DSGE

Examination

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- Write an essay covering the Smets-Wouters (2003) model and a topic of choice (see next slides)
- Submit your essay until the **20.03.17** in digital form including all Matlab/Dynare files required to replicate your results
- For all questions contact: *Fabian.Goessling@uni-muenster.de*

- Derive the Smets-Wouters (2003) model:
  - formalize the model through a maximization problem
  - derive the relevant first-order condition(s)
  - (log)-linearize your system of equations
  - provide an economic intuition
- Implement the Smets/Wouters (2003) model in Dynare (use the model without cost-push shocks in order to derive the output gap)
- State model results (policy functions) for a specific calibration and provide an economic interpretation

- Topic 1: Output Gap
  - Derive the frictionless version of the Smets/Wouters (2003) model (no sticky prices/wages, no cost-push shocks) analytically.
  - Use the frictionless system (log-linearized) to derive the output-gap and compare the model results to the original version.
  - Give economic interpretation of (selected) differences in the policy functions.
  - Simulate both models and apply Bayesian methods to compare the posterior model probabilities.

- Topic 2: Full Information Estimation
  - Describe in detail how Likelihood and Bayesian estimation can be applied to the Smets/Wouters (2003) model.
  - Highlight differences/similarities and possible shortcomings of both methods.
  - Estimate the model using publicly available (i.e. Euro area) data.
  - Give extensive interpretation and reasoning.

- Topic 3: Exogenous Growth & Recursive Preferences
  - Derive the equilibrium conditions of the Long-run risks model of Croce (2014).
  - Stationarize the model equations by de-trending with the stochastic trend variable.
  - Comment on the necessarity of a stationarized model for the perturbation solution method.
  - Implement the stationarized model in Dynare. Comment on the implementation of recursive preferences.
  - Compare the effect of a first, second and third order solution on chosen model variables.

- Topic 4: Impulse Responses
  - Choose economically important parameters of the Smets/Wouters (2003) model (provide your reasoning) and examine the sensitivity of the model moments.
  - Analyse the Impulse-Response-Functions (IRF) and provide economic interpretation of their sensitivity.
  - Calibrate your model using different sets of moments and simulated data.
  - Provide interpretation of emerging differences.

- Topic 5: Government
  - Formalize the role of a government in the Smets/Wouters (2003) model with an objective function and a budget constraint.
  - Derive a fiscal policy rule.
  - Highlight whether and/or under which condition this rule is ideal.
  - Apply Bayesian estimation techniques either on simulated or historical data.

- Topic 6: Filtering
  - Explain why filtering is necessary for the estimation of DSGE models.
  - Derive the Kalman filtering equations step by step. Explain why the Kalman filter is sufficient for the Smets/Wouters model.
  - Use different sets of observable variables in the filtering step (simulated data) and comment on the results.
  - Compare the obtained likelihood cuts and explain possible differences.

- Topic 7: Financial Markets
  - Add a finanical market to the Smets/Wouters (2003) model.
  - In particular consider stocks and bonds.
  - Highlight differences to the original model.
  - Apply Bayesian estimation techniques either on simulated or historical data.

- Topic 8: Monetary Policy
  - Extend the Smets/Wouters (2003) model by introducing a time-inconsistency mechanism of monetary policy.
  - Explain the implications and provide economic intuition.
  - Apply Bayesian estimation techniques either on simulated or historical data.

- Topic 9: Stochastic Volatility & Recursive Preferences
  - Derive the equilibrium conditions of the stochastic growth model with stochastic volatility of Caldara et al. (2012)
  - Derive the analytic steady-state.
  - Implement the model in Dynare. Comment on the implementation of recursive preferences.
  - Solve the model using a perturbation in a) *levels* and b) *logs*. Compare the resulting policy functions.
  - Apply Bayesian estimation techniques either on simulated or historical data.

- Topic 10: Forecasting
  - Use historical data to calibrate the Smets/Wouters (2003) model.
  - Simulate the model and save the trajectories.
  - Use the model/observation equations to forecast the distributions of chosen variables/growth rates.
  - Asses the sensitivity of the forecast distributions w.r.t a chosen set of parameters.
  - Compare your forecast with a (naive) benchmark e.g. the last observed variable/growth rate.
  - Discuss possible improvements.

The grade will reflect

- compliance of the formal requirements (use LaTeX!),
- economic interpretation,
- methodological transparency,
- computational implementation.