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NOMINAL GDP TARGETING FOR MIDDLE-INCOME COUNTRIES

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ABSTRACT It has been proposed that central banks should target Nominal GDP (NGDP), as an alternative to targeting the money supply, exchange rate, or inflation. But the proposal appears in the context of the largest advanced economies. In fact NGDP Targeting may be more appropriate for middle-sized middle-income countries. The reason is that such countries are more often subject to large supply shocks and terms of trade shocks. Such unexpected shocks can force the credibility-damaging abandonment of CPI targets or exchange rate targets that had been previously declared. But they do not require the abandonment of a nominal GDP target, which automatically divides an adverse supply shock equally between impacts on inflation and real GDP. The argument can be illustrated in a model where the ultimate objective is minimizing a quadratic loss function in output and inflation but a credible rule is needed in order to prevent an inflationary bias that arises under discretion. A NGDP rule dominates IT unless the Aggregate Supply curve is especially steep or the weight placed on price stability is especially high. Parameters estimated for the cases of India and Kazakhstan suggest that the Aggregate Supply curve is flat enough to satisfy the necessary condition. The general argument applies regardless whether the monetary authorities at a particular time seek credible disinflation, credible reflation, or simply a credible continuation of the recent path.
JEL F41, E52
Keywords Central bank, Developing, Emerging markets, GDP, Income, Inflation, Monetary policy, Nominal, Shock, Supply, Target, Terms of trade

ÖZ Merkez Bankalarının para arzı, döviz kuru veya enflasyon oranı yerine nominal GSYH (NGSYH)'yı hedeflemeleri önerilmektedir. Ancak, söz konusu önerinin en büyük gelişmiş ekonomiler bağlamında ortaya atıldığı görülmektedir. Aslında, NGSYH hedeflemesi, orta-ölçekli, orta-gelir düzeyindeki ülkeler için daha uygun olabilir. Bunun nedeni, söz konusu ülkelerin büyük arz şoklarına ve ticaret haddi şoklarına daha sık maruz kalmasıdır. Bu tarz beklenmedik şoklar, daha önceden açıklanmış enflasyon (TÜFE) veya döviz kuru hedeflerinin, kredibiliteye zarar verecek şekilde değiştirilmesini zorunlu kılabilmektedir. Diğer taraftan, söz konusu şoklar, nominal GSYH hedefinin değiştirilmesini gerektirmemekte, çünkü olumsuz bir arz şokunun etkisi otomatik olarak enflasyon ve reel GSYH arasında eşit olarak dağılmaktadır. Bu görüş, çıktı ve enflasyon üzerine tanımlı bir ikinci dereceden kayıp fonksiyonun minimize edilmesinin amaçlandığı bir modelle gösterilebilir, ancak ihtiyati karar durumunda ortaya çıkacak bir enflasyon sapmasını engelleyecek, kredibilitesi olan bir kural gerektirmektedir. NGSYH kuralı, Toplam Arz eğrisi oldukça dik veya fiyat istikrarının ağırlığı çok yüksek olmadığı sürece enflasyon hedeflemesi (EH) rejimine üstün gelmektedir. Hindistan ve Kazakistan için tahmin edilen parametreler, Toplam Arz eğrisinin gerekli koşulları sağlayacak kadar yatay olduğunu göstermektedir. Söz konusu görüş, para otoritelerinin belli bir dönemde kredibilitesi olan dezenflasyon, kredibilitesi olan reflasyon veya basitçe kredibilitesi olacak şekilde geçmiş patikayı devam ettiriyor olmasından bağımsız olarak geçerliliğini korumaktadır.
ORTA-GELİRLİ ÜLKELER İÇİN NOMİNAL GSYH HEDEFLEMESİ
JEL F41, E52
Anahtar Kelimeler Merkez Bankası, Gelişmekte olan, Yükselen piyasa ekonomileri, GSYİH, Gelir, Enflasyon, Para politikası, Nominal, Şok, Arz, Hedef, Ticaret Hadleri

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The aftermath of the Great Recession has seen the revival of proposals that monetary authorities should target Nominal GDP (NGDP), as an alternative to targeting the inflation rate or other variables.[1] The reasons for having a simple and publicly announced target are transparency and the anchoring of expectations. The general argument for GDP targeting is that it is robust with respect to unanticipated developments. A target such as some version of the CPI defeats the purpose if it has to be abandoned in the event of a shock.

Proposals for targeting NGDP arise almost invariably in the context of major industrialized countries. But a good case can be made that the idea is in fact more applicable to middle-sized middle-income countries.[2] The reason is that developing countries and other small open economies tend to experience bigger terms of trade shocks and supply shocks, such as weather-related disasters.

While focusing on industrialized countries, the recent revival of NGDP targeting has at the same time focused on the case of countries that seek to achieve a credible monetary expansion, including usually an increase in expected inflation. The motive has been to address economic weakness in the United States, United Kingdom, Euroland, and Japan, in the aftermath of the severe negative demand shock that hit them in 2008. Developing countries do not particularly need monetary expansion or higher inflation. But NGDP targeting, viewed in a wider perspective, is a way to achieve any monetary setting, not just expansion. When it was originally proposed by Meade (1978) and Tobin (1980) and supported by many other economists in the 1980s, the motive was to achieve credible monetary *discipline*, particularly a *decrease* in the inflation rate, rather than credible monetary expansion and an increase in inflation. Disinflation is still needed in some developing countries, like India. Regardless, the attractive feature of NGDP targeting, the robustness to unknown future shocks, is similar whether applied at times when the objective is a monetary setting that is easier, tighter, or unchanged.

[1] Woodford (2012) is the state of the art. The revival of nominal GDP targeting began in the blogosphere; Frankel (2012, 2013a) gives more references, including both the historical origins and recent bloggers.

[2] There had been earlier only a few obscure proposals that nominal GDP targeting be considered by developing countries: McKibbin and Singh (2003), Frankel (1995b), and Frankel, Smit and Sturzenegger (2008). These authors were thinking of, respectively, India, East Asia, and South Africa.

What is Different about Middle-Income Countries?

Monetary authorities in emerging markets, developing countries and transition economies are likely to have a more acute need to earn credibility than those in advanced countries. Many have a shorter track record, e.g., countries that emerged from the break-up of the Soviet Union in 1991. Many have histories that include episodes of monetary instability or even hyperinflation, e.g., in Latin America. One implication is that it may be more necessary for these countries to declare a nominal anchor, or even an explicit rule, than is the case for advanced countries.[3]

For a very small or poor country, especially one with under-developed financial markets, a fixed exchange rate may be the only natural anchor. But middle-sized middle-income countries are likely to want their exchange rate to float.[4] This is especially true of countries that experience high terms of trade volatility and other real shocks.[5] If the exchange rate is not to be their anchor, what is?

Another implication of the credibility problem in middle-income countries is that it may be more important that they actually be able subsequently to keep the chosen variable inside a target range most of the time, or abide by the announced threshold in the case of forward guidance. The Bundesbank had enough credibility that it could afford to miss its declared M1 targets most of the time (because velocity shocks would render them unrealistic). Other countries that do not have that luxury may need to consider more carefully how to choose a target ex ante that they are likely to be willing to live with ex post. Otherwise credibility may be reduced rather than enhanced.

The importance of choosing as target a variable that is robust to shocks brings us back to the question of what kinds of shocks countries experience. As shown in the minimal theoretical model that is sketched out below, the superiority of nominal income targeting to inflation targeting (narrowly defined) depends on the presence of supply shocks. As already noted, supply shocks tend to be more important in developing countries and commodity exporting countries, due to greater vulnerability to severe weather events and natural disasters, more strikes and social instability, and bigger terms of trade shocks. Even the productivity shocks featured in modern theoretical

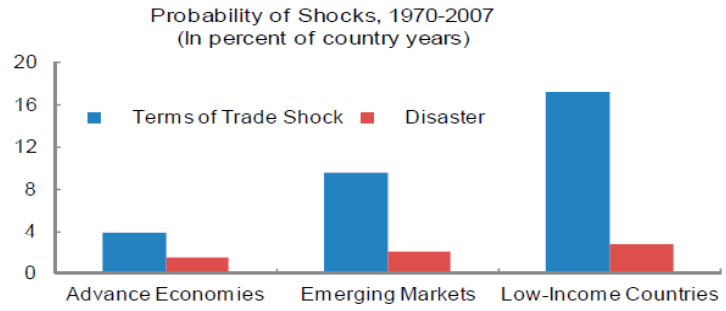
[3] e.g., Fraga, Goldafjn and Minella (2003).
[4] Frankel (2004) surveys the literature.
[5] The traditional textbook wisdom is that countries exposed to real shocks, particularly trade shocks, should float -- the exchange rate can then accommodate changes in the terms of trade – while countries exposed to domestic demand shocks, particularly monetary shocks, should fix. (e.g., Fischer, 1977.) Empirical confirmation that countries with high terms of trade volatility are better off floating comes from Broda (2004), Edwards and Levy Yeyati (2005), Rafiq (2011) and Céspedes & Velasco (2012).

models are likely to be larger in such countries. During a boom, the country does not know in real time whether the rapid growth is permanent (it is the next Asian Tiger) or temporary (the result of a transitory fluctuation in commodity markets or domestic demand).[6]

Natural disasters and terms of trade shocks are particularly valuable from an econometric viewpoint, because they are measurable and exogenous. Figure 1 shows that they are a more important source of volatility in emerging markets and developing countries than in industrialized countries.

Consider one prominent sort of terms of shock among developing countries: a fall on world markets in the dollar price of a commodity that the country exports. Neither an exchange rate target nor a CPI target would allow the currency to depreciate; both would automatically prevent it by calling for sufficiently tight money. An exchange rate target would not allow the depreciation by definition, while a CPI target would work against it because of the upward effect on import prices that would otherwise result. In both cases, sticking with the announced regime in the aftermath of an adverse trade shock would likely yield an excessively tight monetary policy. A nominal GDP target, by contrast, would allow accommodation of the adverse terms of trade shock: it would call for a monetary policy loose enough to depreciate the currency against the dollar. Under a nominal GDP target, adverse supply shocks are automatically divided between real output loss and inflation. This is what one would want.

Figure 1. Supply Shocks are More Frequent in Emerging Markets and Developing Countries



Sources: IMF(2011a): Managing Volatility: A Vulnerability Exercise for LICs.

[6] The trend growth rate in emerging market countries is highly variable: Aguiar and Gopinath (2007).

Levels, or Rates of Change?

There is a potentially important question whether real GDP, the price level, and nominal GDP are to be defined in terms of levels or rates of change. The version of NGDP targeting that has been revived in recent years is often a proposal to target the level of NGDP rather than the rate of change. (Recall that the immediate context, in the case of industrialized countries, is an attempt to achieve monetary expansion even when the nominal interest rate is constrained by the Zero Lower Bound.) The argument is that if the expansion turns out to fall short of the target in the first year, and yet the intentions of the authority are ultimately credible, then the shortfall will automatically generate a further boost to public expectations of coming monetary expansion and inflation, a reduction in the real interest rate, and thereby an accelerated movement toward the target. This argument for targeting the level of NGDP rather than the rate of growth is the same that had been offered earlier for proposals to announce a target for the price level rather than the inflation rate. In both cases, the pro argument is a faster return to the goal, provided the policy is credible. In both cases, the con argument is that the public may not understand, and may not believe, a target phrased in terms of the level of NGDP or the price level, as easily as a target phrased in terms of the rate of growth.

In the simple model developed below, we express variables in level terms. But that is only because we are thinking of everything defined as shocks, deviations from what was expected. The announcement of a goal for the rate of growth of nominal GDP one year into the future is the same as the announcement of a goal for the level one year into the future (given today's level). The authorities might rebase the target at the end of the first year, or they might not. The central issue here is nominal GDP versus CPI, not level versus rate of growth.

The Effects of Supply Shocks

Consider how each of three regimes behaves under each of three shocks: a pure domestic supply shock (such as a drought or earthquake) and two kinds of terms of trade shocks: a fall in the price of the export good, say autos, and a rise in the price of the import good, say oil. Of course other sorts of shocks can happen as well; but the premise here is that we are talking about a country where these three kinds of shocks are the biggest ones.

In the case of the exchange rate target, the currency is prevented from depreciating in response to an adverse supply shock or terms of trade shock, leaving the economy with a trade deficit (and with a loss in income if the

shock is a fall in the price of the export, inflation if the shock is a rise in import prices, and both if it is a supply shock). The CPI target, if taken seriously, can actually call for a monetary policy reaction that has the exchange rate moving in the wrong direction in response to these shocks. Only the nominal GDP target has the exchange rate depreciating in response to an adverse domestic supply shock or fall in the world price of the export commodity.

Under strict IT, to prevent the price index from rising in the face of an adverse supply shock monetary policy must tighten so much that the entire brunt of the fall in nominal GDP is borne by real GDP. As shown in Figure 2, the consequent fall in output puts the economy at an inferior (at point B, on a relatively inferior iso-welfare curve). Most reasonable objective functions would, instead, tell the monetary authorities to allow part of the temporary shock to show up as an increase in the price level so that the fall in output need not be as severe.[7]

Under the NGDP target, the adverse supply shock puts the economy at point C. This gives exactly the right answer if the simple Taylor Rule's equal weights accurately capture what discretion would do. In other words, under these special conditions, it captures the advantages of discretion but also the advantages of a transparent rule, for example avoiding the inflation bias that the Barro-Gordon model attributes to discretion. Even if not exact, the true objective function would have to put far more weight on the price stability objective than the output objective, or AS would have to be very steep, for the price rule to give a better outcome. That is not impossible: the case where IT dominates nominal GDP targeting even in the face of a supply shock is shown in Figure 3. It requires a steep AS curve and a flat loss-function tradeoff between output and inflation. These are parameters that can be estimated.

[7] This is precisely the reason why many IT proponents favor *flexible* inflation targeting, often in the form of the Taylor Rule, which does indeed call for the central bank to share the pain between inflation and output. e.g. Svensson (2000). (It is also a reason for pointing to the "core" CPI rather than "headline" CPI.)

Figure 2. When a Nominal GDP Target Delivers a Better Outcome than IT

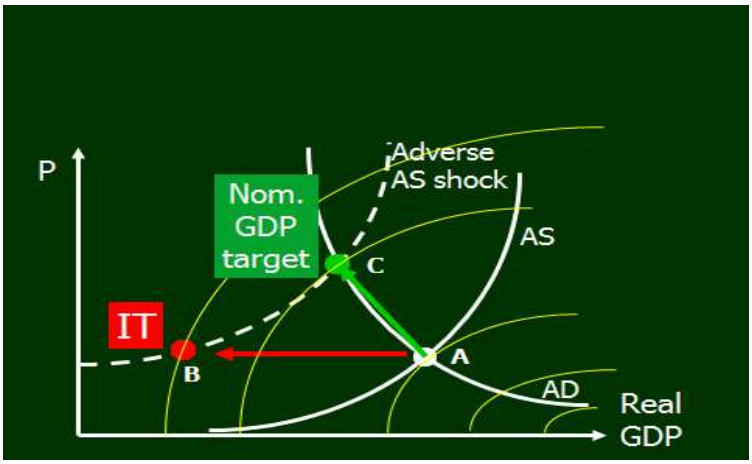
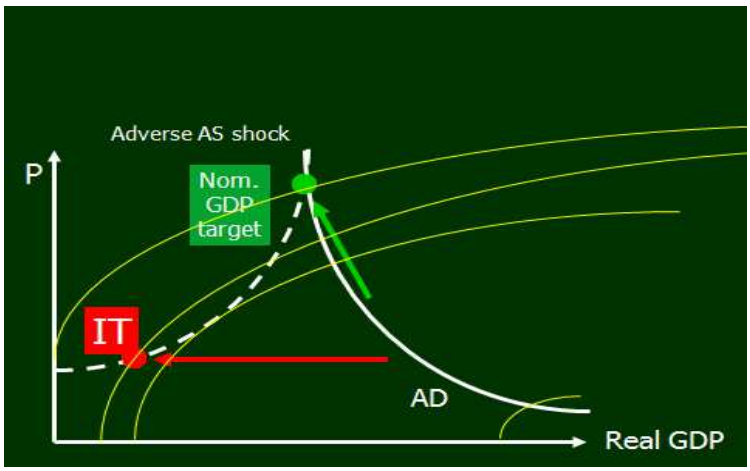


Figure 3. When IT Delivers a Better Outcome than a Nominal GDP Target



The Simple Theoretical Model

This section outlines the theory behind Figures 2 and 3.

We assume only two equations, one a supply relationship and the other for demand:

$$\text{AS: } y_t = b\,p_t - u_t \qquad u_t \equiv \text{adverse supply shock.} \qquad (1)$$

$$\text{AD: } p_t + dy_t = m_t + v_t, \qquad v_t \equiv \text{positive demand shock.} \qquad (2)$$

All variables are in logs, so the Aggregate Supply and Aggregate Demand curves become straight lines. Output y is expressed relative to potential output and the price level p is expressed relative to its expectation which, at a one-year horizon is the same thing as the inflation rate relative to its expectation. Expected inflation is important, even though it is not shown explicitly here: The point of having a credible rule is to influence expected inflation in a desired direction.

The simplest possible interpretation of Equation 2 is that it is the quantity theory of money, where m is defined as the money supply, d can be set to 1, and v is defined narrowly as a velocity shock. A slightly less simple interpretation of the Aggregate Demand relationship is that it is the reduced form of an IS-LM system, where the interest rate has been solved out, and v includes various sources of changes in demand. Under a third interpretation, m could be defined as simply the interest rate itself or as an index of monetary conditions (including the credit quantities, stock market prices and the exchange rate) – whatever is the preferred indicator of the monetary policy setting.

$$\text{Solving for the price level, } p_t = \frac{m_t}{1+db} + \frac{v_t}{1+db} + d\frac{u_t}{1+db}. \qquad (3)$$

$$\text{Solving for real income, } y_t = b\frac{m_t}{1+db} + b\frac{v_t}{1+db} - \frac{u_t}{1+db}. \qquad (4)$$

Equations 3 and 4 can be thought of as the base case where the money supply or other indicator of the monetary policy stance is set for the year. We could solve for one alternative case when monetary policy is varied so as to keep the price level p_t equal to an announced inflation target (IT) and a second alternative case when it is varied so as to keep nominal GDP equal to an announced target ($y_t + p_t$).

The government is assumed to have a price stability objective and an output stability objective. The two regimes, IT and NGDP targeting, can then be evaluated by their ability to minimize a quadratic loss function in inflation and output: $\Lambda = \boldsymbol{a}\,\boldsymbol{p}^2 + (\boldsymbol{y}-\bar{\boldsymbol{y}})^2$, where $\boldsymbol{a}$ is the weight assigned to the price stability objective, and we assume that the lagged or expected price

level relative to which p is measured can be normalized to zero. The preferred level of output is $\hat{y}$.

One good way to model the advantages of transparency and credible commitment is the framework of dynamic inconsistency and inflation bias. Barro and Gordon (1982) showed that if the central bank has full discretion to minimize the loss function in this model, there is an inflationary bias under rational expectations or in the long run: $p^e = Ep = (\hat{y} - \bar{y})\, b/a$. The point of a credible nominal target is to eliminate the inflationary bias. But the economy is still vulnerable to short-run shocks, and their impact depends on which variable has chosen to be the nominal target, as shown by Rogoff (1985) and Fischer (1990).

If the money supply is the nominal anchor, then $p + y = \bar{y} + v$. Combining with the Aggregate Supply relationship, the equilibrium is given by

$$y = \bar{y} + (u + bv)/(1+b), \quad \text{and} \quad p = (v - u)/(1+b). \tag{5}$$

Which regime minimizes the loss function? It depends on how big the shocks are, and how big a weight (a) is placed on price stability. In the case of a nominal GDP rule, the authorities vary the money supply in such a way as to accommodate velocity shocks. The equation $p + y = \bar{y} + v$ is replaced by the condition that $p + y$ is constant. The solution is the same as in the monetarist case, except that the v disturbance drops out. The loss function is unambiguously better than in the money rule case, as long as there are any velocity shocks. This was the basis of the original argument for NGDP targeting in the 1980s. (One needs to know both $var(u)$ and a, in order to be able to say that the rule dominates discretion.)

Under a price level rule, the authorities set monetary policy so that the price level is not just zero in expectation, but is zero regardless of later shocks. The price level rule is likely to dominate the money supply rule if velocity shocks are large. (If velocity shocks are small, the money supply rule collapses to the nominal GDP rule.)

The price level rule is in turn dominated by the nominal GDP rule if

$$a < (2 + b)b. \tag{6}$$

This condition does not automatically hold. The question is whether the inverse slope of the Aggregate Supply curve is high relative to the priority placed on price stability. This corresponds nicely to what we learned from looking at Figures 2 and 3. For example, if the condition $a < b$ holds, the necessary condition easily follows; nominal GDP targeting dominates. (The results asserted in the last three paragraphs are derived in Frankel, 1995a,b, 2011; and Bhandari and Frankel, 2014).

The original Taylor Rule from Taylor (1993), which is still the form in which it is most commonly presented, gives equal weight to output and price stability in determining how the monetary authorities should adjust their policy instrument, the real interest rate, in response to shocks: $\boldsymbol{a} = 1$. In that case, the criterion (6) becomes the question is whether $\boldsymbol{b} > \sqrt{2} - 1$. The important parameter that we need to estimate is *b*, the inverse slope of the supply curve. Is the AS curve flat enough? Is $1/b < 1/(\sqrt{2} - 1) = 1+\sqrt{2} = 2.414$?

Parameter Estimation

We need to know the parameters, especially the slope of the AS curve. (It would also be good to know how big the variance of the supply shocks is. If they are small, then the difference between NGDP targeting and IT is small.) In principle, these parameters can be estimated, so long as we have good instrumental variables to identify the two equations. Exogenous instruments to identify shifts in the Aggregate Supply curve include natural disasters such as droughts, hurricanes and earthquakes[8] and terms of trade shocks such as increases in import prices. Exogenous instruments to identify shifts in the Aggregate Demand curve include fluctuations in the incomes of major trading partners (weighted by bilateral trade) and military spending. The equations can be estimated by Instrumental Variables.[9]

$$\text{AS: } p_t = (1/b)\, y_t + (\alpha/b) x_t + (\beta/b) w_t + (1/b)\, u_t \quad . \qquad (1')$$

where $x_t \equiv$ adverse terms of trade shock;
$w_t \equiv$ adverse weather shock or other natural disaster; and
$u_t \equiv$ other adverse supply shock.

$$\text{AD: } y_t = -(1/d)\, p_t + (1/d)\, m_t + (\delta/d)\, y^*_t + (\gamma/d)\, g_t + (1/d)\, v_t, \qquad (2')$$

where
$y^*_t \equiv$ income shock among a weighted average of trading partners;
$g_t \equiv$ shock in government military spending as a share of GDP;
$v_t \equiv$ other positive demand shock.

When we estimate the AD relationship, we do not include a measure of m_t, which we implicitly solve out by means of a monetary reaction function. For

[8] Cavallo and Noy (2011).
[9] If there is a single exogenous or instrumental variable for each equation instead of two, then the slopes can be estimated by Indirect Least Squares: The ratio of the demand shock coefficient in the income equation (4) to the demand shock coefficient in the price equation (3) is an estimate of the crucial parameter *b*, the inverse slope of the Aggregate Supply Curve. The ratio of the supply shock coefficient in the price equation (3) to the supply shock coefficient in the income equation (4) is a statistical estimate of *-d*, the slope of the Aggregate Demand curve.

example, if the monetary authorities were targeting inflation during the sample period, weather shocks should in theory show up entirely in y_t and not at all in p_t. But if they were following one of the other regimes, such exogenous supply shocks should show in p_t as well as y_t .

Frankel (2013b) reports, in the context of an oil-exporting country, preliminary estimates of the coefficient in the Aggregate Supply equation, identified as such by means of the Instrumental Variables for demand shocks. In the case of Kazakhstan, over the period 1993-2012, the estimated Aggregate Supply slope at the one-year horizon is 1.66 and statistically significant. The point estimate satisfies the condition of being less than 2.41, thereby satisfying the necessary condition. (Its inverse, *b*, is greater than .41.) Thus under the assumptions we have made, it is estimated that Nominal GDP Targeting dominates Inflation Targeting for Kazakhstan, in terms of achieving the objectives of output and price stability.[10]

Bhandari and Frankel (2014) report preliminary estimates in the case of a large developing country, India, over the period 1996-2013. Here the extent of the annual monsoon rain is a particularly important supply shock.[11] The estimated Aggregate Supply slope at the one-year horizon ranges from .38 to .67, depending on the measure of inflation. Each estimate of the slope coefficient is not only significantly greater than zero statistically, but significantly less than 2.41.

In other words, the estimates suggest that India and Kazakhstan look more like Figure 2 than like Figure 3: The short-run Aggregate Supply curve is relatively flat. If inflation were not allowed to rise in response to an adverse aggregate supply shock, then the resulting loss in output would apparently be severe.

A truckload of qualifications is needed. The statistical analysis is only preliminary; some might regard as heroic the assumptions that were made to arrive at this point; and much has been left out of the analysis. But many other researchers have estimated short-run supply slopes as well. Although the issue can be controversial, estimated coefficients are commonly less than 2 or 2.4.

Some later versions of the Taylor Rule assign a smaller weight to inflation than to output in the short-term reaction function. Taylor (1999) has $\boldsymbol{a} = 0.5$. This would make the condition $\boldsymbol{a < (2 + b)b}$ easier to satisfy: $\boldsymbol{b} \geq 0.1$ would be sufficient. In this case, it would be enough that the AS slope is less than

[10] The results for other oil-exporting countries are not as good as for Kazakhstan. Natarajan (2014).
[11] Christensen (2013) also argues that India should target NGDP, on much the same grounds.

10. To reject this condition one would need to believe in a very steep short-run supply curve indeed.

Thus there are grounds for believing that NGDP targets accommodate supply shocks better than does Inflation Targeting. For middle and low-income countries prone to large supply shocks, this is an important consideration.

Summary of Conclusions

Pretty much everybody at least pays lip service to transparency, credibility, and anchoring of expectations. Perhaps some central bankers wish to retain full discretion de facto, even while declaring a monetary policy de jure. If so, fine. For example, it may be necessary to give the International Monetary Fund some sort of answer when the mission representative asks what the nominal anchor is.

But assuming that the desire for transparency, credibility, and anchoring of expectations is genuine, then surely it is desirable that the variable that is chosen is one that the country is likely to be able to live with. There is not much point announcing an M1 target if it is missed whenever there is a velocity shock. Similarly, there is not much point announcing an inflation target if it is missed whenever there is a supply or trade shock. The advantage of NGDP targeting, relative to Inflation Targeting, is that one is more likely to be able to stick with the target in the presence of supply or trade shocks.

The central point of this article is that the case for NGDP targeting is stronger for middle-income and low-income countries than for high-income countries. The reason is that they tend to experience larger terms of trade shocks and supply shocks.

The basic argument for NGDP targeting relative to IT holds regardless whether one favors the targeting of the level of the variable in question or the rate of change. It holds regardless whether the regime is instituted during a period when the goal is disinflation (e.g., India today; everyone in the 1980s), monetary stimulus (e.g., the largest industrialized countries, after 2008-09), or holding a steady course (many emerging market countries). It holds regardless whether one thinks that the central bank should announce a target range for the ex post outcome, target an ex ante forecast, or offer forward guidance in the form of a threshold for changing interest rates.

In a theoretical model where the ultimate objective is minimizing a quadratic loss function in output and inflation, NGDP targeting dominates IT unless the Aggregate Supply curve is especially steep or the weight

placed on price stability is especially high. The slopes of the Aggregate Supply and Aggregate Demand curves can be identified by using data on trading partner income and military spending as exogenous determinants of demand and data on natural disasters and commodity price fluctuations as exogenous determinants of supply. Preliminary estimates of this nature, for India and Kazakhstan, suggest that the Aggregate Supply curve is flat enough to satisfy the necessary condition.

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