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Nominal GDP versus Price Level Targeting: An Empirical Evaluation

- **In response to the ongoing discussion in the literature of the appropriate framework for monetary policy, we compare two of the most frequently discussed alternatives to inflation targeting—targeting either the level of nominal GDP or the price level—within the context of a simple vector autoregressive (VAR) model**
- **The model is estimated using quarterly data over the period 1979:4-2003:4, a period in which the economy was buffeted by substantial supply and demand shocks**
- **The paths of the federal funds rate, nominal GDP, real GDP, and the price level under nominal GDP and price level targeting are simulated over the 2004:1-2006:4 period**
- **The loss function values indicate that closely targeting the path of nominal GDP based on 4.5% desired growth in nominal GDP produces noticeably lower losses in the simulation period than either price level targeting or a continuation of the implicit flexible inflation targeting monetary policy that characterized the estimation period**

The Federal Reserve's monetary policy framework before and after the 2008 financial crisis has often been characterized as flexible inflation targeting, a policy of constrained discretion that, before the crisis, contributed to a low, stable rate of inflation around the target rate of 2 percent and to modest fluctuations of output around estimates of potential output. Unfortunately, this good macroeconomic performance was not sufficient to ensure financial stability. This fact, along with the slow recovery of the United States and other economies from the recession associated with the financial crisis, and inflation persistently below target for the last decade, has

led to suggestions that the Fed should replace flexible inflation targeting with targeting the path of the level of nominal GDP or with targeting the path of the price level, policy approaches that their advocates argue would have been promoted a faster post-crisis recovery.

Our objective in this paper is to analyze and compare targeting the path of the level of nominal GDP with targeting the path of the price level for a recent period, 2004 – 2006. We assess the statistical merits of both policies in the context of a single econometric framework, a simple vector autoregression (VAR) estimated using quarterly data over the 1979:4-2003:4 period of implicit inflation targeting by the Fed. Specifically, in the context of the policy planning process summarized by Blinder (1997), we use the VAR to conduct counterfactual experiments consisting of 1,000 trials—dynamic, stochastic out-of-sample simulations—in which we compute policy interventions needed to keep the targeted variable within specified tolerance bands, reflecting constrained discretion, for both nominal GDP and price level targeting. For these alternative strategies, we compute a sequence of monetary policy innovations consistent with each strategy and then use these innovations along with representative historical shocks to the other variables to compute the simulations. For each experiment we seek answers to the following questions: (1) Which policy approach, targeting nominal GDP or targeting the price level, best achieves the Fed's dual mandate in terms of real GDP and the price level?3 (2) How do the simulation results compare with results of a "continuation policy" consistent with a simple dynamic forecast over the simulation period? (3) Is the policy path needed to target nominal GDP or the price level "reasonable" or is the degree of interest rate variability implausible? In the extreme, is there instrument instability? (4) Do the changes in policy strategy lead to a perception by agents that a Lucas-type regime change has occurred? (5) Is either type of policy, a nominal GDP target or a price level target, obviously preferred to the other? Is either preferred to the continuation policy? We summarize our results using three variants of an ad hoc (but common) loss function with different weights on the squared deviations of real GDP and the price level from their specified target paths.

Given the Federal Reserve's medium-to-long-run inflation target of 2%, we assume a 2% inflation rate underlies the price level target. For nominal GDP, we consider three targets based on growth rates of 4.5%, 5%, and 5.5%. A 2.5% rate of growth in real GDP underlies the 4.5% growth rate along with the 2% inflation rate, and rates of growth in real GDP of 3% and 3.5% underlie the 5% and 5.5% nominal GDP growth, respectively. We find that, for both 1% and 2% tolerance bands around the targets, nominal GDP targeting based on a desired 4.5% rate of growth in nominal GDP is superior to a policy aimed solely at the price level and to the "continuation

policy." However, as detailed below, for higher desired rates of nominal GDP growth, the relative rankings of the policies reveal some ambiguity. In addition, while the policy instrument for attaining our targets, the federal funds rate, fluctuates within historical norms, adjustments to the funds rate needed to attain either the nominal GDP or the price level objective are, at the outset of the simulation periods, larger than the usual 25 basis point adjustments typical of monetary policy. Thus, the cost of attaining the nominal GDP or price level objective may be initially greater variability in market rates of interest.

In a growing literature, several recent papers stand out as particularly relevant to our work. Using a small variant of the FRB/US model, English, Lopez-Salido, and Tetlow (2015) compare the performance of the economy when the Fed follows a rule based on nominal income targeting to outcomes from an optimal commitment strategy and to the performance based on an inertial Taylor rule. Under conditions similar to those faced by the Fed in the fall of 2012, their simulations suggest that the paths of the federal funds rate, core PCE inflation, the unemployment rate, and the output gap are closer to those associated with the optimal commitment strategy under nominal income targeting than with the inertial Taylor rule. However, they express concerns about the effects of data revisions on the effectiveness of nominal income targeting.

Benchimol and Fourçans (2019) evaluate a DSGE model using a variety of policy rules including Taylor rule variants, nominal GDP growth rate targets, and level nominal GDP targets. Their evaluation is in the form of a variety of loss functions for the central bank and household welfare measures. When using the central bank loss function, which is the weighted sum of the variances of inflation, the output gap, interest rate changes, and wage growth as the criterion, level nominal GDP targets generally perform best. In two variants of a New Keynesian model, Garín, Lester, and Sims (2016) investigate the welfare implications of targeting rules for nominal GDP, inflation, and the output gap that are special cases of a standard Taylor rule. The targeting rules are compared with those for a standard Taylor rule. In virtually all cases for both models, output gap targeting does best, although nominal GDP targeting is a close second in most cases. They argue that successfully implementing an output gap rule is likely not feasible because of difficulties in accurately measuring the output gap in real time and difficulties in communicating the rule to the public. In a practical sense, their results suggest that nominal GDP targeting is a preferred alternative to inflation targeting or a standard Taylor rule.

Hendrickson (2012) argues that the stabilization of inflation in the U.S. in the 1980s was achieved by a commitment to low, stable rates of growth in nominal GDP. He embeds into two alternative DSGE models an interest rate rule in which the current value of the federal funds rate

is a function of its lagged value and the rate of change in nominal GDP and finds that the volatility of both inflation and real GDP decline the stronger the response of the Fed funds rate to nominal income. Beckworth and Hendrickson (in press) find that nominal GDP targeting is superior to use of the Taylor rule in real time.

Finally, Bodenstein and Zhao (in press) utilize a medium-size DSGE model to compare a variety of policy strategies including inflation targeting, price level targeting, nominal GDP targeting, and Walsh's (2003) speed limit policy in which the policymaker is concerned with stabilizing inflation and the change in the output gap. They consider policymaking under commitment and under discretion and compute the welfare implications of each policy. Under commitment, inflation targeting is slightly preferred to the speed limit policy. These two policies are preferred to both price level targeting and nominal GDP targeting, but price level targeting dominates nominal GDP targeting. Under discretion, the speed limit policy is the best overall.

The literature just cited compares nominal GDP targeting, price level targeting, and inflation targeting by analyzing the macroeconomic effects of formal rules specific to each type of targeting that are embedded in a variety of DSGE models. A strong point of this approach is that it respects the Lucas critique and allows expectations endogenous to the model to adjust to the specific rule. However, although central banks often use the settings of their policy instrument implied by a variety of different rules as inputs to their policy deliberations, in practice no major central banks have yet adopted an explicit rule, and, arguably, none are likely to do so in the near future. Given that flexible inflation targeting, the strategy employed by many central banks today, is implemented in a constrained-discretionary way, it is plausible that, if adopted, nominal GDP targeting or price level targeting would be implemented in a similar way. Rather than follow the cited studies and use a variant of a DSGE model to evaluate nominal GDP and price level targeting, we follow the suggestion of McCallum (1988) that alternative strategies be evaluated within a variety of different types of models and employ a pure time series model in which we assume that the same type of constrained discretion that guides the Federal Reserve's flexible inflation targeting framework also would guide the implementation of either nominal GDP targeting or price level targeting.

Since we evaluate a change in policy strategy from implicit flexible inflation targeting to nominal GDP or price level targeting, the Lucas critique is potentially applicable. However, as noted by Leeper and Zha (2003) in their discussion of modest policy interventions, as long as the new strategies don't result in markedly different behavior by the Federal Reserve and hence don't significantly alter private agents' beliefs about the policy regime, counterfactual simulations using

the VAR can be a viable way to evaluate these strategies. We compute the modesty statistic suggested by Leeper and Zha (2003), which analyzes the statistical properties of the policy innovations. Intuitively, relative to policy shocks in the historical regime, if the policy innovations needed to transition to the new policy regime are sufficiently large and persistent, agents in the economy are likely to perceive that a change in regime has occurred, obviating the usefulness of the historical data. To determine if the Lucas critique is applicable to the counterfactual policy innovations that attain our hypothesized objectives for nominal GDP or price level target, we compute the modesty statistics and find sufficiently small values to suggest that our results may not violate this critique.5 We proceed as follows. In section II, we present the VAR model to be estimated and discuss its impulse response functions. In section III, we provide an intuitive discussion of the counterfactual methodology employed to assess the relative merits of nominal GDP versus price level targeting