments, households with large mortgage debts increase their spending more strongly when rates fall, than savers cut their spending

  - micro in La Cava et al. (2016) on Australia and Cloyne et al. (2016) for UK; macro for UK in Aron et al. (2012).

- Many (BOC, DNB, ECB, RBA) have realised the need for 'semi-structural' non-DSGE macro models.

- Cusbert & Kendall, 2018, introducing the new model say:

- "A weakness of DSGE models is that they often do not fit the data as well as other models, and the causal mechanisms do not always correspond to how economists and policymakers think the economy really works.

- In order to more easily manage (DSGE) models, they typically focus on only a few key variables, which can limit the range of situations where they are useful.

- The key strength of full-system econometric models like MARTIN is that they are flexible enough to incorporate the causal mechanisms that policymakers believe are important and fit the observable relationships in the data reasonably well. They can also be applied very broadly to model a wide range of variables."

- But….

- Impose net worth constraint as the only way asset prices, liquidity and credit shocks affect consumption, given income.

- Trivialise the role of debt relative to housing and stock market wealth.

- Ignore how shifts in credit constraints alter behaviour, so miss 'credit-driven household demand channel', Mian and Sufi, 2018.

- Lack good explanations for debt, house prices and residential construction.

- The result: cannot explain the financial accelerator and time and country variations in its impact.

- Miss major channels of monetary transmission.

Good on expectations, but fails in other ways:

- **Amplifying feedback loops** via financial system's ability to extend credit are **missing**, failing 2007 acid test of simulating consequences of house price fall, Mishkin (2007 Jackson Hole).

- **Unstable parameters**: speed of adjustment for non-durables consumption 0.18 in 2009, 0.10 in 2015, 0.16 in 2018.

- House price equation excludes credit shifts – with weak long-run solution and very slow adjustment.

- Residential investment equation has hardly any response to house prices.

- Misrepresents lags in monetary transmission.

- Though **claimed to be 'micro-founded', FRB-US is not a 'structural model'** in the Cowles Commission sense.

- "In particular, there is a need to incorporate feedback and second-round effects across sectors in order to fully capture sectoral risk transfers and enhance the spillover analysis. One example is the gap in stress tests on links between financial sector stress and credit supply conditions, the impact of these conditions on the real economy, and feedback effects on financial sector stress." Blancher et al. 2013.

- The GFC had its causes in overvalued U.S. real estate.

- 3 causes of overvaluation:

  o large macro shocks,

  o shifts in fragile fundamentals (poorly regulated, over-leveraged financial system),

  o endogenous 'overshooting dynamics' (extrapolative expectations, Geanakoplos 2010 leverage cycle)
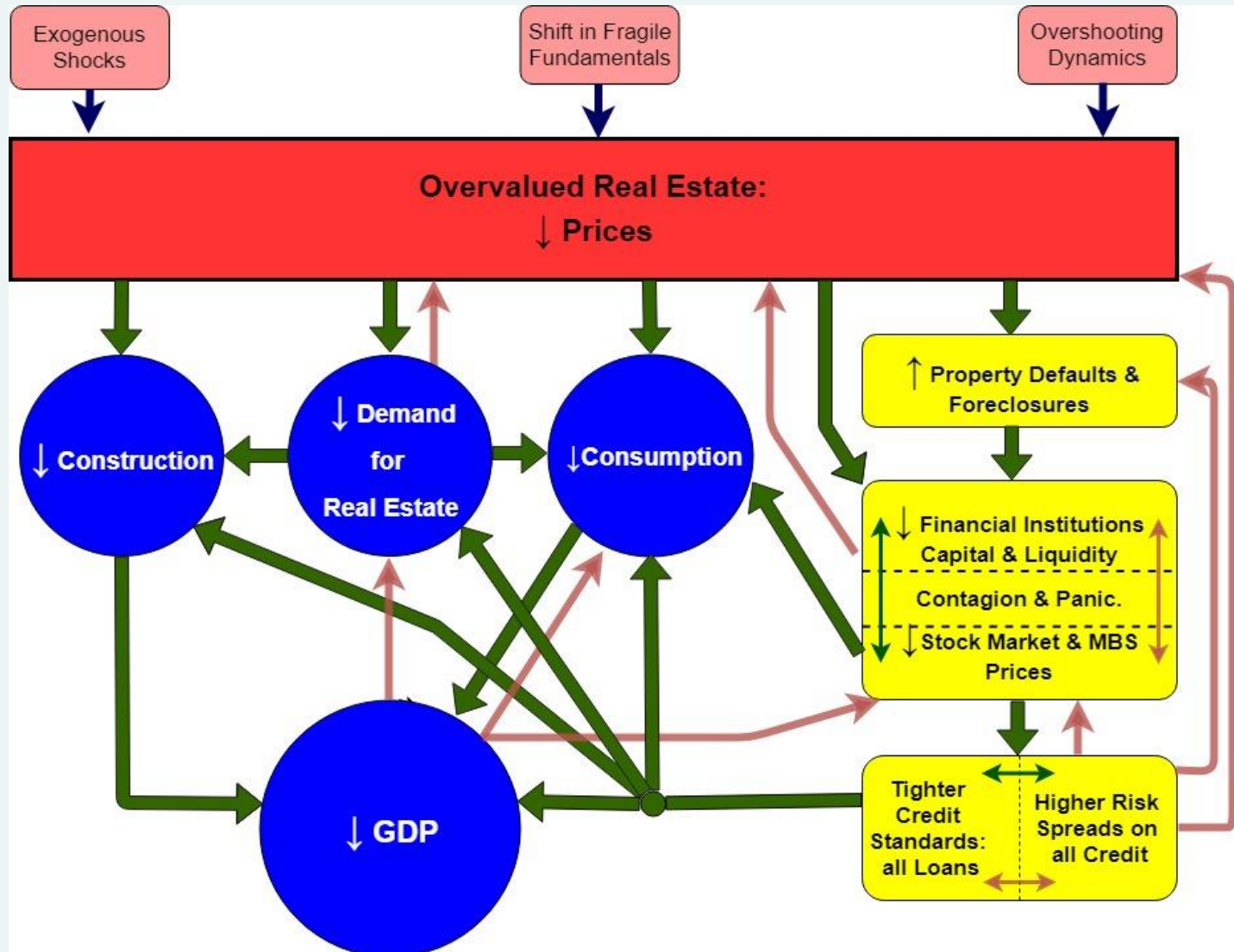
Strength of LHS transmission depends on:

- Responsiveness of construction to higher real estate prices (land-use planning system).

- Responsiveness of real estate demand to expected returns: depends on gearing, tax system and degree to which investors extrapolate recent gains.

- Gearing depends on regulation, tax incentives, perceived risk.

- Responsiveness of consumption to higher house prices: depends on access to home equity loans, ease of refinancing and severity of down-payment constraint.

Strength of RHS transmission depends on:

- Leverage, interconnectedness and liquidity in financial system.

- Quality of prudential regulation, industry structure.

- Micro research on the so-called *housing wealth effect* on consumption finds (in countries with home equity withdrawal options) this is much more of a collateral effect than a classical wealth effect:

  o Hurst & Stafford (2004), Mian et al. (2013), Browning et al. (2013), Windsor et al. (2015) and Andersen et al. (2016).

- Implies housing wealth should be treated separately from other assets, and that the effect of housing wealth on consumption is conditional on ease of access to credit and hence is time-varying.

- This has been a feature of my time-series consumption research since Muellbauer & Murphy (1989).

- Where home equity withdrawal is difficult and down-payment constraint heavy, higher house prices can reduce aggregate consumption:

  o e.g. Japan (Aron et al. 2012), Germany (Geiger et al. 2016), France (Chauvin & Muellbauer 2018).

Need consumption-portfolio-asset price-housing investment system.

- To plug consumption function with disaggregation of wealth into a macro model, we need equations for assets and debt.

- Extract credit conditions as common latent variables from same system (LIVES 'latent interactive variable equation system').

- Latent variables (e.g. splines) for mortgage and non-mortgage CCI.

- 6-equation sub-systems:

  o For consumption, unsecured debt, mortgage debt, liquid assets, house prices and 'permanent income' - still need equations for acquisition of housing and of illiquid financial assets.

  o Chauvin & Muellbauer (2018 INSEE journal) for France.

  o Geiger et al. (2016, ECB W Paper 1904) on Germany.

  o Evidence for dampening mechanisms.

- 4-equation sub-system:

  o Duca & Muellbauer (2013) for US and Duca et al. (2016 AER Proc.) confirm powerful amplifying mechanisms in US.

- Lagged ratio of French non-performing loans/total bank loans to private sector is negatively correlated with mortgage CCI: a role for bank balance sheets.
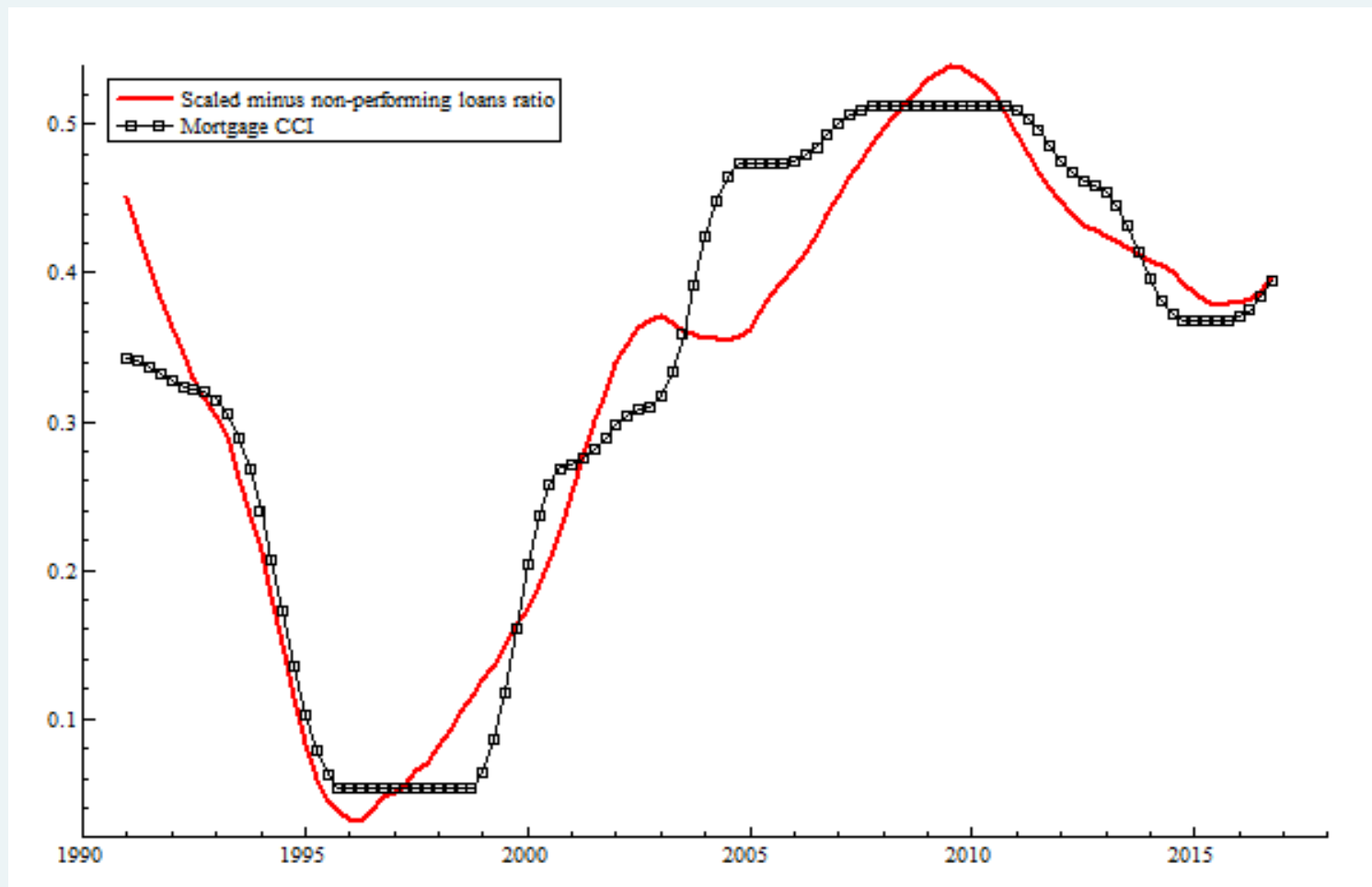
- Household sub-system needs to be incorporated in larger econometric model for full GE simulations.

- Stock-flow consistency is important aspect.

- Benefits include better models of monetary transmission and empirical estimates useful for calibrating ABM models.

- Consistency with *relevant* micro-theory is looser but better than in representative agent DSGE models.

- Need stochastic aggregation for models fitted to macro data.

- Esp'y for financial stability, need to incorporate *extensive* as well as intensive margin, e.g. % in negative equity, % unemployed.

- Mean-field approx. (Grasselli & Li, 2017) is one approach. If distributions are stable, % in tail is often closely connected with mean, e.g. Aron & Muellbauer (2016 JUE) estimate of % in negative equity in UK.

- Theory-based models make simplifying assumptions.
- We generally do not know which model is correct.
- For applied work, formulate a model which encompasses or 'nests' rival models, each being a special case (imposing parameter restrictions) of the encompassing model.
- David Hendry and co-authors proposed this approach in the 1970s, Davidson et al. (1978), see Birner (2002) for the history of thought context.
- The basic aggregate life-cycle/permanent income consumption function can be generalised:

$$\ln(c_t/y_t) = \alpha_0 + \ln(y_t^p/y_t) + \gamma A_{t-1}/y_t$$

a) Split net worth into key elements with different coefficients – e.g. to reflect notion that cash is more spendable than pension wealth, and that housing wealth differs from financial wealth according to inter-temporal choice theory.

b) Allow coefficient on *ln (yperm/y_t)* to differ from 1 - e.g. to allow for the possibility that some households are myopic.

c) Allow intercept α_0 to be time-varying: if down-payments required for mortgage and other loans fall, saving for a down-payment declines so that α_0 rises.

d) Allow time-variation in house price/income effect and/or housing collateral effect which shifts with access to home equity loans.

e) Follow equilibrium correction method since most data are I(1).

- The long-run version of the credit-augmented generalized aggregate consumption function is:

$$\ln(c_{t}/y_{t}) = \alpha_{0t} + \alpha_{1t}r_{t} + \alpha_{2}rl_{t} + \alpha_{3t}\ln(y_{t}^{p}/y_{t}) + \gamma_{1}NLA_{t-1}/y_{t} + \gamma_{2}IFA_{t-1}/y_{t}$$
$$+ \gamma_{3t}HA_{t-1}/y_{t} + \gamma_{4t}\ln(hp_{t-1}/y_{t-1}) + \gamma_{5}demog_{t}$$

- Here c is consumption, y is non-property income, r is a real interest rate for borrowing, rl is a real interest rate on deposits, y^{p}/y is the ratio of permanent income (using high discount rate) to current income, NLA is liquid assets minus debt, IFA is illiquid financial assets, hp is an index of house prices, HA is gross housing wealth, and $demog$ captures the effect of demography on consumption.

- Key coefficients can vary with CCI.

- Income uncertainty is captured by the change in the unemployment rate; short-run effects include change in nominal interest rate, weighted by debt/income and interacted with CCI.