News Shocks and the Term Structure of Interest Rates: Reply

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This reply to Cascaldi-Garcia’s (2017) comment argues that by using the original code of Kurmann and Otrok (2013) with new data on utilization-adjusted TFP, Cascaldi-Garcia (2017) confounds positive and negative news shocks. With a small modification to the code – how a news shock is signed as positive – we obtain news shock responses consistent with Sims (2016) and Kurmann and Sims (2017) and largely reestablish the results of Kurmann and Otrok (2013).

Over the past decade, a burgeoning literature has emerged investigating the role of news shocks about future productivity for business cycle fluctuations. Much of this literature has relied on utilization-adjusted Total Factor Productivity (TFP) estimated by Fernald (2014) as the measure of productivity. Fernald periodically revises this measure based on new data and methodological refinements. Sims (2016) and Kurmann and Sims (2017) document that a recent revision, which concerns the estimation of utilization, has led to large changes in the cyclical behavior of Fernald’s measure that can materially affect the macroeconomic effects of news shocks. Cascaldi-Garcia (2017) uses the replication code of Kurmann and Otrok (2013) with a revised vintage of Fernald’s measure and reports that the macroeconomic effects of news shocks essentially disappear. As a result, the close relation between news shocks and slope shocks to the term structure of interest rates uncovered by Kurmann and Otrok (2013) becomes much weaker.

In this reply, we argue that one should not simply run the code of Kurmann and Otrok (2013) with the new data, but that the new data naturally alter the way in which one wants to distinguish positive from negative news shocks. We show that the results by Cascaldi-Garcia (2017) arise because when using revised vintages of Fernald’s measure, the code of Kurmann and Otrok (2013) confounds positive and negative news shocks. With a small modification to the code – how a news shock is signed as positive – we obtain news shock responses consistent with Sims (2016) and Kurmann and Sims (2017) and largely reestablish the results of Kurmann and Otrok (2013).

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1 Sims (2016) has been subsumed into the larger paper by Kurmann and Sims (2017) that provides additional analysis on the revisions in Fernald’s adjusted TFP series and proposes an alternative identification of news shocks that is robust to these revisions.
I. Identification of Slope Shocks and News Shocks

The identification of slope shocks and news shocks in Kurmann and Otrok (2013) is based on a vector autoregression (VAR) that combines measures of the term structure slope and productivity with prominent macro aggregates. Applying the methodology developed by Uhlig (2003), the slope shock is identified as the innovation associated with the maximum forecast error variance share (MFEV) of the spread between long- and short-term treasury yields over a given forecast horizon. Following Barsky and Sims (2011), the news shock is identified as the innovation that accounts for the MFEV of productivity over a given forecast horizon, but with the additional restriction that the innovation is orthogonal to current productivity.\(^2\)

An important yet little discussed issue with MFEV-based identification is that because the forecast error variance is a squared object, an additional rotation condition is needed to sign the shock. This is particularly important when drawing from the joint distribution of VAR coefficients to compute confidence or coverage intervals for impulse responses.\(^3\)

For the slope shock, Kurmann and Otrok (2013) implement this rotation condition by signing the shock as positive if the impact response of the slope is non-negative. Since the impact response of the slope is highly significant, this condition is natural. For the news shock, implementing the rotation condition is not as straightforward since the impact response of productivity is zero by assumption. Kurmann and Otrok (2013) sign a news shock as positive if it has a non-negative effect on productivity five quarters after impact. For the vintage of Fernald’s measure that Kurmann and Otrok (2013) use, the choice of how many quarters after the shock to sign the effect of news on productivity does not matter since adjusted TFP starts responding very quickly after the shock. Indeed, all the results in their paper are robust to whether the rotation condition is imposed at a short or a long horizon. More generally, however, one needs to be careful with imposing the rotation condition at too short of a horizon as this risks confounding positive and negative news shocks if the response of productivity to a news shock is delayed – as is argued for example by Beaudry and Portier (2006) – or if the response is surrounded by substantial uncertainty. In what follows, we therefore impose the rotation condition at 40 quarters, although none of the results would change if we imposed the rotation condition at 20 quarters, 60 quarters, or 80 quarters.\(^4\)

A second issue for news shock identification concerns the weight one attributes to the different forecast horizons in the MFEV objective. Following Barsky and Sims (2011), Kurmann and Otrok (2013) apply equal weight to all forecast horizons between 0 and 40 quarters. One can argue, however, that including longer forecast horizons, say up to 80 quarters, is preferable because new technologies can take a long time to diffuse.

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\(^2\)A complete description of the two identifications can be found in Kurmann and Otrok (2013).

\(^3\)This rotation condition is fundamentally different from “sign restrictions” that have become popular in the structural VAR literature. Sign restrictions refer to set identification (e.g. a shock cannot have a negative effect on some variable) whereas the rotation condition here simply signs an exactly identified shock as positive or negative.

\(^4\)One might be concerned that the longer the horizon at which the rotation condition is imposed, the more the news shock is biased towards exerting a permanent effect on productivity. This can be easily tested. If the news shock had only a transitory effect, then the lower bound of the coverage interval of the impulse response of productivity would approach zero at longer horizons. For the results presented below, this is clearly not the case.
Concurrently, as argued by Kurmann and Sims (2017), the sensitivity of Fernald’s adjusted TFP series to a seemingly innocuous revision in utilization suggests that the series is subject to potentially important cyclical measurement issues. In this case, identifying news shocks by imposing orthogonality with current productivity and giving weight to short forecast horizons in the MFEV objective risks confounding news shocks with other business cycle shocks.\(^5\) We return to both of these concerns below.

II. Results

We report results for the same baseline VAR as in Kurmann and Otrok (2013) except that we impose the rotation condition on the news shock at the 40 quarter horizon instead of the five quarter horizon. As in Cascaldi-Garcia (2017), we measure productivity both with the 2007 vintage of adjusted TFP originally used in Kurmann and Otrok (2013) and a vintage published after the revision in utilization.\(^6\) All the other data series are as in Kurmann and Otrok (2013) except that consumption is adjusted for population growth.\(^7\) As discussed further below, this adjustment is sensible because it avoids introducing additional trends that could worsen the approximation the VAR provides of the true dynamics.

Figure 1 shows the impulse responses to a news shock. Here and below, black solid lines refer to median responses and grey bands to corresponding 16 to 84 percent coverage intervals implied by the joint posterior distribution of VAR coefficients estimated with the 2016 vintage of adjusted TFP. Red dash-dotted lines refer to median responses and red dashed lines to corresponding 16 to 84 percent coverage intervals for the VAR estimated with the 2007 vintage.

The impulse responses based on the 2007 vintage of adjusted TFP look very similar to the ones reported in Kurmann and Otrok (2013). The median impulse responses based on the 2016 vintage of adjusted TFP match these results quite closely although the coverage intervals are somewhat larger. This contrasts with Figure 2 of Cascaldi-Garcia (2017) where the median impulse responses based on the 2016 vintage are much closer to zero and the coverage intervals are very wide.

The stark difference in results is explained by the fact that we impose the rotation condition at the 40 quarter horizon whereas Cascaldi-Garcia (2017) – by applying the replication code of Kurmann and Otrok (2013) without any modification – imposes the rotation condition at the five quarter horizon. This does not matter when the VAR is estimated with the 2007 vintage of adjusted TFP since, as shown in Figure 1, adjusted TFP responds significantly one quarter after the shock hits. When the VAR is estimated

\(^5\)For the slope shock, these concerns do not apply since measurement is not an issue and the slope is stationary, reverting to its unconditional mean relatively quickly. Hence, including forecast horizons beyond 40 quarters in the slope identification does not affect any of the results.

\(^6\)The revision in utilization occurred in March 2013. We use the March 2016 vintage whereas Cascaldi-Garcia (2017) uses a 2015 vintage. Results are very close.

\(^7\)Consumption is measured as the log of real chain-weighted total personal consumption expenditures adjusted for population growth. Inflation is measured as the growth rate of the GDP deflator. The slope is measured as the spread between the 5-year zero coupon yield and the Federal Funds rate. The long bond yield is computed as the sum of the spread and the Federal Funds rate. The VAR is estimated for the 1959:2-2005:2 sample as in Kurmann and Otrok (2013), although very similar results would obtain if the sample was extended to more recent data.
Figure 1. Impulse responses to a news shock for 2007 and 2016 vintage of adjusted TFP

Note: The news shock is identified as in Barsky and Sims (2011). See text for details. Solid black lines are the posterior median estimates for the VAR estimated with the 2016 vintage of adjusted TFP. The grey bands correspond to the 16 to 84 percent posterior coverage intervals. The red dash-dotted lines are the posterior median estimates for the system estimated with the 2007 vintage of adjusted TFP. The red dashed lines correspond to the 16 to 84 percent posterior coverage intervals.
with the 2016 vintage of adjusted TFP, however, the response of adjusted TFP is delayed and remains insignificant for almost 10 quarters. By imposing the rotation condition at five quarters, Cascaldi-Garcia (2017) therefore confounds positive and negative news shocks. This explains the muted median impulse responses and the very wide coverage intervals in Figure 2 of his comment.

For the slope shock, using the revised vintage of adjusted TFP leaves the impulse responses essentially unchanged, except for adjusted TFP which increases on impact, then returns temporarily towards its pre-shock level, before starting a gradual ascent towards a permanently higher level. These results are very similar to the ones reported in Figure 3 of Cascaldi-Garcia (2017) and are therefore relegated to the online appendix.

The impulse responses to the news shock and the slope shock based on the 2016 vintage of adjusted TFP line up quite closely and certainly much better than is reported in Cascaldi-Garcia (2017). This is reflected in a correlation coefficient between the two shocks of 0.59. While this is lower than the 0.86 reported in Kurmann and Otrok (2013), the relation between the two shocks thus remains substantial. Moreover, as reported in the appendix, when we apply the alternative identification of news shocks by Kurmann and Sims (2017) that does not impose contemporaneous orthogonality with productivity and applies the MFEV objective at the 80 quarter horizon, the reaction of the different variables to a news shock and a slope shock overlap even more closely, including for adjusted TFP, and the correlation between the two shocks increases to 0.73.\(^8\) These results confirm the conclusion of Kurmann and Otrok (2013) that movements in the slope contain substantial information about expected future productivity growth.

Next, we analyze the robustness of our results to not adjusting consumption expenditures by population. Figure 2 shows the impulse responses to a news shock. The median impulse responses of the different variables move again quite closely together; and as before, the initial response of adjusted TFP is more muted and insignificant from zero for more than 5 quarters. Hence, the conclusion from above remains the same: by applying the rotation condition at the 5 quarter horizon, Cascaldi-Garcia (2017) confounds positive and negative news shocks.

One interesting difference between the results in Figure 1 and Figure 2 is that the coverage intervals of the impulse responses based on the 2016 vintage are substantially wider when consumption is not adjusted for population. This suggests that the combination of using the 2016 vintage of adjusted TFP and introducing an additional trend by not correcting consumption for population growth considerably worsens the approximation that the baseline VAR provides with respect to long-run shocks. One way to assess this is by extending the VAR with other real aggregates that include the same population growth trend. More generally, it is well-known that the type of low-dimensional VARs used above can generate inaccurate answers when the economy is complicated even in relatively simple ways.\(^9\) We therefore check the robustness of the above results with

\(^8\)The alternative identification of Kurmann and Sims (2017) is robust across the different vintages of Fernald’s adjusted TFP series. The close correspondence between slope and news shocks is therefore independent of the vintage of TFP used. Similar results obtain if we apply the MFEV objective of the Barsky-Sims (2011) identification over the 0 to 80 quarter horizon instead of the 0-40 horizon.

\(^9\)See Faust and Leeper (1997) for an early example of this point; and Christiano, Eichenbaum and Vigfusson
FIGURE 2. IMPULSE RESPONSES TO A NEWS SHOCK FOR 2007 AND 2016 VINTAGE OF ADJUSTED TFP WHEN CONSUMPTION IS NOT POPULATION-ADJUSTED

Note: The news shock is identified as in Barsky and Sims (2011). See text for details. Solid black lines are the posterior median estimates for the VAR estimated with the 2016 vintage of adjusted TFP. The grey bands correspond to the 16 to 84 percent posterior coverage intervals. The red dash-dotted lines are the posterior median estimates for the system estimated with the 2007 vintage of adjusted TFP. The red dashed lines correspond to the 16 to 84 percent posterior coverage intervals.
larger VARs, including the one reported in Kurmann and Otrok (2013) that augments the baseline VAR with output, investment, and the stock price index. As reported in the appendix, we find that the impulse responses for this larger VAR feature tighter coverage intervals and look similar to the ones reported in Kurmann and Otrok (2013), independent of the vintage of adjusted TFP used, and independent of whether the real aggregates are adjusted for population or not.10 This confirms that using a larger VAR can help alleviate potential approximation issues that arise due to non-stationarity.

III. Conclusion

We conclude that the main results of Kurmann and Otrok (2013) are largely robust to revisions in Fernald’s adjusted TFP series: slope shocks are closely associated with news about future productivity growth and generate similar dynamics in real macro aggregates, inflation, and the Federal Funds rate as a news shock identified as in Barsky and Sims (2011). This being said, the large revisions in Fernald’s estimated utilization adjustment suggest that for all its improvements over a traditional Solow residual, Fernald’s measure of productivity may be confounded by systematic measurement error. In this case, the identifying assumption that news shocks are orthogonal to current TFP, as is commonly assumed in the literature including by Barsky and Sims (2011), is not appropriate and may confound news shock with other business cycle shocks.11 This important issue is addressed in Kurmann and Sims (2017). When we apply their alternative identification that is robust to the revisions in Fernald’s adjusted TFP series, we find that the relation between slope shocks and news shocks is further strengthened.

REFERENCES


(2006) for a more recent treatment of this issue. Adding variables to the information set also mitigates the invertibility/fundamentalness problem highlighted in Fernandez-Villaverde et al. (2007) or Leeper, Walker and Yang (2013).

10 The correlation between the news shock and the slope shock for this larger VAR based on the 2016 vintage of TFP and consumption not adjusted for population is 0.48. For the baseline VAR used in Figure 2, the correlation between the news shock and the slope shock is 0.40.

11 More generally, even if there are no endogeneity issues with Fernald’s TFP series, it is not clear why news shocks should be unrelated to current productivity. Or as Basu, Barsky and Lee (2014) put it: “It is possible that news about future productivity arrives along with innovations in productivity today.”


