PhD Thesis:

Rescuing private DSGE

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In 2008, financial crisis hit US economy, provoking a strong and persistent slowdown in economic activity. Monetary authorities reacted bringing the interest rate at their minimum (Zero Lower Bound). After more than 5 years, the official interest rates are still there. The Great Recession lasted more than expected and the growth trend of the last five years have been substantially lower than in the previous twenty years. The employment rate and the total number of hours worked in the US economy are still below their pre-crisis level. The long period of low interest rates and disappointing recovery pushed many economists to mention the possibility that major developed economies had slipped into a secular stagnation trap. Though last quarters observations show sign of a stronger recovery on both side of the Atlantic, economic growth trends and macroeconomic performance looks still very far in terms of stability form the Great Moderation era.

DSGE models have been developed during the Great Moderation years. The main use has been devoted to study the fluctuations happening around an average exogenous growth trend.

The policy makers goal has been to minimize the fluctuations. The recent crisis showed the inadequacy of the pre-crisis state-of-the-art DSGE models in several dimensions:

- Concerning the fluctuations, DSGE models were not able to explain the Great Recession without recurring to the occurrence of a very unlikely shock. To overcome this

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inadequacy, DSGE models have been complemented with financial sectors, financial frictions or brand-new type of shocks (i.e. Marginal Efficiency of Investment shock (Justiniano et al. (2011)).

- Concerning the solution methods, the Great Recession stressed the role of non linearities inside the economy (stochastic volatility, occasionally binding constraint, the zero lower bound on the interest rate). This issue has been addressed by the development of a series of non-linear solution techniques. On the same front, non-linear estimation techniques became more and more important. Still, the curse of dimensionality seems to limit the diffusion of the non-linear solution and estimation techniques, especially to handle medium-scale DSGE models, for which fully non-linear methods are impractical.

- Concerning the mean: as growth trend seems affected by the Great Recession, DSGE models started to incorporate knowledge sector, $R\&D$ sectors and so forth to model endogenous growth in the DSGE models (Comin and Gertler, Bianchi (2014), Guerron Quintana (2014)).

The goal of these thesis is to fix some open issues related to the use of empirical DSGE models after the end of the Great Moderation.

In the first chapter, a simple set of techniques going under the name of Approximate Bayesian Computation (ABC) is proposed to perform non-linear DSGE estimation. In fact, non-linear model estimation is generally perceived as impractical and computationally burdensome. This perception limited the diffusion on non-linear models estimation.

ABC is a set of Bayesian techniques based on moments matching: moments are obtained simulating the model conditional on draws from the prior distribution . An accept-reject criterion is applied on the simulations and an approximate posterior distribution is obtained by the accepted draws.

A series of techniques are presented (ABC-regression, ABC-MCMC, ABC-SMC). To assess their small sample performance, Montecarlo experiments are run on AR(1) processes

and on a RBC model showing that ABC estimators outperform the Limited Information Method (Kim, 2002), a GMM-style estimator.

In the remainder, the estimation of a new-Keynesian model with a zero lower bound on the interest rate is performed. Non-gaussian moments are exploited in the estimation procedure.

In the second chapter of the thesis, I try to explore the relations between growth trend of the economies and business cycles fluctuations, focusing on the role played by housing medium term fluctuations.

In many economies' recent experiences, housing market volatile fluctuations have been blamed as responsible for driving or at least influencing the trend at which economies were growing (US, Japan and Spain to mention a few).

The second chapter inquires on the possibility that houses, playing the double role of durable consumption good and collateral, can affect the growth trend at which an economy grows.

This is done through the study of a medium scale DSGE model with heterogeneous agents and endogenous growth where housing prices fluctuations influence the households' investment in technology, with a final effect on the growth trend.

It turns out that against the general wisdom, an exogenous increase in the appetite for housing generates a temporary decline in the growth trend. Conversely, the temporary relaxation of the borrowing constraints for debtors is able to generate the positive co-movement between housing prices and growth trend observed in the last twenty years across the developed economies. The more indebted the economy, the larger the degree of exposure to this type of fluctuations will be.