Remarks on
"Central banker's modeling toolbox: one-for-all or all-for-one"

Raf Wouters (NBB)

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The “one-for-all” model

- The main central bank projection model should deliver:
  - structural interpretation of the state of the economy:
    - real-nominal-financial
  - competitive statistical forecasts: point and density forecasts
  - counterfactual policy simulations for monetary and (macro)prudential policy
    - evaluate objective, indicators and instruments
    - fundamental distortion that motivates policy intervention (3D-project)
    - transmission mechanism for policy interventions:
      endogenous risk and risk-taking are important ingredients

=> integrated macro-finance model

Properties of the “one-for-all” model

- General equilibrium perspective
- Appropriate dataset and stochastic structure
- Explicit modelling of expectations and risk component

⇒ Beyond the standard linear Gaussian setup

- Feasibility
- Arguments for suite of models

General equilibrium perspective

- GE approach is necessary for identifying endogenous risk channel:
  - system of simultaneous equations that contains feedback channels (towards endogenous risk) and that is driven by broad set of exogenous shocks (multidimensional)
  - financial crisis suggests that endogenous risk mechanism is quantitatively important for financial stability and for the business cycle and with an active role for constrained FI
  - efficiency and spillover of policy instruments determine the optimal design of monetary and macroprudential policy: risk taking channel of MP/UMP, real cost of higher CR

- GE perspective is necessary for identification of shocks (Chari et al 2009):
  - use broad information set to overcome identification problem (macroprudential shocks?)

- GE dynamics should be consistent with findings of partial-information early warning models:
  - allow for structural interpretation in terms of underlying shock and friction/distortion (See Brunnermeier-Palia-Sastry-Sims (2016) for such an exercise in SVAR context)

Appropriate dataset and stochastic structure

- Large dataset improves forecast and identification:
  - price and quantity information to identify D/S nature of shocks (labor, oil market)
  - relevant risk premium, financial aggregates and balance sheets (book and market prices), volatility index (indicator for quantity of risk/ time variation in second moments), credit standards (indicator for risk aversion and risk taking behavior), etc.
  - survey expectations: timely information, forecast consistent or outperforming surveys, minimize need for judgment (Slobodyan-Wouters 2016)

- Appropriate specification of the stochastic structure:
  - specification of shocks important for optimizing model fit and forecast performances: e.g. risk premium shock (SW 2007), risk shocks (CMR 2014)
  - anticipated/news shocks? (DSGE > VAR)
  - time-varying volatility in exogenous shocks

Identification of expectations and risk component in asset pricing

- Explicit testing and modelling of expectations:
  - rational expectations versus learning (AL or RS)
  - perfect information versus partial/sticky/limited processing capabilities
  - discipline expectations with survey data: anchoring of inflation expectations:

    Andrade et al 2016, Carvalho et al 2015,

- Endogenous risk modelling:
  - multidimensional nature ⇔ one risk indicator
  - various models with non-linear amplification dynamics available
  - risk pricing reflects effective risk aversion of FI as marginal investor +

    feedback is reinforced when financial constraints become binding (He Krishnamurthy 2013)

Towards non-Gaussian non-linear dynamics

==> Feasible to solve and estimate non-linear models with endogenous volatility and risk:

- Models with time varying volatility in exogenous shocks:
  - stochastic volatility (FV-RR 2007 – JP 2008) / large shocks (Curdia et al 2014, Chib et al 2014) / RS (Liu et al 2011)

- Non-linear models with occasionally binding constraints:
  - OccByn (Guerrieri-Iacoviello 2015) or anticipated shocks (LSW 2015 - LMW 2016)
  - no uncertainty/risk (=> Stochastic extended path Adjemian-Julliard 2013)

- Non-linear model with endogenous risk:
  - Regime Switching in forward looking models: exogenous (LSW2015, DelNegro et al 2014 dynamic prediction pools) or endogenous regime switching (Maih 2014)
  - Perturbation approach: third order pruning gives linear approximation of risk channel (Dewachter-Wouters 2014)
  - Projection methods (Gust et al 2016, Aruoba-Schorfheide 2014, Maliar et al 2015)

- Bayesian estimation techniques for non-linear model evaluation:
  - efficient SMC sampling techniques (Herbst-Schorfheide 2014,F-Villaverde-Schorfh.2016)
  - deterministic filters: sigma (Binning-Maih 2015), UKF (Andreasen 2013)

- Parallel processing and distributed computing

Arguments for model diversity

- model uncertainty:
  - testing and comparing alternative specification of the frictions
  - no generally accepted analytical framework for macroprudential analysis
- document stylized fact on non-linear or time-varying macro-finance relations
  - reduced form evidence on crucial variables, non-linear relations and time-varying variances and correlations
- sector detail:
  - not all sectors can be analyzed with the same detail in one model: use common core block
- heterogeneity within sectors:
  - (macro)prudential policy that is targeting for lower vulnerability and increased resilience is more interested in outcomes for most exposed banks/firms/household not necessary in the average outcome
  - aggregation issues complicate such an analysis in DSGE context