

## **Supplemental Information**

### **Long-Run Confidence: Estimating Confidence Intervals when using Long-Run Multipliers**

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## **A Replicating Ferguson, Kellstedt, and Linn, 2013**

In this application, we re-analyze a model of how policy mood responds to public policy that was replicated in Webb, Linn, and Lebo (2019) (WLL). Our analysis shows similar patterns to the other applications. While the bounds approach offers indeterminate results for the LRM on the two most theoretically relevant predictors, the direct estimation suggests a different inferential outcome with a high degree of confidence.

Mood, in this context, is the electorate's preference for the size of government. When the public wants the federal government to expand, mood will be higher. When the electorate is more conservative, favoring a smaller government, mood will be lower (Stimson, 2018). The actual measure of policy mood is based on Stimson's (2018) dyad ratio algorithm that combines thousands of individual survey questions to develop a single time series of the preferences of the U.S. electorate. It is one of the foundational concepts in the study of U.S. macro politics. Durr (1993) was the first to argue that mood should respond to changes in the economy and the actual size of government. As the economy expands, Durr contended, the public would express support for a more expansive government because the stronger economy would make it easier to pay for the policies. When the economy contracts and finances become tighter, the public is likely to prefer lower taxes, leading mood to decrease. The second main antecedent of policy mood, public policy itself, has been a more robust predictor of changes in mood. This thermostatic model of public opinion holds that when policy moves in one direction, the public responds by moving in the opposite direction (Wlezien, 1995).

WLL chose the Ferguson, Kellstedt, and Linn (2013) paper as an application because the time series properties of policy mood are notoriously difficult to diagnose. As WLL note, several tests of the stationarity of policy mood give conflicting and ultimately confusing results. Thus, they continue, scholars have not reached a consensus on the stationarity of mood. Across the literature, it seems like researchers have used almost every possible specification of mood's dynamic properties, and the tests are so inconsistent that no

one really knows the correct specification. This is precisely the type of inconclusive results that bedevil applied time series research. Researchers must make a decision about the stationarity of policy mood and treat it as true. The approach advocated by WLL allows researchers to directly incorporate the uncertainty of the specification tests into the hypothesis testing.

The conclusions that WLL reach are that the evidence is insufficient to support either the theory that policy mood responds to the economy or the thermostatic model of opinion. The effect of unemployment is unambiguously insignificant. The other two LRMs, however, are less clear. The t-statistics are between the upper and lower bounds. While these are technically indeterminate results, WLL suggest that the researcher should fail to reject the null hypothesis with this pattern of results unless the researcher is confident that mood is a stationary series. Again, the stationarity tests are so inconsistent that this does not seem like a warranted conclusion.

[Table A.1. Here]

Using our Bayesian approach to the model, we reach different substantive conclusions. We report the result in Table A.1. In this application, the MCMCs had four chains, each with a 250,000 iteration burnin, followed by 50,000 iterations and a thinning of 5. The results, then, are based on a total of 40,000 draws from the posterior. The point estimates of the coefficients are almost identical to the results in WLL using OLS. The main difference in the substantive conclusion is the significance of the LRM for the policy measure. In WLL, this fell between the bounds, leading to an indeterminate conclusion. With our Bayesian approach, the 95 percent credible interval excludes zero, suggesting that there is a significant LRR between public policy and public mood. In fact, in 98.5 percent of the draws from the posterior, the estimated LRM for the policy measure is negative. In contrast, for the unemployment measure, only 78.6 percent are less than zero, while 96.2 percent of the draws from the LRM of inflation are below zero.

Figure A.1 presents the posteriors of the coefficients for the lagged value of mood, the lagged value of the policy measure, and the LRM for the policy measure. Unlike the previous example, there are no draws of the posterior of the lagged dependent variable that approach zero. As a result, the LRM does not have the extreme values that we see in Figure 2. While the posterior of the LRM for policy does have some draws that are positive, the credible region is narrow enough that we conclude that there is an LRR between the variables.

[Figure A.1 Here]

## References

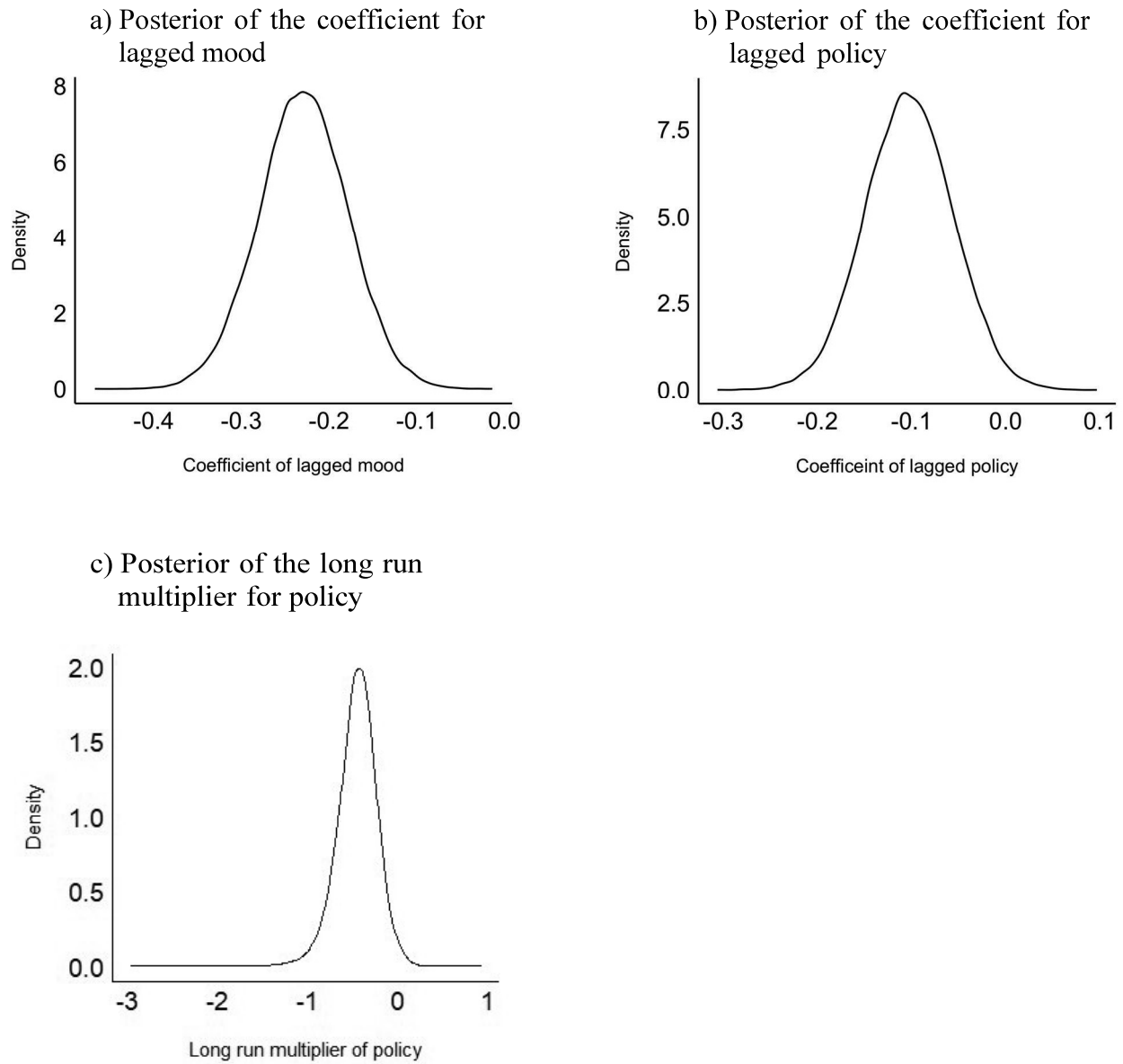
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Table A.1: A Model of Domestic Policy Mood: Quarter Two 1968 through Quarter Four 2010.

| Variable     | $x_{t-1}$               | $\Delta x_t$           | LRM                     |
|--------------|-------------------------|------------------------|-------------------------|
| Mood         | -0.23<br>(-0.33, -0.13) |                        |                         |
| Inflation    | -0.12<br>(-0.25, 0.01)  | -0.12<br>(-0.53, 0.29) | -0.52<br>(-1.11, 0.07)  |
| Unemployment | -0.08<br>(-0.29, 0.12)  | 0.93<br>(-0.03, 1.89)  | -0.36<br>(-1.51, 0.56)  |
| Policy       | -0.10<br>(-0.19, -0.01) | -0.17<br>(-0.57, 0.23) | -0.45<br>(-0.94, -0.05) |
| Vietnam      | 1.80<br>(0.52, 3.10)    |                        |                         |
| Constant     | 19.37<br>(11.06, 27.63) |                        |                         |
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*Note:* Bayesian error correction model replicating Ferguson, Kellstedt, and Linn (2013). Results present the median and 95 percent credible region of the parameter estimates from the posterior distribution. LRM = long-run multiplier.

Figure A.1: Estimated posteriors of the coefficient for the lagged values of mood and policy, and the long-run multiplier for policy.



Note: The posterior distributions were produced from 50,000 draws from the MCMC results presented in Table A.1.