Essays on Technology and Forecasting

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1 The Production Frontier and Macro Dynamics (job market paper)

The macroeconomic response to a productivity shock and its implications for model specification is an ongoing debate. I consider a frictionless DSGE model that is standard in most respects, but which uses an aggregate production possibility frontier (PPF) that decomposes aggregate productivity into sector- and factor-biased components. I show that this extension helps the model of production fit U.S. productivity and relative price data. The model predicts that the macro impact of a productivity shock depends on how technology interacts with final goods and factors of production. In response to a sector-biased productivity shock, the macro economy exhibits contractionary effects similar to those described in Galí (1999) and Basu et al. (2009), while in response to a factor-biased shock, the model predicts expansionary macro responses consistent with the off-the-shelf RBC model. I find that the confidence bands for the impact effects of productivity shocks include both New Keynesian and RBC-type responses. Thus, it is difficult to distinguish between these classes of models based solely on the impact effect of a productivity shock

2 Macro Forecasting with Large Datasets: Trimming Predictors and Forecast Combination (with Rodrigo Sekkel)

A longstanding finding in the forecasting literature is that averaging forecasts from different models improves upon forecasts based on a single model, with equal weight averaging working particularly well. We show that the simple average approach can be improved by trimming the set of potential models prior to forecast combination. We compare different trimming schemes and propose a new version based on the Model Confidence Set (MCS) (Hansen et al. (2011)). Applying our analysis to U.S. macroeconomic aggregates, we find significant gains in out-of-sample forecast accuracy from our proposed trimming method. We argue that parameter estimation error in small samples provides an explanation for these gains. Finally, we show that once the worst models are trimmed, there are minimal gains from using approaches like BMA that assign different weights to the remaining forecasts.

3 Semiconductors and U.S. Economic Growth

Semiconductor technology is widely credited with driving the evolution of information technology, yet the device's use as an intermediate input by many sectors of the economy makes its economic impact difficult to quantify. I use the prototype NAICS-based industry production account data of Jorgenson et al. (2011) and the weighting scheme of Domar (1961) to measure the direct impact of semiconductor production on aggregate growth and productivity, and the contribution of semiconductors via industries that use these devices as intermediate input. I find that over the 1960-2007 period innovation in the Semiconductor industry grew close to 9% per year, twenty five times the innovation growth rate for the economy as a whole, and accounted for close to 30% of aggregate economic innovation. By sector, semiconductor use accounted for 37% of the growth in labor productivity in the Communications Equipment industry, 25% of the growth of the Other Electronic Products industry, 14% of Educational Services, and 9% of labor productivity growth in the Computer and Peripheral Equipment industry for the period. More recent data on prices through 2009 suggests that innovation in semiconductors remained strong in 2008, but slipped a bit in 2009 amidst the financial crisis.