

# Online Appendix for “Impulse response analysis for structural dynamic models with nonlinear regressors”

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# 1 Online appendix

## 1.1 DGP for dynamic misspecification simulations

To examine how robust the ranking of the LP and plug-in estimators are to dynamic misspecification, we consider a variation of DGP 1 (DGP 1'). This DGP is representative of an empirical model such as the one a practitioner could use to study the effect of a shock on quarterly GDP growth. The DGP is given by

$$\begin{cases} x_t = \varepsilon_{1t}, \\ y_t = 0.256y_{t-1} + 0.146y_{t-2} - 0.052y_{t-3} + 0.027y_{t-4} + 0.061y_{t-5} + 0.069y_{t-6} \\ + 0.215x_t + 0.12x_{t-1} + 0.139x_{t-2} + 0.179x_{t-3} - 0.068x_{t-4} + 0.037x_{t-5} - 0.103x_{t-6} \\ - 0.297 \max(0, x_t) - 0.331 \max(0, x_{t-1}) - 0.157 \max(0, x_{t-2}) - 0.257 \max(0, x_{t-3}) \\ - 0.027 \max(0, x_{t-4}) - 0.098 \max(0, x_{t-5}) + 0.114 \max(0, x_{t-6}) + \varepsilon_{2t}. \end{cases} \quad \text{thank} \quad (1)$$

The intercept has been normalized to 0 in population and the population innovations are Gaussian with unit variance.

## 1.2 Additional simulation results

This section reports simulation results for the baseline DGPs where we vary the sample size ( $T = 120, 240, 480$ ), the size and sign of the shock ( $\delta = 1, -1, 2, -2$ ). DGP 1 corresponds to the case where  $x_t$  is restricted to an observed i.i.d. shock

$$\begin{cases} x_t = \varepsilon_{1t}, \\ y_t = 0.5y_{t-1} + 0.5x_t + 0.3x_{t-1} - 0.4 \max(0, x_t) + 0.3 \max(0, x_{t-1}) + \varepsilon_{2t}, \end{cases} \quad (2)$$

In DGP 2,  $x_t$  instead follows an exogenous AR(1) process:

$$\begin{cases} x_t = 0.5x_{t-1} + \varepsilon_{1t}, \\ y_t = 0.5y_{t-1} + 0.5x_t + 0.3x_{t-1} - 0.4 \max(0, x_t) + 0.3 \max(0, x_{t-1}) + \varepsilon_{2t}, \end{cases} \quad (3)$$

DGP 3 corresponds to the unrestricted model:

$$\begin{cases} x_t = 0.3x_{t-1} + 0.2y_{t-1} + \varepsilon_{1t}, \\ y_t = 0.5y_{t-1} + 0.5x_t + 0.3x_{t-1} - 0.4 \max(0, x_t) + 0.2 \max(0, x_{t-1}) + \varepsilon_{2t} \end{cases} \quad (4)$$

In all DGPs, the intercept has been normalized to 0 in population and the population innovations are mutually independent and distributed  $NID(0, 1)$ .

Figure 1: The Accuracy of Alternative Impulse Response Estimators,  $T = 120$ ,  $\delta = 1$

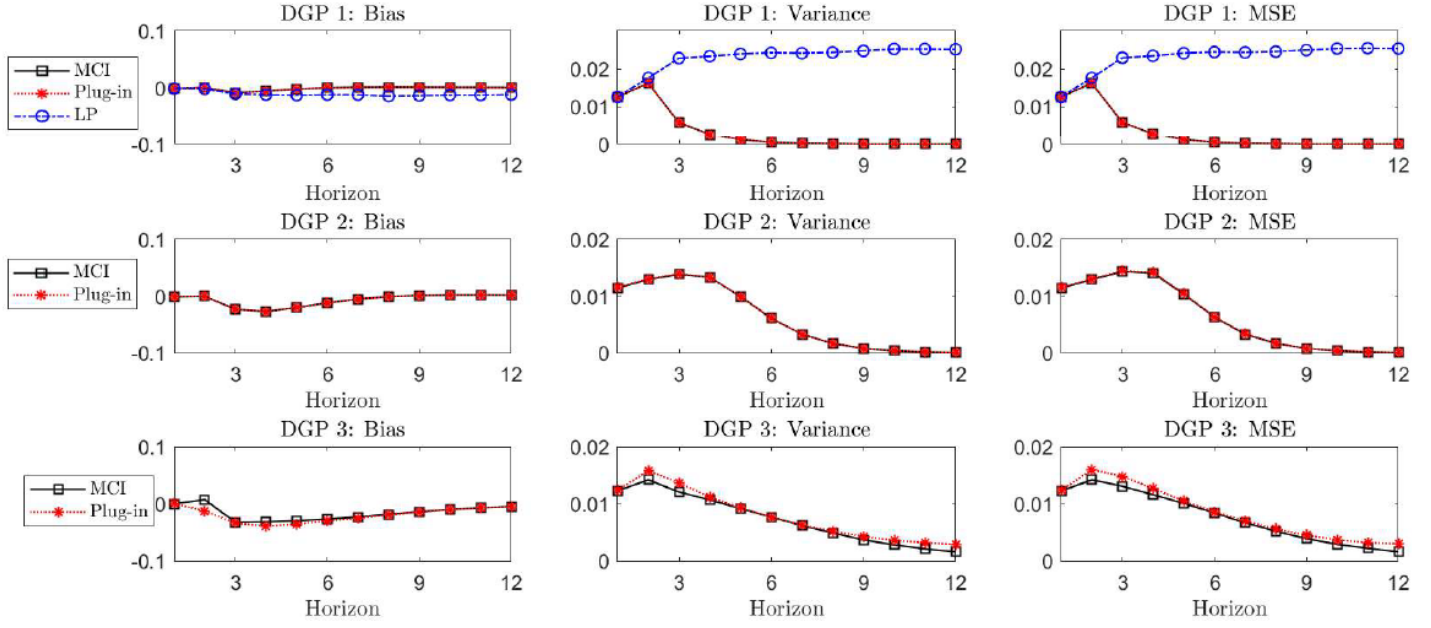


Figure 2: The Accuracy of Alternative Impulse Response Estimators,  $T = 120$ ,  $\delta = -1$

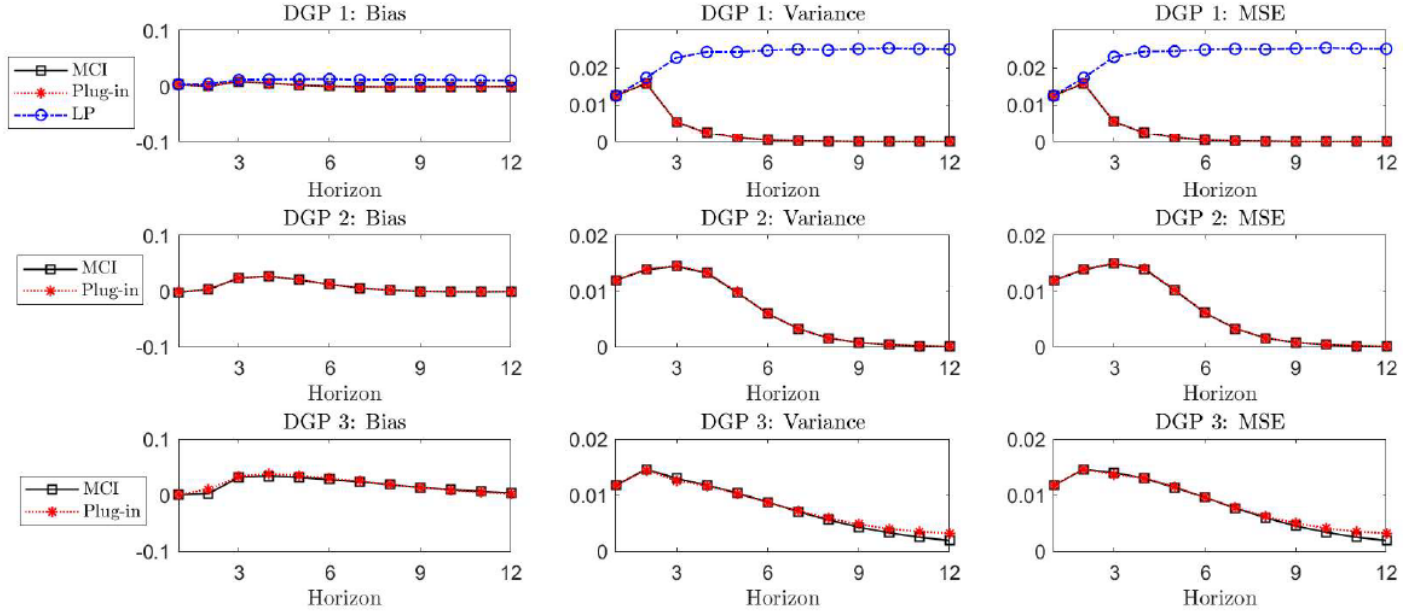


Figure 3: The Accuracy of Alternative Impulse Response Estimators,  $T = 120$ ,  $\delta = 2$

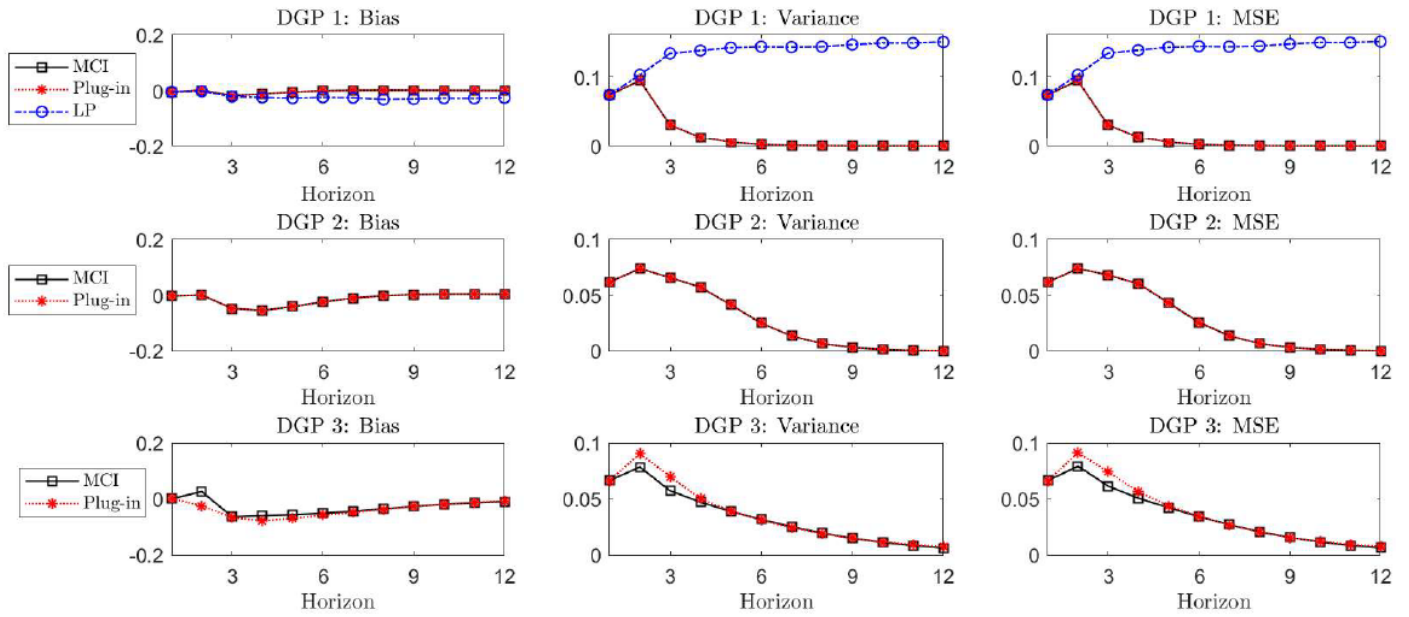


Figure 4: The Accuracy of Alternative Impulse Response Estimators,  $T = 120$ ,  $\delta = -2$

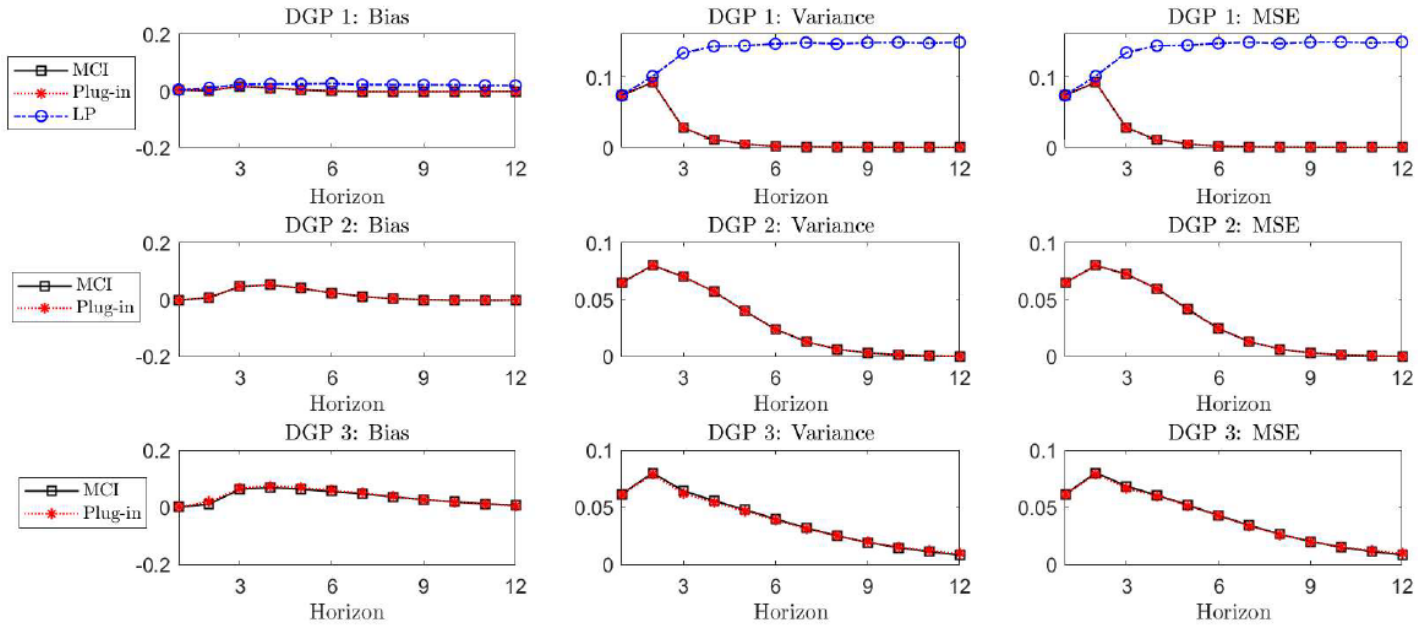


Figure 5: The Accuracy of Alternative Impulse Response Estimators,  $T = 240$ ,  $\delta = 1$

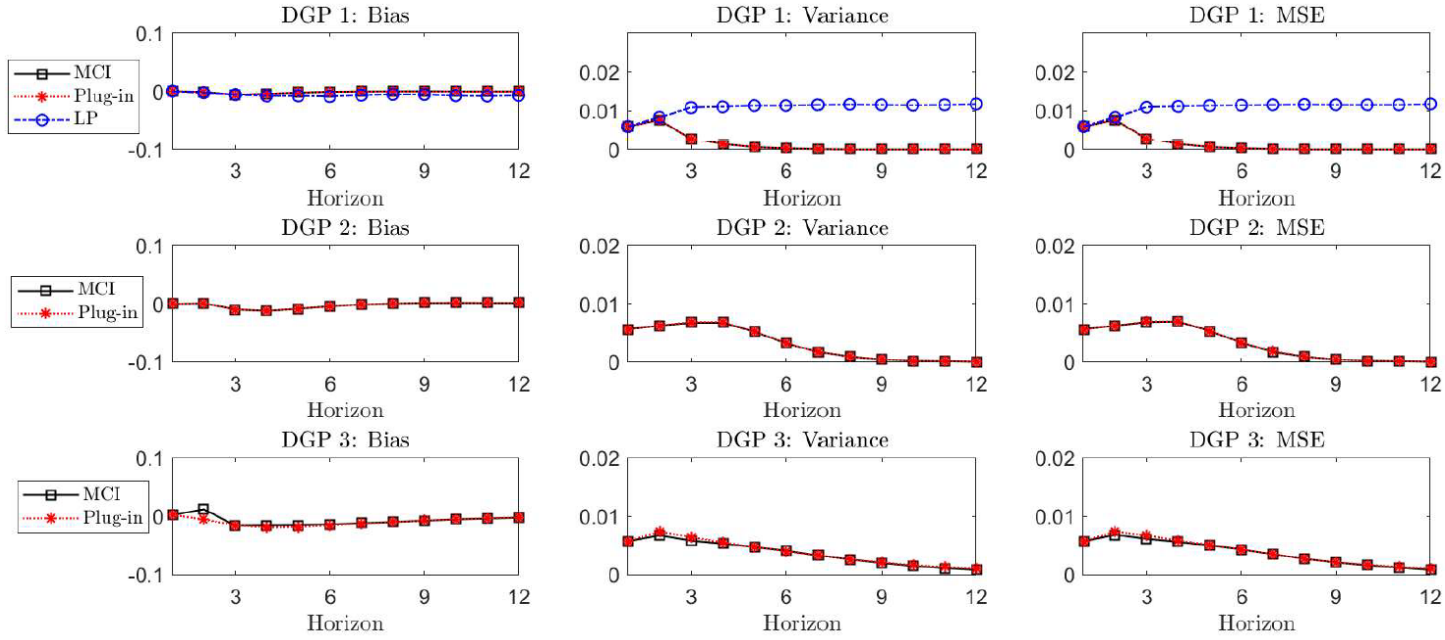


Figure 6: The Accuracy of Alternative Impulse Response Estimators,  $T = 240$ ,  $\delta = -1$

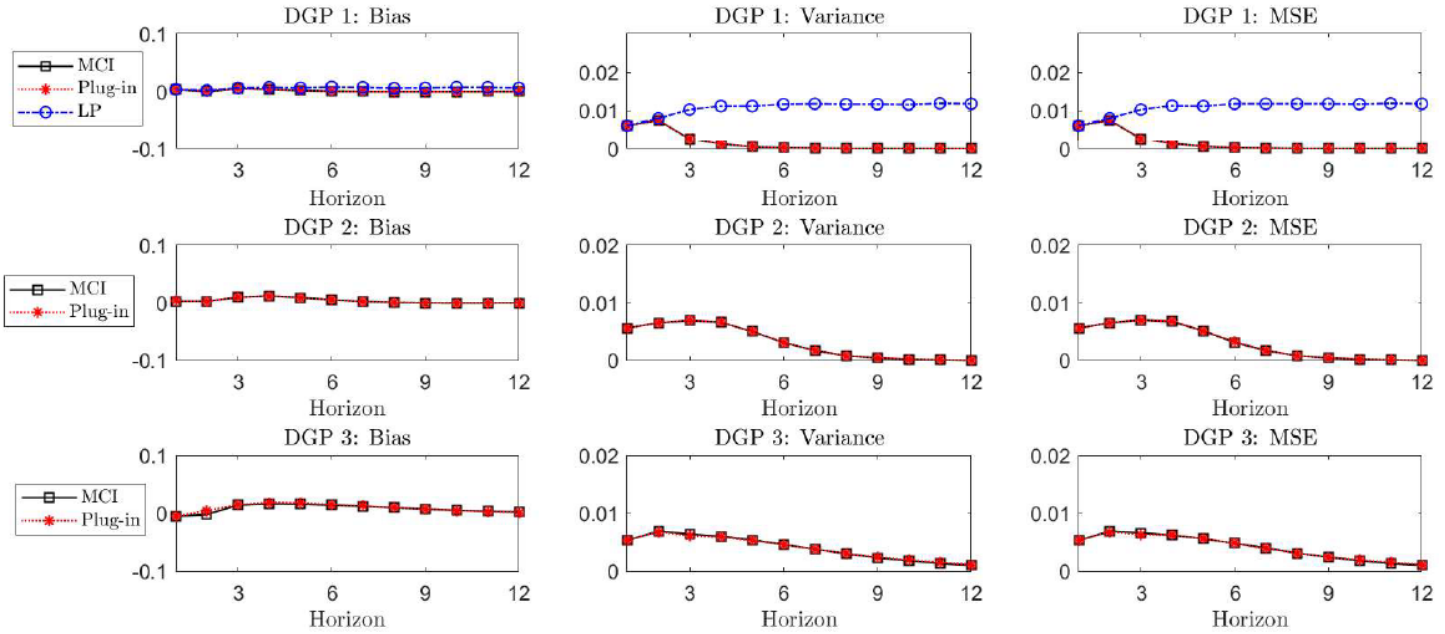


Figure 7: The Accuracy of Alternative Impulse Response Estimators,  $T = 240$ ,  $\delta = 2$

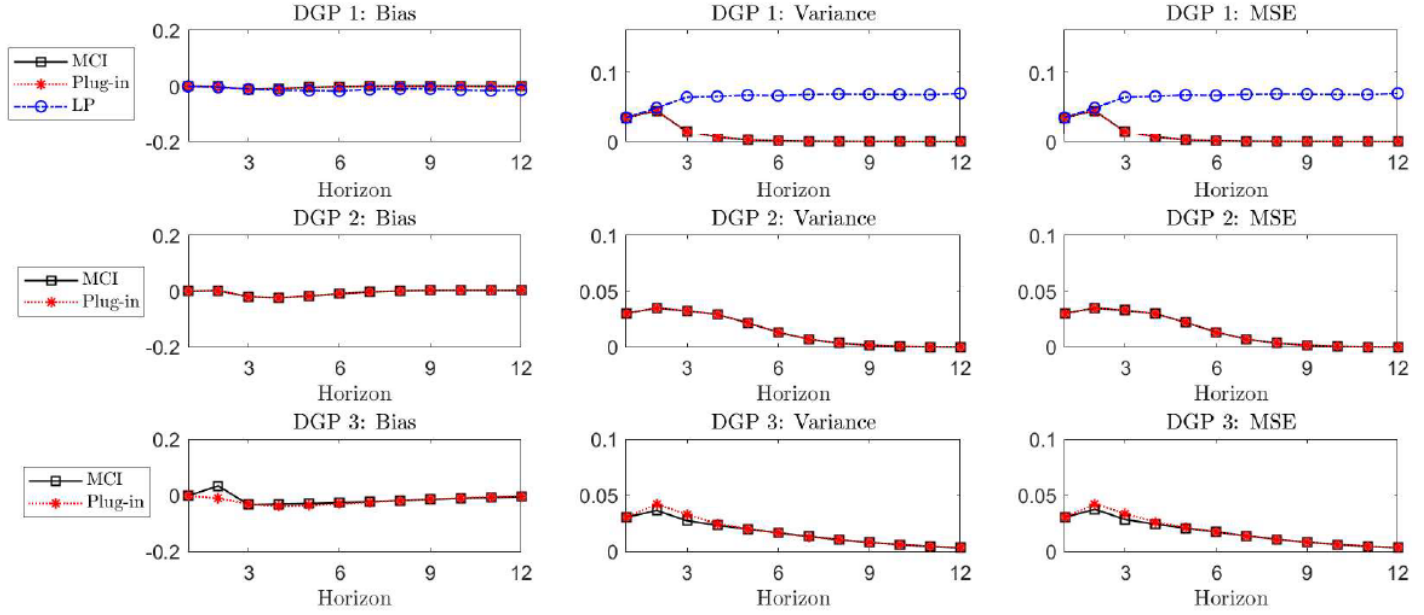


Figure 8: The Accuracy of Alternative Impulse Response Estimators,  $T = 240$ ,  $\delta = -2$

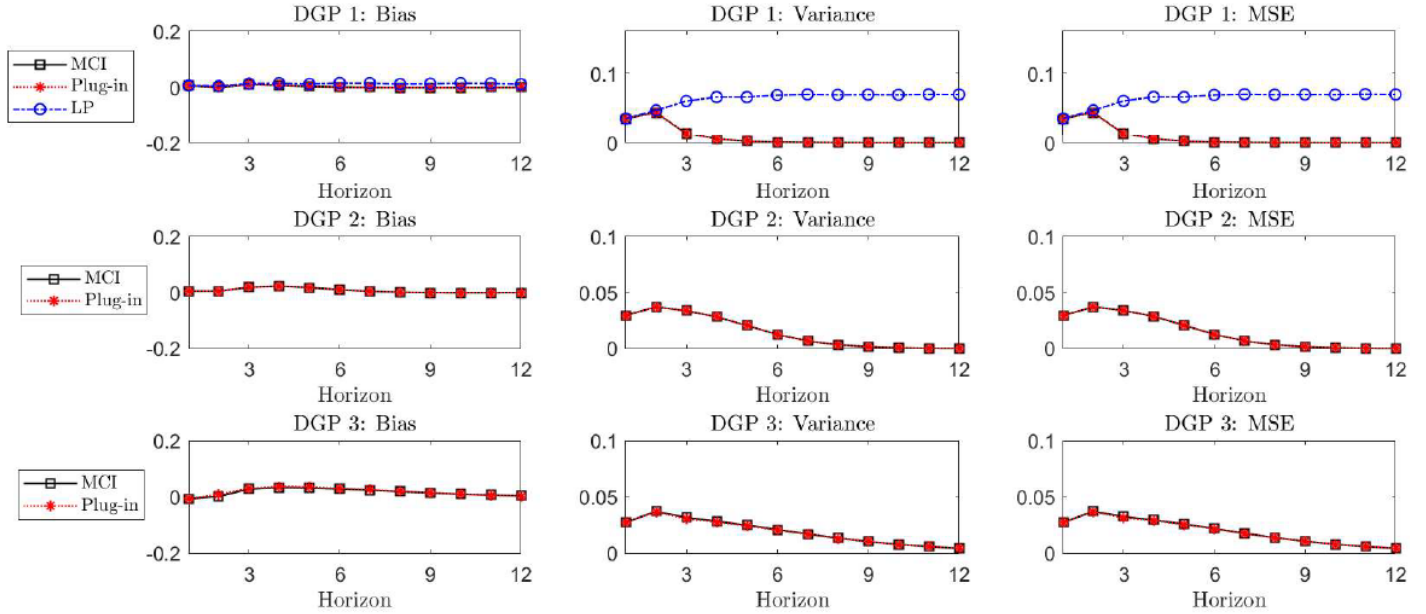


Figure 9: The Accuracy of Alternative Impulse Response Estimators,  $T=480$ ,  $\delta = 1$

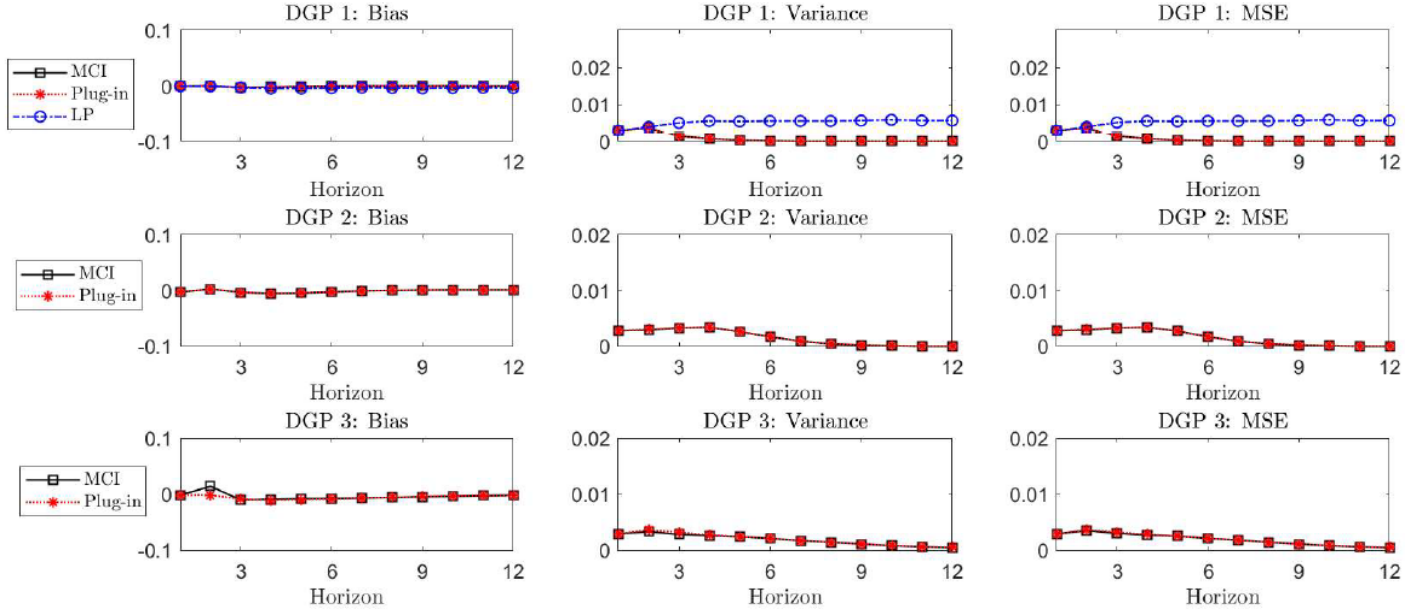


Figure 10: The Accuracy of Alternative Impulse Response Estimators,  $T = 480$ ,  $\delta = -1$

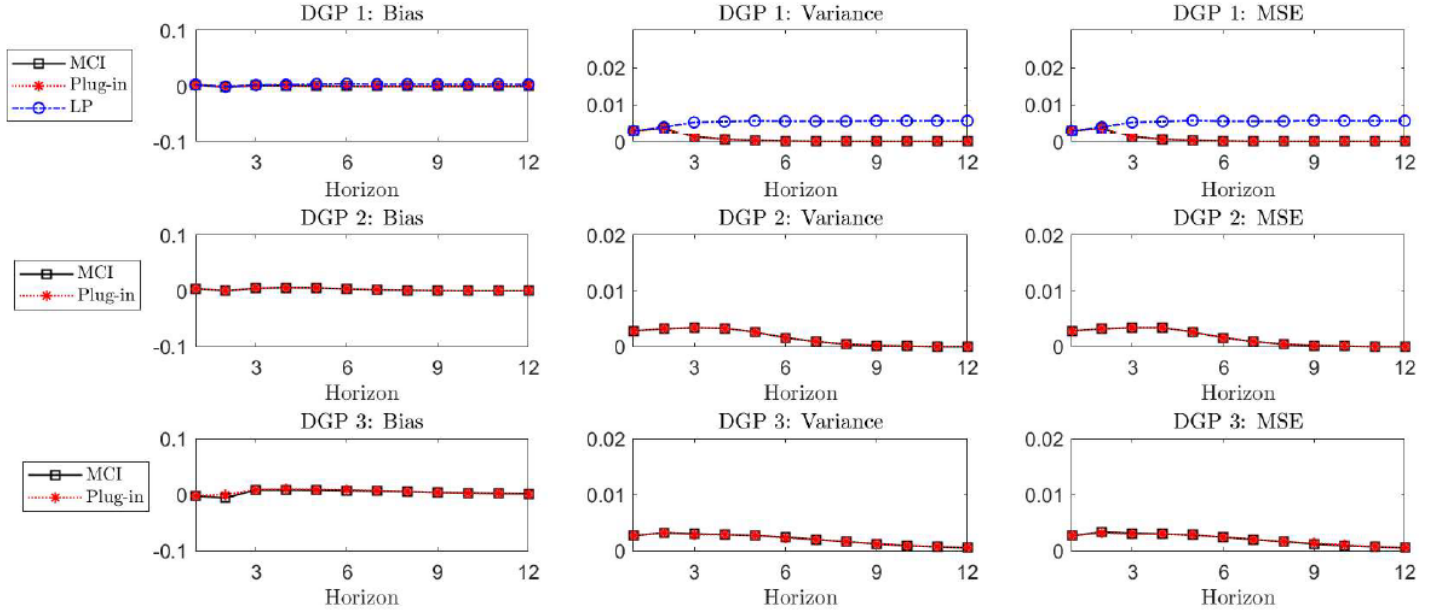




Figure 11: The Accuracy of Alternative Impulse Response Estimators,  $T = 480$ ,  $\delta = 2$

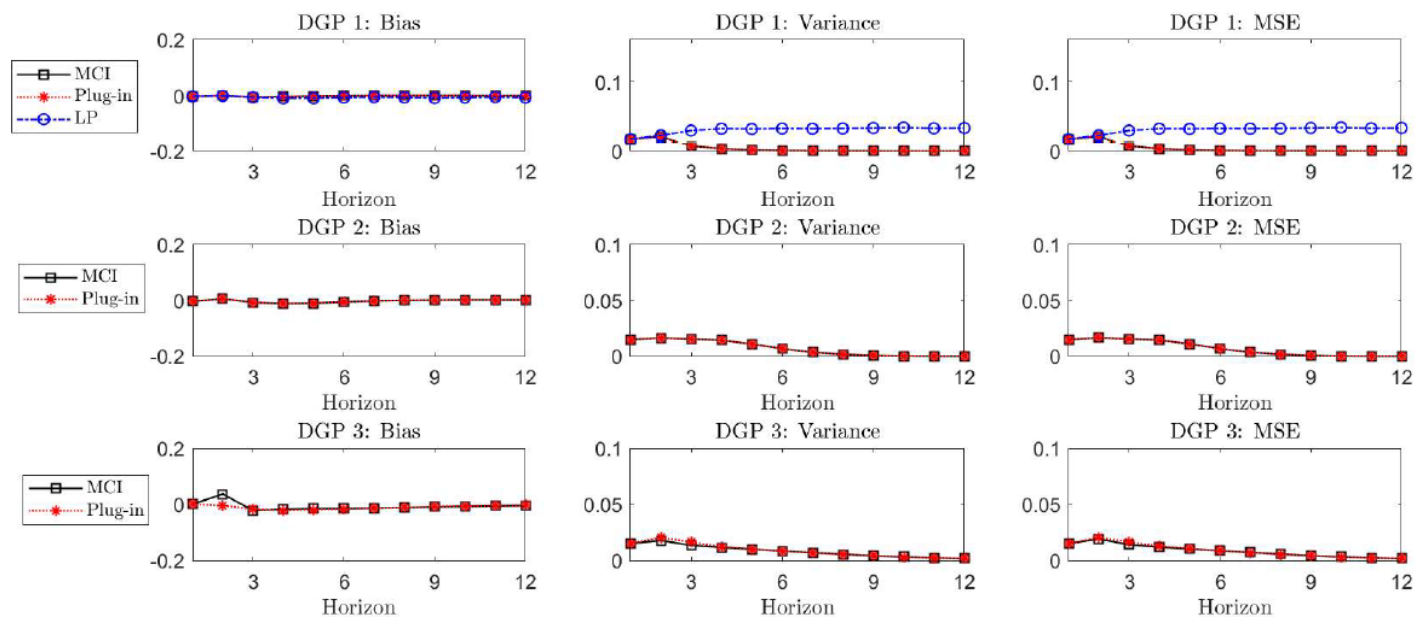


Figure 12: The Accuracy of Alternative Impulse Response Estimators,  $T = 480$ ,  $\delta = -2$

