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## PRESS RELEASE

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### **Shocks and frictions in US business cycles: a Bayesian DSGE approach**

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Over the past decade, a new generation of small-scale monetary micro-founded business cycle models with sticky prices and wages (the New Keynesian or New Neoclassical Synthesis (NNS) models) has become popular in monetary policy analysis. This paper estimates an extended version of these models on US data covering the period 1966:1-2004:4 and using a Bayesian estimation methodology. The estimated model contains many shocks and frictions. It features sticky nominal price and wage setting that allow for backward inflation indexation, habit formation in consumption and investment adjustment costs that create hump-shaped responses of aggregate demand, and variable capital utilisation and fixed costs in production. The stochastic dynamics is driven by seven orthogonal structural shocks: total factor productivity shocks, risk premium shocks, investment-specific technology shocks, wage mark-up shocks, price mark-up shocks, exogenous spending shocks and monetary policy shocks.

The objectives of the paper are threefold. First, as the NNS models have become the standard workhorse for monetary policy analysis, it is important to verify whether they can explain the main features of the US macro data: real GDP, hours worked, consumption, investment, real wages, prices and the short-term nominal interest rate. We show that the NNS model has a fit comparable to that of Bayesian VAR models. These results are confirmed by a simple out-of-sample forecasting exercise. The restrictions implied by the NNS model lead to an improvement of the forecasting performance compared to standard VARs, in particular, at medium-term horizons. Bayesian NNS models therefore combine a sound, microfounded structure suitable for policy analysis with a good probabilistic description of the observed data and good forecasting performance.

Second, the introduction of a large number of frictions raises the question whether each of those frictions are really necessary to describe the seven data series. The Bayesian estimation methodology provides a natural framework for testing which frictions are empirically important by comparing the marginal likelihood of the various models. We find that price and wage stickiness are found to be equally important. Indexation, on the other hand, is relatively unimportant in both goods and labour markets. While all the real frictions help in reducing the prediction errors of the NNS model, empirically the most important are the investment adjustment costs. In the presence of wage stickiness, the introduction of variable capacity utilisation is less important.

Finally, we use the estimated NNS model to address a number of key business cycle issues. First, what are the main driving forces of output developments in the US? We find that “demand” shocks such as the risk premium, exogenous spending and investment-specific technology shocks explain a significant fraction of the short-run forecast variance in output. However, wage mark-up (or labour supply) and to a lesser extent productivity shocks explain most of its variation in the medium to long run. Second, do positive productivity shocks increase or reduce employment. We find that they have a significant short run negative impact on hours worked. This is the case even in the economy with flexible prices and wages because of the slow adjustment of the two demand components following a positive productivity shock. Third, inflation developments are mostly driven by the price mark-up shocks in the short run and the wage mark-up shocks in the long run. Nevertheless, the model is able to capture the cross correlation between output and inflation at business cycle frequencies. Finally, in order to investigate the stability of the results, we estimate the NNS model for two subsamples: the “Great Inflation” period from 1966:2 to 1979:2 and the “Great Moderation” period from 1984:1-2004:4. We find that most of the structural parameters are stable over those two periods. The biggest difference concerns the variances of the structural shocks. In particular, the standard deviations of the productivity, monetary policy and price mark-up shocks seem to have fallen in the second sub sample, explaining the fall in the volatility of output growth and inflation in this period. We also detect a fall in the monetary policy response to output developments in the second sub-period.