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Understanding Nominal GNP Targeting

THROUGHOUT 1989, popular wisdom held that the U.S. monetary authority was faced with a daunting policy task: it should not permit too much money growth and cause prices to rise too rapidly, but it should not allow too little money growth and cause the economy to tip into recession as real output would fall. Sympathy for monetary policymakers, however, is not necessarily widespread among economists. Many economists deny that the tradeoff between inflation and output growth exists in the long run. Moreover, even those who grudgingly agree that the tradeoff may exist in the short run contend that monetary policymakers create problems for themselves by attempting to exploit the possible output-inflation tradeoff.

What alternative policy guidelines exist? Among a variety of alternatives, there has been recent emphasis on something called nominal income targeting.[1] Using this approach, the monetary authority would ignore the presumed trade-off between inflation and real output growth; instead, it would simply adjust money stock growth to achieve some targeted level or growth rate in nominal GNP. In this paper, we examine this policy alternative. We first make the theoretical case favoring nominal GNP targeting. Given this theory, we then turn to the practical aspects of targeting nominal GNP.

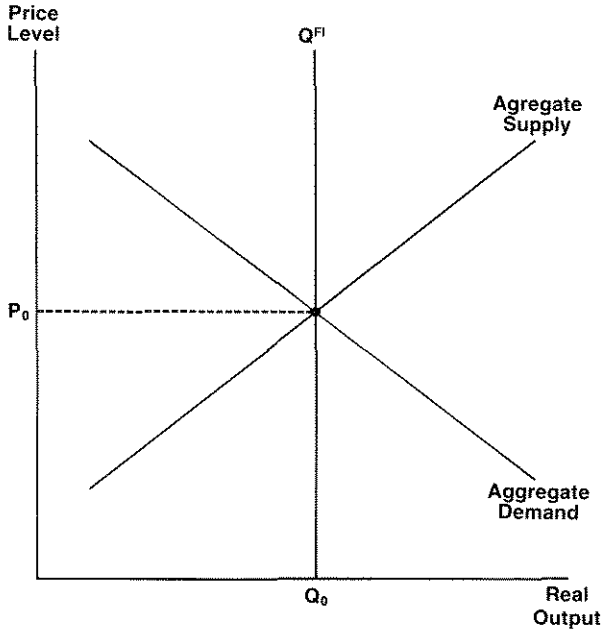
TARGETING NOMINAL GNP: THE THEORY

In this section, we set out the theoretical case favoring nominal GNP targeting. In doing so, we abstract from technical and operational problems and focus instead on the implications of nominal GNP targeting for stabilizing price and output within a widely used macroeconomic model. Later we will return to the issue of how to actually set up and utilize nominal GNP targeting.

Naturally, the economic implications of alternative monetary policies depend to a large extent on the macroeconomic framework being used for the analysis. We employ a particular version of what is perhaps the most widely used framework for analyzing macroeconomic

[1]See McCallum (1987), McNees (1987), Carlson (1988) or Kahn (1988) for examples of policy-oriented discussions of nominal GNP targeting.

Figure 1



fluctuations, the textbook aggregate supply-demand model.

A Stochastic Aggregate Supply-Demand Model

A graphical representation of the textbook aggregate demand-supply model is given in figure 1. This model specifies that the aggregate price level (P) and the level of real output (Q) are set by the intersection of the aggregate supply and demand curves. As figure 1 shows, the aggregate demand curve slopes downward; that is, there is an inverse relationship between the aggregate price level and the demand for real output. This inverse relationship can arise for either of two reasons. As the price level rises, the purchasing power of money balances declines, reducing wealth and hence reducing the quantity of consumption goods demanded. In addition, the higher price level leads to an increase in the quantity of nominal money demanded because the higher prices require larger average money balances to purchase the same real quantity of goods and services. Increased money demand bids up the interest rate, and higher interest rates imply less consumption and investment spending.[2]

The aggregate supply curve slopes upward in figure 1. There are several explanations for the positive slope of the aggregate supply curve. We concentrate on a particular, widely used explanation: that the nominal wages of workers are set by agreement for a fixed period of time and the amount of employment is determined by the employer. This agreement can either be a formal contract or an informal handshake (also called an implicit contract) between labor and management; in either case, nominal wages adjust slowly to *unexpected* changes in the economic environment. As a result, profits rise as prices rise and fall as prices fall. Firms respond to these changes in profits by appropriate changes in output and employment.[3]

This response does not describe the situation relevant for *expected* changes in the economic environment, however, because expected changes are taken into account when nominal wage agreements are made. Thus, figure 1 also includes a vertical line labeled Q^{FI}, which indicates the supply curve relevant when expected changes occur. The superscript FI stands for "full information," to indicate that this is the supply curve applicable when the only changes in the economic environment are those expected to occur when wage agreements were signed. Notice that this curve does not show a direct relationship between price and quantity. In fact, it shows that, for expected changes, the relevant supply curve is vertical at the output level labeled Q^{FI}.

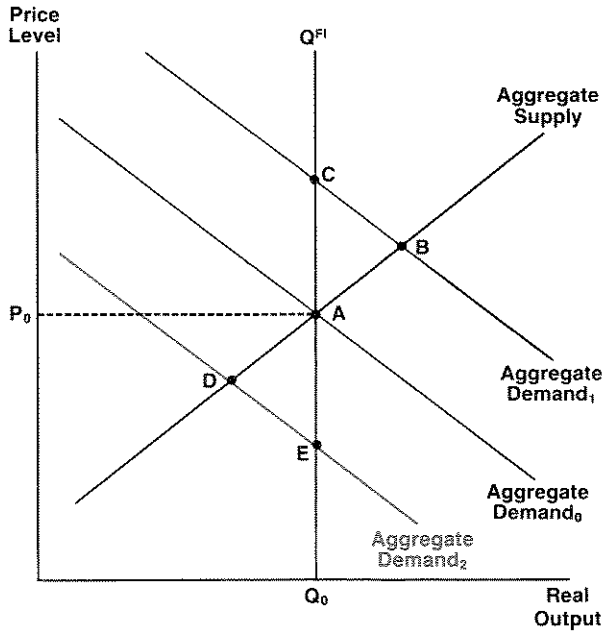
The output level Q^{FI} does not change when prices change because workers and firms, when negotiating wage agreements, will adjust the nominal wage to compensate for changes in the price level. Thus, an expected increase in the price level will be compensated by an increase in the contracted nominal wage.

This vertical aggregate supply curve is a reflection of the "natural rate hypothesis." The

[2]With the inflation rate held constant, the increase in the nominal interest rate implies an equivalent increase in the real interest rate.

[3]Early versions of this theoretical approach were developed by Fischer (1977) and Gray (1976). See Barro (1977) for a criticism of this approach. Optimal fixed wage contracts can be found from microeconomic contracting models such as Azariadis (1975); these are models of fixed real wage contracts that shift risk from workers to firms. McCallum (1987) gives a pragmatic argument for the prevalence of nominal wage contracts as opposed to real wage contracts.

Figure 2



natural rate hypothesis states that the full employment level of output is independent of the price level. In this model, the vertical line Q^{FI} represents the natural rate hypothesis.

Monetary policy works by inducing movements in the aggregate demand curve. As the nominal money stock rises, wealth rises and the interest rate falls *at any given price level;* as a result, the demand for goods rises. Graphically, the aggregate demand curve shifts to the right. Thus, expansionary policy (increases in the money stock) shifts the aggregate demand curve to the right, and contractionary policy (decreases in the money stock) shifts it to the left.

To illustrate what this model implies, consider the results of an unexpected increase in aggregate demand, illustrated in figure 2. Since the short-run aggregate supply curve has a positive slope, the aggregate demand increase will produce increases in both price and output until such time as wages are renegotiated. In figure 2, the short-run equilibrium occurs at point B, the intersection of the short-run aggregate supply curve with the new, unexpectedly higher aggregate demand curve.

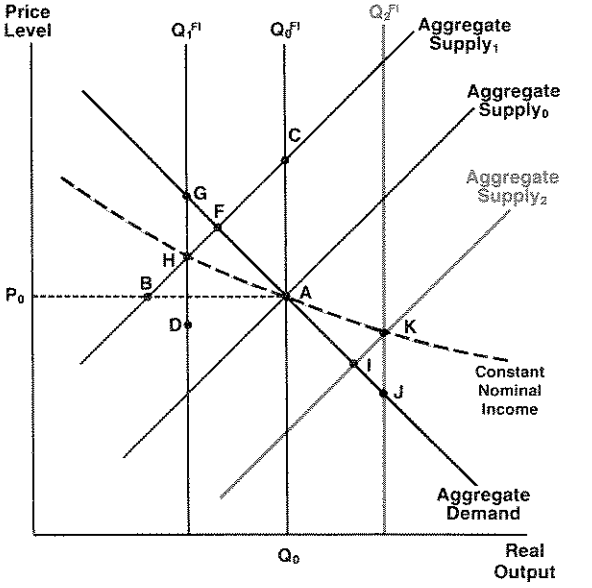
Of course, when workers revise the terms of their labor contracts in response to an unexpected rise in prices, nominal wages will rise and the short-run aggregate supply curve will shift to the left, until it intersects the new aggregate demand curve at point C, where the demand curve crosses the full information aggregate supply curve. When workers become fully informed and have changed their nominal wage accordingly, changes in aggregate demand result only in price level changes.

One implication of this analysis is that an expected increase in demand only produces higher prices. In figure 2, this is illustrated by the movement of the economy from the intersection of the original aggregate demand curve and Q_0^{FI} at point A to the intersection of the new aggregate demand curve and Q_0^{FI} at point C, without the intervening short-run equilibrium at point B.

The analysis of a decline in aggregate demand is symmetric to the above analysis. An unexpected decline in aggregate demand leads initially to lower prices and output on the short-run aggregate supply curve at point D. After firms adjust workers' nominal wages downward in response to lower prices, the full information level of output, point E, is achieved once more.

Unexpected changes in supply, termed supply shocks, are different from demand shocks because they shift both the short-run and the full information aggregate supply curves. For example, suppose that the negative supply shock illustrated in figure 3 occurs, shifting both the long-run and short-run aggregate supply curves to the left.

Figure 3



The short-run equilibrium occurs at point F, the intersection of aggregate demand with the new short-run aggregate supply curve. The full information output also declines from Q_0^{FI} to Q_1^{FI} because the supply shock has reduced the quantity of output firms want to produce even if wages and prices fully adjust to the shock. The adjustment from short-run equilibrium at point F to full information equilibrium at point G occurs when workers renegotiate their nominal wages upward, shifting the short-run supply curve leftward again until it intersects the new full information output level Q_1^{FI} at point G.

Why does the full information output level shift in response to supply shocks? By definition, the full information output level is the one that will be produced when the economy completely adjusts to any disturbance. Thus, a negative supply shock reduces the full information level of output because it reduces the productive capacity of the economy.

Notice that a reduction in the full information level of output need not be permanent. That depends on the nature of the supply shock. If it is only temporary, the full information output level will return to Q_0^{FI} after the shock dissipates. Nonetheless, the decline in Q^{FI} from Q_0^{FI} to Q_1^{FI} represents the reduction in potential output, however temporary, that occurs in conjunction with a negative supply shock.

Finally, the analysis of a positive supply shock is symmetric to the analysis of a negative supply shock. Consider a positive shock to supply. The full information level of output shifts from Q_0^{FI} to Q_2^{FI} as the short-run aggregate supply curve also shifts to the right. If the shock is unexpected, initial equilibrium is at point I, and after all wage adjustments have been made, the economy will produce at the full information level of output at point J.

Monetary Policy in the Aggregate Demand-Supply Model

The aggregate supply-demand framework we employ assumes that random shocks occur to both demand and supply curves. Demand shocks include unexpected changes in business or consumer confidence, income taxes, exchange rates, monetary policy or government spending. These lead to unexpected changes in one or more of the components of aggregate demand: consumption, investment, government spending and net exports. Supply shocks include unexpected changes in the production process, such as oil price surprises, droughts or technological change, that enhance or diminish the aggregate quantity of goods supplied.

Before examining how monetary policy might respond to these shocks, the goals of policy must be discussed. We assume that the monetary authority wants to stabilize the price level and/or the level of output. In the model presented, the only level of real output that can be achieved after wages have fully adjusted to shocks is the full information level of output. Furthermore, in the short run, before contracts are renegotiated, output deviates from full information output only when shocks occur. Thus, output stabilization implies that the monetary policymaker seeks to stabilize output at its full information level. In achieving this goal, the policymaker attempts to keep output where the private sector would produce if it recognized and fully adjusted to the shocks disturbing the economy.[4]

We consider three types of policy targets. Price level targeting involves setting the money stock so that the aggregate demand curve strikes the aggregate supply curve at a point like point A in figure 2. Thus, the price level target might be P_0. When demand or supply shocks occur, the monetary authority will attempt to maintain the short-run equilibrium price level at P_0. In contrast, real output targeting involves changing the money stock so that the aggregate demand curve intersects the aggregate supply curve at Q_0, the target level for real output. Because the full information output level, Q^{FI}, is the level that would be achieved after all adjustments have taken place, the monetary authority would set the real output target at this value. Finally, nominal GNP targeting involves setting the money stock so that the product of the equilibrium price (P) and equilibrium output (Q) equals the target for nominal GNP, $(PQ)^*$. Under this procedure, the monetary authority does not attempt to determine the specific price and real output components of nominal GNP; instead, the policymaker is concerned with their product.

[4]The stochastic disturbances that affect the economy need not all originate from factors exogenous to the policymakers. Stochastic shocks that originate with unexpected policy actions can also adversely impact the economy.

What actions can be taken in the face of demand and supply shocks? If aggregate demand shifts unexpectedly to the right, as was illustrated in figure 2, stabilizing the price level requires the policymaker to contract the money stock; this would shift the aggregate demand curve back to its original position and restore the original price level, P_0, at point A. This same monetary policy response is also necessary to stabilize either real output or nominal GNP.[5] Thus, for demand shocks, the policy response is identical regardless of the specific goal of the policymaker. Because demand shocks move prices and output in the same direction, a policy that offsets price changes will also offset output and nominal GNP movements simultaneously. This result is not true, however, for supply shocks.

The graphical representation of a negative supply shock is presented in figure 3. As the supply shock shifts the aggregate supply curve to the left (from AS_0 to AS_1), the resulting incipient shortage of goods at the initial price level puts upward pressure on the price level. The rise in prices, which reduces the aggregate quantity of goods demanded, continues until the reduced quantity demanded is equal to the lower quantity supplied (point F).

An important feature of this model is the relation between the intersection of the full information output level and the short-run aggregate supply curve for various values of the supply shock. In figure 3, a negative supply shock shifts both Q^{FI} (from Q_0^{FI} to Q_1^{FI}) and the short-run aggregate supply curve to the left. The initial intersection of short-run aggregate supply and full information output occurred at point A; after the shock, these curves intersect at point H. Similarly, a positive supply shock would shift both Q^{FI} (from Q_0^{FI} to Q_2^{FI}) and the short-run aggregate supply to the right. In this case, short-run aggregate supply and full information output would intersect at point K after the shock.

It can be demonstrated that these intersections of short-run aggregate supply and full information output occur at the same level of nominal spending. In other words, the value of P_0Q_0 at point A, P_1Q_1 at point H and P_2Q_2 at point K are identical.[6] The dashed line connecting these points contains all possible intersections of short-run aggregate supply and full information output after a supply shock, but with the nominal wage held constant. Since these intersection points are points of identical nominal spending, the dashed line connecting them is called a rectangular hyperbola. This result is generated by the contract market structure of the labor market; it is *not* a feature of all aggregate demand-aggregate supply models. This model is used because it provides a strong theoretical rationale for the use of nominal GNP targeting.

In the absence of any policy response, the negative supply shock shown in figure 3 would move the economy from equilibrium at point A to point F in the short run and then to point G in the long run. Monetary policy actions designed to maintain the price level at its original value would decrease the money stock to reduce the demand curve. In figure 3, point B is the new short-run equilibrium following the supply shock and the reduction in aggregate demand required to keep the price level at P_0. In this case, however, price stabilization produced a larger decline in real output than did the initial negative supply shock.

On the other hand, maintaining real output at Q_0 would require sufficient growth in the money stock to shift the aggregate demand curve to the right to point C. In this case, the original output level, Q_0, is maintained, but the price level has jumped sharply. Moreover, the inflationary impact of output stability does not stop at point C. Because the rise in output prices is a surprise to workers and other input suppliers, input prices will rise and the short-run aggregate supply curve will shift to the left again. Thus, even without further policy-induced demand changes, the price level will be driven up further; if monetary policy responds again to maintain real output, the price spiral will continue onward and upward.[7]

[5]It may seem perverse for monetary policy to attempt to *reduce* real output! Recall, however, that we are abstracting from the growth in output. As a result, this seemingly perverse policy is just the graphical analog of trying to smooth out cyclical variations in real output that occur along the economy's long-run growth path.

[6]See Bean (1983) or Bradley and Jansen (1989) for a formal demonstration of this claim.

[7]Point B is also a temporary position. When output is below its natural or full employment rate, unemployment is also high. This unemployment will eventually push down wages and costs, moving the short-run aggregate supply curve to the right and intersecting the long-run aggregate supply curve at a point like D. Thus, price stabilization policy in the natural rate model may perversely lead to deflation.

Finally, consider what happens with nominal income targeting. In this case, the monetary authority adjusts the money stock to keep nominal GNP at its target level. In this model, the intersection of the short-run aggregate supply and full information output *after a supply shock* occurs at the same level of nominal spending as their intersection before a supply shock. For example, in figure 3, points A and H are intersections of full-information output and short-run aggregate supply before and after a supply shock. Nominal GNP targeting requires reducing the money supply enough to move the economy from point F after the supply shock occurs to point H; nominal spending at point H is equal to nominal spending at the initial equilibrium point A. Because a supply shock causes short-run aggregate supply and full information output to intersect at points of constant nominal spending, nominal GNP targeting keeps the economy at its full information output level. That is, under nominal GNP targeting, the aggregate demand will always intersect the short-run aggregate supply curve at the full information output level *for any value of the supply shock*.

Nominal income targeting yields two potential improvements over policies designed to stabilize the price level as the level of real output. First, nominal income targeting permits both price and output to adjust simultaneously; thus, it avoids more extreme movements in either price or output alone that occur when policy is directed toward stabilizing one of these variables.

Second, in the model we discuss, nominal income targeting also enables the economy to avoid the changes in nominal wages that produce a second set of adjustments. Nominal wages will *not* change because nominal GNP targeting always stabilizes output at the full information output level, the level firms would choose to produce if they could recognize and fully adjust to the shocks confronting them.

Thus, nominal GNP targeting responds as well as price or output level targeting to demand shocks and is superior to either in responding to supply shocks, especially if policy is directed toward keeping output at the full information level.

TARGETING NOMINAL GNP: COULD IT WORK IN PRACTICE?

Despite concern expressed by some commentators about the division of nominal GNP into its real GNP and price level components, nominal GNP targeting is "perfectly" stabilizing at the only sustainable output level, the "natural" or full information rate of output.[8] Monetary policymakers need not be concerned with anything except the nominal GNP target itself because the real GNP level achieved will automatically be the full information rate of output![9]

Thus, one key result of nominal GNP targeting is that policymakers don't have to estimate the natural rate of output as they would under a real GNP targeting procedure. Under nominal GNP targeting, hitting the preannounced target is sufficient to generate an equality between the actual and full information rate of real GNP, *even if the policymaker knows nothing about the full information rate of output at any point in time.*

The obvious question is, To what extent do these results apply to the real economy?

Can the Monetary Authority Control Nominal GNP?

Targeting nominal GNP requires that the monetary authority control nominal GNP. That is, a change in the money stock must lead to a predictable consequent change in nominal GNP. Few economists doubt that, in broad terms, nominal GNP can be influenced by the monetary authority. For example, the St. Louis equation, which has been used to aid policymaking at the Federal Reserve Bank of St. Louis and elsewhere, demonstrates the relationship between changes in the money stock and subse-

[8]Note that this case does not rule out fluctuations in real GNP, as shocks to the aggregate supply function will alter real GNP and price while keeping nominal GNP constant. These shocks to aggregate supply can be anything that affects the ability of the economy to produce output, such as changes in production technology, exogenous OPEC oil price shocks and droughts. All of these factors may alter the natural rate of output; under nominal GNP targeting, actual real output will also change to remain equal to the natural rate of output.

[9]Stabilizing nominal GNP is not a desirable goal in and of itself; instead, it is desirable because of its implications for stabilizing output at the full information level. In this sense, nominal GNP targeting actually represents an "intermediate target" of policy. An intermediate target is one that is adopted because, by achieving it, one also achieves the ultimate policy goals.

quent changes in nominal GNP over a period of several quarters.[10]

Of course, questions about the controllability of nominal GNP are really questions about the impact of money on the components of spending. They apply equally well to the price or output level. To see this, assume that policymakers adopt a real GNP target. Policymakers might proceed with the two-step procedure described recently by Benjamin Friedman (1988), in which policymakers first choose a target value for real GNP, then estimate the value of the money stock consistent with their real GNP goal. The estimated money stock is an intermediate target of policy in lieu of attempting to hit the real GNP target over periods shorter than a quarter. This procedure works only if achieving the money target is related to achieving the real GNP target. But such a relationship between money and nominal GNP is exactly what is required for nominal GNP targeting to be practical.[11]

Moreover, as discussed earlier, hitting a nominal GNP target will automatically guarantee hitting a real GNP level equal to the full information rate of output. Since this is not measured directly, but is, instead, estimated from various sources, it is useful to know that hitting a targeted nominal GNP level, that can be measured directly, will keep real GNP at its full information rate.[12]

Do Policymakers Know Enough About the Economy?

A common criticism of policymaking is that economists and policymakers do not know enough about how the economy functions to have a model that describes accurately the behavior of macroeconomic variables like real GNP and the price level. In this case, it has been argued that policy action based on a flawed or incomplete model might cause more harm than good. To avoid this problem, Milton Friedman and others have advocated policy rules that do not depend on the state of the economy; these rules are called "non-contingent" monetary policy rules.

Milton Friedman and others have emphasized that "long and variable lags" exist between changes in money aggregates and the full response of GNP. Because the variability in these lags is neither predictable nor well understood, Friedman argues that ignorance of the causes and patterns of variability in the lag structure justifies the use of a constant money rule, such as having a money aggregate grow at exactly 3 percent per year forever. This type of money rule is non-contingent; that is, it does not vary even though nominal GNP, the price level and/or real output varies.

In contrast, nominal GNP targeting can be achieved only with a state-contingent money rule. For example, a rule specifying 3 percent annual nominal GNP growth requires faster money growth when nominal GNP growth is less than 3 percent and slower money growth when nominal GNP growth is above 3 percent. In practice, nominal GNP targeting is a "feedback" money rule, with the feedback running from observed GNP changes to money growth.

One approach to evaluating the potential usefulness of state-contingent money rules is to see whether there is a rule whose favorable properties are robust across alternative theoretical models. This is analogous to Bennett McCallum's search for a money rule with desirable properties across alternative empirical models. The shaded insert describes a nominal GNP rule proposed by McCallum that satisfies the criterion of

[10]The historical reference is Andersen and Jordan (1968) and Andersen and Carlson (1970). A recent update is reported in Carlson (1986).

[11]For a critical analysis of intermediate targeting, see B. Friedman (1975, 1988).

[12]One issue in the controllability of nominal GNP arises because nominal GNP is only observed every quarter, and even then is available only with a lag of several weeks. The question arises whether quarterly observations on GNP are sufficiently timely to allow the monetary authority to target nominal GNP. This issue is specious. First, no technical issue prevents more frequent (e.g., monthly) observation of nominal GNP. Second, numerous economic variables are observed more frequently than nominal GNP and are related to nominal GNP both theoretically and statistically. These can be used to forecast movements of nominal GNP between observations. Over a decade ago, LeRoy and Waud (1975, 1977) demonstrated that such forecasts could be made with data observed at different frequencies using a statistical approach known as the Kalman filter. Thus, monthly or even weekly estimates of nominal GNP are available as guides to policymakers.

Finally, it is important to note that alternative policies such as price level targeting or real GNP targeting also face the observability question. The price level and real output are also observed quarterly, although various components of the price level such as the Consumer Price Index and the Wholesale Price Index are observed monthly. Thus, targeting other variables does not avoid any problems associated with infrequent measurements of the targeted variable.

McCallum's Nominal GNP Rule

Recently, Bennett McCallum has recommended a particular rule for targeting nominal GNP that uses the monetary base. This rule specifies how the policymaker can adjust the monetary base to counteract a portion of the current change in nominal GNP. The reason that only a portion of the total change in nominal GNP is offset is to avoid an instrument instability problem with use of the monetary base. The proposed policy is nondiscretionary: it embodies a targeted path for nominal income growth of 3 percent per year. The particular rule he recommends is:

$$\Delta b_t = 0.00739 - (1/16)(v_{t-1} - v_{t-17}) + \lambda(x^*_{t-1} - x_{t-1}),$$

where Δb_t is the change in the (natural logarithm of the) monetary base, v_t is (the natural logarithm of) base velocity, x_t is (the natural logarithm of) nominal GNP and x^*_t is the target path for (the natural logarithm of) nominal GNP. Since this rule applies quarterly, the constant of .00739 yields a 3 percent annual growth in the monetary base, *ceteris paribus*. This rule specifies that the monetary base grows at 3 percent per year, with deviations from the 3 percent rule for changes in a 16-quarter difference in velocity, and for deviations of nominal GNP from target. The base target is deterministic, simply growing at 3 percent per year.

McCallum's rule has the monetary base responding to a 16-quarter difference in velocity in an attempt to detect and respond to permanent changes in velocity. A one-time permanent increase in velocity will lead to a reduction in the monetary base growth rate spread over a 16-quarter interval, after which it returns to its 3 percent per annum rate. If the velocity change lasts only one quarter, then the response of base growth is positive for one quarter, negative for the following quarter, and afterwards returns to its steady 3 percent per annum rate (absent further changes in velocity).

The term $\lambda(x^*_{t-1} - x_{t-1})$ in the base rule indicates the response of base growth to last quarter's deviation of nominal GNP from target. The parameter λ indicates the speed with which deviations of nominal GNP from target are corrected. The larger is λ, the quicker is the deviation of nominal GNP from target corrected by base growth. Too large a value for λ can cause dynamic instability, however, so this parameter must be chosen with care. McCallum recommends a value of .25, which would generate an increase in base growth of 1 percent per year for each 1 percent deviation of nominal GNP from its targeted path.

To investigate the properties of this proposed rule, McCallum conducts simulation experiments from which he concludes that the adoption of his rule over the 1954-85 period would have produced a root mean square error (RMSE) of nominal income of 2 percent vs. an actual RMSE over this period of nearly 6 percent.

An issue that McCallum does not address is deviations of real GNP from the natural rate of output under his rule relative to the actual experience. Indeed, this is difficult to assess for several reasons. First, measures of the natural rate of output such as potential GNP are, at best, rough constructs. Second, alternative macroeconomic models reach very different conclusions about the decomposition of nominal GNP into its real GNP and price level components. Therefore, McCallum's rule, even if it smooths nominal GNP relative to the historical experience, may not be optimal because part of the historical experience may reflect changes in the natural rate of output, to which real GNP and, under some monetary procedures, nominal GNP should respond.

generating desirable results in simulations across a variety of empirical models.

Of course, it is difficult to evaluate the robustness of a policy rule across alternative theoretical constructs; moreover, even doing so is no guarantee that the theoretical constructs considered actually contain one that conforms "closely" (somehow defined) to the underlying "real-world" economy. Still, the exercise is worth conducting, if only to pinpoint the limitations of our knowledge of the economy. Indeed, such ignorance of how the economy works was precisely the reason Friedman used to advocate his constant money growth rule.

While such an exercise is complicated by the plethora of theoretical macroeconomic constructs available today, many that incorporate a natural rate structure on the supply side seem to show that a nominal GNP target, *if achievable on a timely basis*, will better stabilize the economy than a non-contingent policy rule, such as a fixed money growth rule. The specific state-contingent money rule found to be best, however, differs significantly across these models. Moreover, these models essentially ignore the effect of the lags that would be present in empirically implementing the state-contingent money rule.

After incorporating both the effect of these lags and the inconsistencies across models in ranking alternative state-contingent monetary policy rules, the presumed advantages of nominal GNP targeting become more tenuous.[13] For instance, the advantage of using nominal GNP targeting in the model described in this paper depends on the ability of the policymaker to recognize and respond to changes in nominal GNP more quickly than the private sector can recognize and respond to shocks to the economy. While this may seem reasonable for the model we use, other theoretical models yield other conclusions.

For example, one aggregate demand-supply model generates a positively sloped aggregate supply curve by assuming that workers have incomplete information about the current economic environment; specifically, they lack information on the current prices of goods that they purchase infrequently. Workers accept nominal wage offers based on their *forecasts* of the price level rather than the price level itself. Nominal wages are assumed to be set by an auction market for labor services, in which the wage adjusts instantaneously to current economic conditions.[14] In this case, a larger-than-expected rise in the price of all goods means that workers' forecast of the price level are below the actual price level, thereby inducing workers to accept lower nominal wage offers than usual. Until workers discover what has happened to the price level (which includes observing prices for goods purchased relatively infrequently), they will continue to offer their labor services at a lower real wage than the one they would demand if they were fully informed. This lower real wage induces firms to expand employment and output. In this alternative framework, nominal GNP targeting may be preferable to a fixed money rule; but price level targeting always works to keep real GNP at the natural rate.[15]

Thus, even within an aggregate demand-supply framework, different underlying assumptions about how the labor market operates will produce different evaluations of the relative usefulness of alternative policy rules. Until economists can agree on a model that reasonably explains changes in the state of the economy, it is difficult to take the policy recommendations from any particular model very seriously. In particular, advocates of nominal GNP targeting cannot point to overwhelming theoretical justification for their policy recommendation.[16] Consequently, while the theoretical

[13]Bean (1983), however, demonstrates that nominal GNP targeting in a multiple-period, wage-contracting setting is still preferable to money targeting. In this case, the nominal GNP target is a prospective target, in which rational forecasts of next period's nominal GNP are held constant while the actual value of next period's nominal GNP may vary with unanticipated shocks. In this case, however, nominal GNP targeting is itself dominated by a more general state-contingent rule. Bradley and Jansen (1989) extend Bean's results to a model with elastic labor supply and wage indexing to price.

[14]See Rasche (1973) for an early example.

[15]See Bradley and Jansen (1988) for an analysis of price level targeting in a more recent version of this model.

[16]An additional point in the issue of ignorance of the true model is the well-known result of William Brainard (1967). If the parameter values of the economic model are not perfectly known, policymakers should respond cautiously when employing any state-contingent policy rule, including nominal GNP targeting. Investigating the properties of nominal GNP targeting in a variety of theoretical or empirical models is one way to assess the importance of this ignorance of the true model for policy prescriptions. Since the true model is almost certainly unknown to anyone not practicing mysticism in academic or policymaking garb, however, the theoretical case for any state-contingent policy rule is again weakened.

model outlined earlier in this paper strongly supports the usefulness of nominal GNP targeting, a similar model that differs only in the underlying assumptions about the labor market suggests that price level targeting is superior to nominal GNP targeting.

CONCLUSION

The potential usefulness of nominal GNP targeting for monetary policy purposes has gained widespread attention in recent years. Nominal GNP targeting has several useful features in the context of a simple theoretical model; chief among them is the stabilization of real GNP at its natural rate of output. Moreover, this stabilization occurs automatically, without monetary policymakers having to know what the natural rate of output actually is. Finally, in the case of demand (but not supply) shocks, nominal GNP targeting will also provide price level stabilization.

While nominal GNP targeting may be superior theoretically to alternative policy targets, several problems arise when considering real-world applications of nominal GNP targeting. Ignorance of the correct equations, parameter values and lag structure that characterize the U.S. economy reduces the appeal of nominal GNP targeting.

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