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THE FATE OF FAIT
SALVAGING THE FED'S FRAMEWORK

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ABSTRACT

The Federal Reserve's transition to a flexible average inflation targeting (FAIT) framework in 2020 has come under intense scrutiny, given its failure to prevent the inflation surge of 2021 and 2022. These developments are the result of both a public misunderstanding about how FAIT works and the challenges created by the asymmetric design of the framework. As a result, some observers have called on the Federal Reserve to abandon FAIT and return to its previous framework. This paper, however, argues that FAIT should not be abandoned but improved upon by applying symmetry to its makeup policy and treatment of supply shocks. Doing so would give FAIT the properties of a nominal GDP-level target and turn it into a framework that follows the spirit of Woodford (2013) and Hetzel (2021). This paper calls this proposed framework FAIT-N and shows how to operationalize it using a measure called the NGDP gap.

METADATA

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DISCLAIMER

The Fate of FAIT

Salvaging the Fed's Framework

1. THE FED'S NEW FRAMEWORK

In August 2020, the Federal Reserve (Fed) changed its monetary policy framework from a flexible inflation target (FIT) to a flexible average inflation target (FAIT). This transition brought two major changes to the conduct of US monetary policy. First, FAIT requires the Fed to make up for past misses that were below the 2 percent inflation target, so that the average inflation rate over time stays close to target. This approach differs from FIT, where the Fed was less worried about past misses and usually let bygones be bygones.[1] Second, FAIT redefines the full-employment challenge as shortfalls rather than deviations from the maximum level of employment.

These changes were made by the Fed's main monetary policy-making body, the Federal Open Market Committee (FOMC), after a decade of undershooting the Fed's 2 percent inflation target. The FOMC was worried that this trend, along with the sustained decline of the neutral real federal funds rate, would put the federal funds rate regularly at its effective lower bound and impair the Fed's ability to conduct monetary policy. FAIT was viewed as a solution to this problem because it would keep inflation from persistently falling below target and allow the Fed to be more supportive of full employment.

Ironically, the year after FAIT was adopted, inflation rose to its highest level in 40 years owing to the supply chain bottlenecks and the large fiscal and monetary support during the pandemic. Furthermore, not only did inflation surge, but FOMC members predicted it would stay meaningfully above 2 percent through 2023. FAIT has proven far more successful in raising inflation than the FOMC ever expected.

Fed officials acknowledged in late 2021 that high inflation was becoming a serious problem, but their strategy for dealing with inflation under FAIT has led to a great deal of confusion. In particular, many observers assumed that because inflation has been well above 2 percent for more than a year, the Fed will run inflation below 2 percent for some time to satisfy the average inflation part of FAIT. However, the FOMC's Summary of Economic Projections (SEP) states that "appropriate monetary policy" over the next few years implies a return to 2 percent inflation from above. There is no planned undershooting of the inflation target to bring the average inflation rate back to 2 percent. Fed Chair Jerome Powell echoed this asymmetric view of FAIT at the January 2022 FOMC press conference: "[T]here's nothing in our framework about having inflation run below 2 percent so that we would do that, try to achieve that outcome."

Other Fed officials, such as former vice chair Richard Clarida, Governor Lael Brainard, and regional Fed presidents John Williams and Charles Evans, also see FAIT as asymmetric.[2] But many Fed watchers see this asymmetric interpretation by Fed officials as contradicting the FOMC's original desire for an average inflation target, a form of price-level targeting that

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[1] In 2016, however, the FOMC said it was worried about systematic misses in its inflation target in its *Statement on Longer-Run Goals and Monetary Policy Strategy*. Specifically, the FOMC added the following sentence to its statement: "The Committee would be concerned if inflation were running persistently above or below this objective."

[2] See Clarida (2020, 2021), Brainard (2020, 2021), Williams (2021), and Evans (2021).

requires offsetting of deviations from both above and below the 2 percent inflation target over a defined time horizon.[3]

So how do Fed officials reconcile this asymmetric treatment of inflation with FAIT? This paper argues that there are two ways to understand their interpretation. First, FOMC members never intended FAIT to be a symmetric price-level target. Rather, they saw the makeup portion of FAIT applying only to the undershooting of the inflation target in order to keep long-run inflation expectations anchored. Second, the FOMC's new emphasis on shortfalls from maximum employment makes the "flexible" part of FAIT much more important in implementing monetary policy. Specifically, it gives Fed officials greater ability to see through the inflationary effects of negative supply shocks that put the price stability and full-employment goals into conflict.

Still, this understanding raises questions about the fate of FAIT. Can a monetary policy framework with a one-sided makeup policy and so much flexibility on maximum employment maintain its inflation-fighting credibility? For some observers, the answer is no. They see the high inflation of 2021–2022 as evidence that FAIT has failed as a monetary policy framework (El-Erian 2021; Summers 2022). For them, it is time to scrap FAIT and return to FIT.

This paper, however, makes the case that FAIT can be salvaged by modifying it to be a special case of nominal GDP-level targeting (NGDPLT).[4] Specifically, if the elements of makeup policy and seeing through supply shocks are applied symmetrically, FAIT effectively becomes an NGDPLT while keeping long-run inflation expectations anchored at 2 percent. This paper proposes a novel way to implement this change to the FAIT framework: take the forecast of NGDP deviations from its neutral level—the NGDP gap—and embed it in a Taylor rule. Doing so creates a practical and FAIT-like reaction function for the FOMC. This forward-looking approach would have called for tightening monetary policy by mid-2021 and prevented some of the high inflation that emerged in 2021–2022. These proposed changes to the FAIT framework provide a starting point for conversations leading up to the FOMC's next review of its monetary policy framework in 2024–2025.

2. FAIT IS NOT A SYMMETRIC PRICE-LEVEL TARGET

During the FOMC's framework review of 2019–2020, the monetary policy framework that garnered the most public attention was average inflation targeting (AIT). Influential Fed officials such as New York Fed President John Williams and prominent academics such as Lars Svensson spoke extensively about it during this period.[5] As a result, it was covered widely in the press, and many observers expected it to be the Fed's new framework. AIT, in turn, was seen as a version of a symmetric price-level target (PLT) that had a defined time horizon for calculating the average inflation rate.[6] This understanding of AIT as a symmetric makeup policy was probably reinforced by the FOMC's 2016–2019 *Statement on Longer-Run Goals and Monetary Policy Strategy* that described its previous flexible inflation targeting (FIT) framework as being a "symmetric inflation goal," with which the Fed "would be concerned if inflation were running persistently above or below this objective." Given this framing, it was reasonable to expect that the next evolution of the Fed's framework would be symmetric, too. Consequently, when the flexible average inflation

[3] See Reis (2022), Sumner (2022), and Luther (2021).

[4] Many of the advantages of NGDPLT discussed in this paper are also discussed in Ireland (2022).

[5] See Mertens and Williams (2019, 2020) and Svensson (2020).

[6] See Wessel (2019), Reifschneider and Wilcox (2019), and Beckworth (2020a).

target (FAIT) framework was first introduced in August 2020, many Fed watchers failed to appreciate that the new framework was a one-sided approach to makeup policy rather than a symmetric one. As noted by Armaneth (2021), this created a disconnect between the public's expectations of the new framework and how it was actually implemented.

A careful reading of statements by Chair Powell and other Fed officials, however, shows that from the start, FAIT would be used as a makeup policy—the averaging part—only when inflation was running below target. This asymmetry in FAIT was first seen in Fed Chair Jerome Powell's August 2020 speech that announced the new framework and subsequently in the released FOMC's *Statement on Longer-Run Goals and Monetary Policy Strategy*. Both noted that "following periods when inflation has been running below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time" (Powell 2020; FOMC 2020a). There was no mention of running inflation below target if it had been running above 2 percent. FAIT was meant to be a one-sided form of makeup policy.

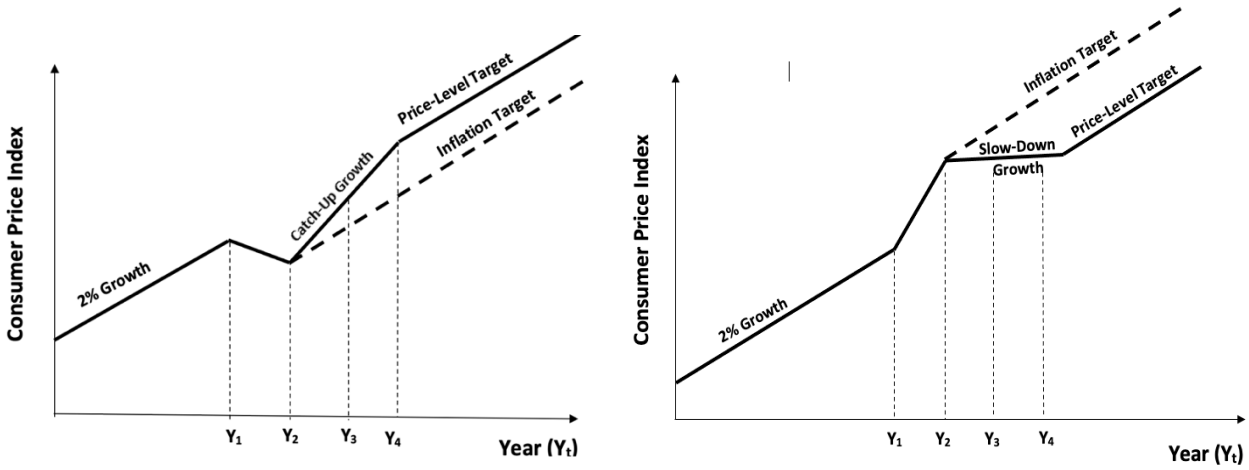
Other Fed officials quickly echoed this asymmetric view of FOMC.[7] In September 2020, Fed Governor Lael Brainard said that FAIT "would likely aim to achieve inflation moderately above 2 percent for a time to compensate for a period . . . when it has been persistently below 2 percent." But Brainard also said she "would expect the Committee to *accommodate rather than offset inflationary pressures moderately above 2 percent*" (Brainard 2020). Then Fed vice chair Richard Clarida noted both in a November 2020 speech and a January 2021 speech that the "new framework is *asymmetric* . . . the goal of monetary policy after lifting off from the ELB [effective lower bound] is to return inflation to its 2 percent longer-run goal, *but not to push inflation below 2 percent*. In other words, after liftoff from the ELB, monetary policy reverts to simple flexible inflation targeting" (Clarida 2020, 2021). Chicago Fed President Charles Evans explained in September 2021 that "FAIT is *asymmetric*: If the FOMC finds themselves undershooting for any extended period of time, they are prepared to overshoot to compensate, *but without the same worries for combatting high inflation*" (Evans 2021). Finally, New York Fed President John Williams explained in November 2021 that the goal of makeup policy is to "offset the downward bias to inflation expectations exerted by the lower bound under inflation targeting," but that if the "lower bound were to prove to be a less frequent constraint on policy" then the framework would "act very much like standard inflation targeting," where inflationary bygones are bygones (Williams 2021). Jerome Powell's January 2022 comment that there is "nothing in our framework about having inflation run below 2 percent" was simply a restatement of this understanding.

Figure 1 and its accompanying table illustrate the difference between the AIT framework expected by many and the actual FAIT framework announced by the FOMC by comparing them to two benchmark monetary policy regimes: a simple inflation target (IT) with no makeup policy and a price-level target (PLT) with symmetric makeup policy.

Both the IT and PLT aim for 2 percent inflation a year in this example. The top set of rows in the table (under "Hitting 2% Target") shows a scenario where there are no shocks. When this happens, IT and PLT are identical and generate an average inflation rate of 2 percent over the five-year sample. AIT and FAIT are identical to IT and PLT in the no-shock scenario.

[7] All emphases in this paragraph are added by the authors for this paper.

FIGURE 1. Inflation vs. Price-Level Targeting at 2%



	Y_0	Y_1	Y_2	Y_3	Y_4	Average Inflation Rate	AIT	FAIT
Hitting 2% Target								
Inflation Target	2.00%	2.00%	2.00%	2.00%	2.00%	***2.00%***	X	X
Price-Level Target	2.00%	2.00%	2.00%	2.00%	2.00%	***2.00%***	X	X
Below 2% Target								
Inflation Target	2.00%	-2.00%	2.00%	2.00%	2.00%	***1.20%***		
Price-Level Target	2.00%	-2.00%	***4.00%***	***4.00%***	2.00%	***2.00%***	X	X
Above 2% Target								
Inflation Target	2.00%	6.00%	2.00%	2.00%	2.00%	***2.80%***		X
Price-Level Target	2.00%	6.00%	***0.00%***	***0.00%***	2.00%	***2.00%***	X	

The second set of rows (under "Below 2% Target") shows what happens when a negative demand shock lowers inflation below target to minus 2 percent. The PLT makes up for this miss by running inflation above target for two years, and thereby maintains the 2 percent inflation average over the sample period. The IT does not make up for the miss and ends up with an average inflation rate of 1.2 percent. Both AIT and FAIT would mimic PLT in this negative demand shock scenario. The top-left graph in figure 1 illustrates the differences.

The third set of rows (under "Above 2% Target") shows a positive demand shock temporarily raising inflation above target to 6 percent. The PLT accounts for this overshoot by running inflation below target so that the average inflation rate is kept at 2 percent. The IT does not account for the miss and ends up with an average inflation rate of 2.8 percent. The outcomes are illustrated in the top-right graph of figure 1. In this scenario, AIT would mimic PLT, while FAIT would mimic IT. Note, though, that the average inflation rate under IT would eventually fall back to 2 percent as more years pass. This is consistent with the FAIT framework and is reflected in the

FOMC's *Summary of Economic Projections* that shows current inflation falling back to 2 percent over several years.

The FOMC's asymmetric interpretation of FAIT is understandable, given that a key motivation for the framework review was the prior decade of below-target inflation. This development, coupled with a declining real neutral federal funds rate, had Fed officials concerned that monetary policy may regularly hit the ELB. FAIT was the FOMC's solution to dealing with this specific problem of below-target inflation and the main reason why it is a one-sided makeup policy.

FAIT, therefore, can be seen as an asymmetric price-level target that is only used in ELB environments. Ben Bernanke recommended a similar approach in 2017 and called it a temporary price-level target (TPLT) (Bernanke 2017a, 2017b). Former Fed vice chair Richard Clarida acknowledged that FAIT drew heavily from Bernanke's ideas of TPLT and could be viewed as a version of it (Clarida 2020, 2021). It is worth considering, then, the original arguments made for TPLT and how FAIT compares to them.

3. FAIT AS A (POORLY IMPLEMENTED) TPLT

Ben Bernanke proposed TPLT in 2017 for the same reason the FOMC adopted FAIT in 2020: he was worried that the US economy would be increasingly stuck at the ELB or, as he calls it, the zero lower bound (ZLB). Bernanke saw TPLT as a practical solution to this predicament, because it preserved the Fed's existing framework of FIT in normal times but allowed temporary makeup policy at the ELB. Specifically, he called for "targeting the average inflation rate over the period in which the ZLB is binding." Stated differently, TPLT would "commit in advance to avoid raising rates at least until any shortfalls of inflation from the target during the ZLB period have been fully offset" (Bernanke 2019). This is the same one-sided makeup policy found in FAIT.

A key reason why Bernanke supported TPLT over PLT is that under the latter, "the central bank cannot 'look through' supply shocks that temporarily drive up inflation, but it must commit to tightening to reverse the effects of the shock on the price level." A TPLT, however, only turns on price-level targeting at the ELB, where the key challenge is negative demand shocks. Away from the ELB, TPLT becomes FIT and "allows policymakers to 'look through' temporary inflation shocks" (Bernanke 2017b).

This same reasoning also applies to FAIT. It, too, can "look through" supply shocks, not only because it resorts to FIT outside the ELB but also because it has explicitly accounted for such shocks in its *Statement on Longer-Run Goals and Monetary Policy Strategy* (FOMC 2020a):

> The Committee's employment and inflation objectives are generally complementary. However, *under circumstances in which the Committee judges that the objectives are not complementary,* it takes into account the employment shortfalls and inflation deviations and the potentially different time horizons over which employment and inflation are projected to return to levels judged consistent with its mandate. (emphasis added)

Here, the FOMC is giving itself increased flexibility for dealing with supply shocks—the shocks that create the circumstances where the full-employment and price goals are in conflict with each other. This exception for supply shocks, coupled with the new emphasis on "shortfalls" from

maximum employment, is why there is an F in FAIT. It is also the second source of asymmetry in the FAIT framework.[8]

Since its inception during the pandemic, FAIT has largely followed the prescriptions of Bernanke's TPLT. Specifically, the FOMC has used FAIT to conduct one-sided makeup for inflation at the ELB and has attempted to see through inflation caused by supply shocks related to the pandemic. Despite these efforts, FAIT is plagued by two weaknesses that make it a poorly implemented version of TPLT.

The first weakness is that FAIT relies heavily on discretion.[9] The FOMC determines the conditions under which makeup policy operates, and this makes FAIT susceptible to the time inconsistency problem as noted by the Fed's own staff during the 2019–2020 review of the framework.[10] Put differently, FAIT's heavy reliance on discretion creates more uncertainty about the future path of monetary policy. Former New York Fed president Bill Dudley believes the FOMC's use of this discretion in makeup policy has led to the reemergence of a "stop-go" monetary policy that plagued the Fed in the 1970s (Dudley 2021).

The second weakness is that FAIT faces multiple knowledge problems. FAIT empowers the Fed to see through inflation caused by supply shocks, but in real time this is a difficult task, as was vividly illustrated in 2021. The FOMC stated its makeup policy would end once inflation exceeded 2 percent and was expected to stay above it for some time. Personal consumption expenditure (PCE) inflation went well above 2 percent starting in March 2021. However, for the Fed to stop its makeup policy during this time, it needed to know whether the demand-driven portion of inflation had met the 2 percent threshold. The FOMC was understandably uncertain about this question, given that the large supply shocks from the pandemic were also contributing to inflation, and so waited until March 2022 to end the makeup policy, which contributed to the overheating of the economy. FAIT also requires that the Fed estimate shortfalls from "maximum" or full employment, but such measures are unobservable, time varying, and therefore incredibly hard to know in real time.

For some observers, such as Larry Summers and Mohammed El-Erian, these problems and the high inflation of 2021–2022 are prima facie evidence that FAIT has failed as a monetary policy framework (El-Erian 2021; Summers 2022). For them, it is time to scrap FAIT and return to FIT. FAIT, however, has some desirable features, such as makeup policy at the ELB and seeing through supply shocks. So before throwing the FAIT baby out with the bathwater, it is worth considering ways to improve upon and salvage the framework. One idea is to take these desirable features and apply them in a symmetrical and systematic manner—that is, adapt FAIT so that, one, it allows for makeup policy both above and below target inflation; and, two, it sees through inflation caused by both negative and positive supply shocks. If done in a rules-based manner,

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[8] As Charles Evans (2021) noted, "There is a second asymmetry depending on whether the shock comes from the supply or demand side."

[9] For example, from September 2020 to November 2021, the FOMC's conditions for ending makeup policy and starting liftoff were defined as "labor market conditions have reached levels consistent with the Committee's assessments of maximum employment and inflation has risen to 2 percent and is on track to moderately exceed 2 percent for some time" (FOMC 2020b, 2021). The terms *maximum employment* and *some time* were poorly defined and arguably lulled the Fed into complacency over inflation in 2021–2022.

[10] The Fed's staff noted the time inconsistency problem with TPLT in Duarte et al. (2020), which, as noted above, is nearly identical to FAIT.

these changes should go a long way toward making FAIT more credible and time consistent, according to a Fed staff report.[11]

Michael Woodford has shown that a practical way to implement this idea is to do nominal GDP-level targeting (NGDPLT). It automatically sees through supply shocks and, as a level target, does makeup policy for both above- and below-target misses caused by demand shocks. Woodford notes that "a commitment to a nominal GDP-level path is completely consistent with a commitment to a medium-term inflation target" (Woodford 2013, 6). Robert Hetzel has suggested a similar idea, in which the "FOMC announces benchmarks for nominal GDP growth that over time align with the FOMC's long-term inflation target" (Hetzel 2021, 2). Woodford and Hetzel both see medium-run inflation being anchored by the Fed maintaining a stable growth path for nominal GDP. This provides a way to salvage FAIT and is considered next.[12]

4. NGPDLT AS A MEDIUM-TERM INFLATION TARGET

An NGDPLT targets the level of total dollar spending in the economy and therefore keeps the aggregate demand on a stable trajectory. By singularly focusing on an aggregate demand growth path, NGDPLT is indifferent to how total dollar spending gets allocated between real economic activity and inflation. In other words, NGDPLT ignores short-term movements in inflation and allows them to reflect supply shocks. This is how NGDPLT is able to see through temporary supply shocks and provide a stable medium-term inflation target as suggested by Woodford (2013) and Hetzel (2021).

This point can be illustrated using the monetary policy-Phillips curve (MP-PC) model. It is a modified version of the aggregate demand-aggregate supply (AD-AS) model, where a monetary policy (MP) curve replaces the AD curve, and a Phillips curve (PC) replaces the short-run AS curve. The MP-PC model is derived in the appendix and falls under the "toy model" classification of Blanchard (2016)—that is, it is useful for communicating key ideas, given its transparent assumptions and simplicity. One way is by showing the economy in terms of inflation rates and real GDP growth rates, the convention used in popular discussions of the economy.

The model consists of three equations: Phillips curve (PC), monetary policy (MP), and full employment (FE):

$$\text{PC: } \pi_t = E_t\pi_{t+1} + \phi\Delta\tilde{y}_t + e_t^{PC}$$

$$\text{MP: } \pi_t + \Delta y_t = \Delta ngdp_t^{Target} + e_t^{AD}$$

$$\text{FE: } \Delta y_t^P = \Delta y_{t-1}^P + e_t^{FE}$$

In the PC equation, π_t is the current inflation rate, $E_t\pi_{t+1}$ is the expected inflation rate next period, $\Delta\tilde{y}_t$ is the change in the output gap, and e_t^{PC} is the PC shock, an inverse temporary supply shock.[13] The shock is temporary because it does not carry over to the next period. The change in

[11] Duarte et al. (2020), in particular, note that makeup policy will be "more credible if it provides the public with easily verifiable promises, if it explains its intended policy strategy in a variety of public communications, if the policy strategy is in effect both in expansions and recessions, and if the time horizon of its promises is relatively short" (15).

[12] Similarly, St. Louis Fed President James Bullard (2020) has argued that NGDPLT is similar in spirit to average inflation targeting.

[13] The Phillips curve can be derived from a short-run aggregate supply curve, and consequently e_t^{PC} can be viewed as an inverted supply shock.

the output gap is defined as $\Delta\tilde{y}_t = \Delta y_t - \Delta y_t^P$, where Δy_t is the change in the natural log of real GDP, and Δy_t^P is the change in the natural log of potential real GDP. For simplicity, the MP equation assumes the Fed can automatically adjust the NGDP growth rate, $\pi_t + \Delta y_t$, so that it hits its target NGDP growth rate, $\Delta ngdp_t^{Target}$. The MP equation, however, allows for temporary aggregate demand shocks, in the e_t^{AD} term, that may arise from some other source, such as fiscal policy. The FE equation shows that the growth of potential real GDP, Δy_t^P, is equal to last period's potential real GDP growth rate plus a permanent supply shock, e_t^{FE}.

Given that the Fed can hit its desired NGDP growth rate in this model and therefore has credible monetary policy, expected inflation becomes the difference between the targeted NGDP growth rate and the expected potential real GDP growth:

$$E_t\pi_{t+1} = \Delta ngdp^{Target} - E_t\Delta y_{t+1}^P$$

The central bank can shift the MP curve by changing the targeted NGDP growth rate, and any point on the MP curve reflects a combination of $\pi_t + \Delta y_t$ that sums to the targeted NGDP growth rate.[14] Shifts in the PC are caused by changes in either the expected inflation rate or a temporary supply shock. Shifts in the FE curve are created by permanent supply shocks. Long-run equilibrium in this model occurs at the inflation rate and the real GDP growth rate, where the three curves intersect. In the short run, this condition may not hold as the economy adjusts in response to the supply and demand shocks.

Figure 2 puts this all together. It illustrates how an NGDPLT can provide a stable medium-run inflation target by assuming the Fed targets NGDP growth at 4 percent, potential real GDP is growing at 2 percent, and the medium-run inflation target is 2 percent.

Figure 2 shows the economy in equilibrium in year 1. Then, a negative supply shock occurs in year 2 and shifts the PC inward to point **b**, temporarily raising inflation to 3 percent and lowering real GDP growth to 1 percent. The NGDP-targeting central bank allows this temporary change in the composition of the NGDP because the overall targeted growth rate of 4 percent is still maintained. The shock, e_t^{PC}, does not carry over to the following year, so it does not change the expected inflation rate, and the equilibrium is restored in year 3. Finally, in year 4, a positive supply shock shifts the PC outward to point **c**. This temporarily lowers inflation and raises real GDP growth to 3 percent. Again, the NGDP-targeting central bank allows this temporary change in the composition of the NGDP because the overall targeted growth rate of 4 percent is still maintained.

[14] Put differently, the MP curve is a unit-elastic aggregate demand curve.

FIGURE 2. A 4% NGDP Target, Supply Shocks, and Inflation

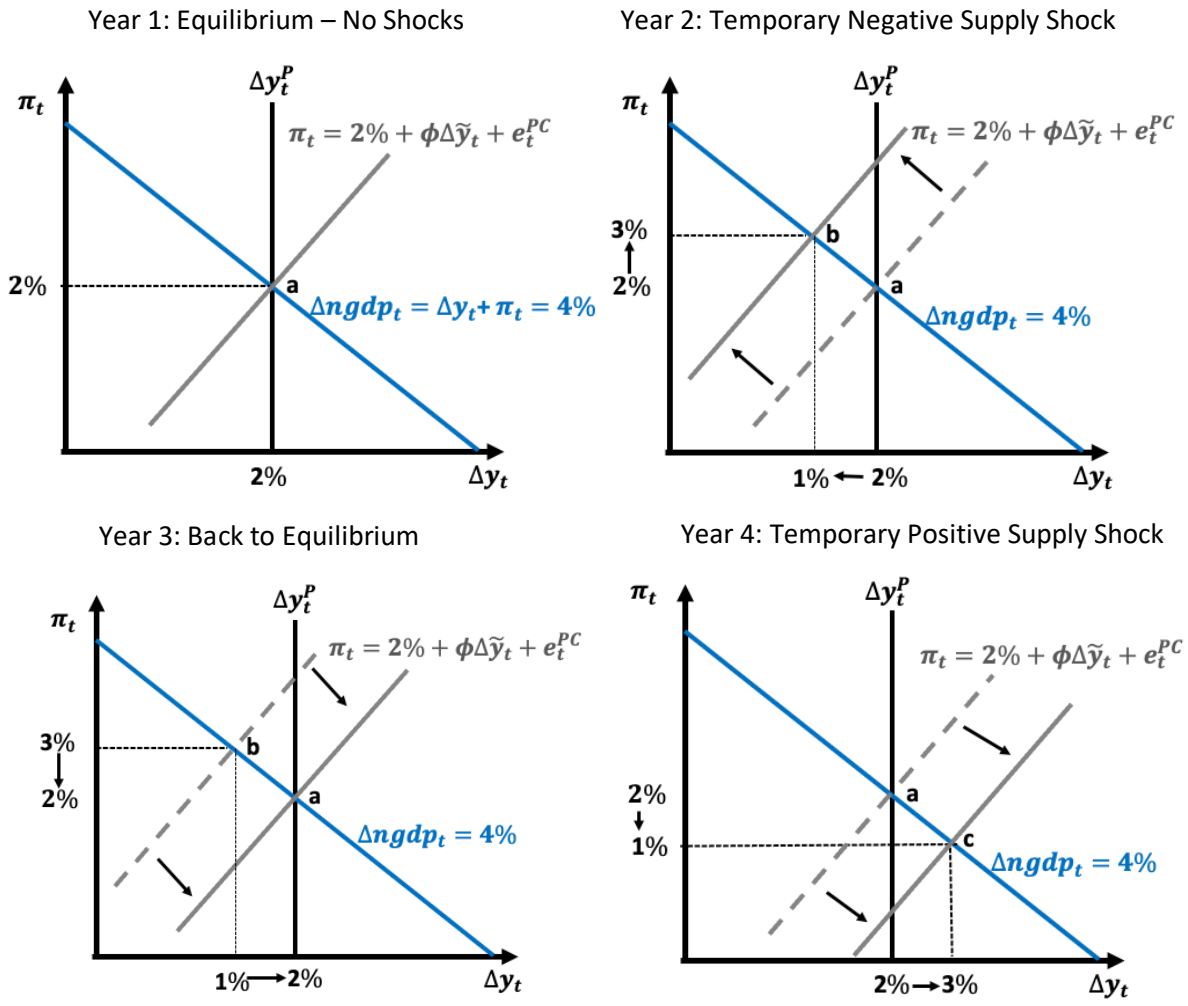


Table 1 summarizes the inflation and real GDP outcomes over the four years in figure 2. It shows that the negative and positive temporary supply shocks offset each other, so that over the medium run the inflation rate averages 2 percent. More generally, because temporary supply shocks are random and likely result in temporary inflation outcomes being distributed around the desired inflation rate, an NGDPLT should keep medium-run inflation anchored at 2 percent.

If the supply shocks are permanent, the analysis becomes more complicated, but it still results in an anchored medium-run inflation rate. The complication arises because the central bank will have to choose to update the NGDPLT to reflect the change in potential real GDP and maintain the existing inflation target or to update the inflation target and maintain the existing NGDPLT. Either way, the inflation rate will converge to the desired rate over the medium run and, therefore, fulfill the price stability objectives of Woodford (2013) and Hetzel (2021).[15]

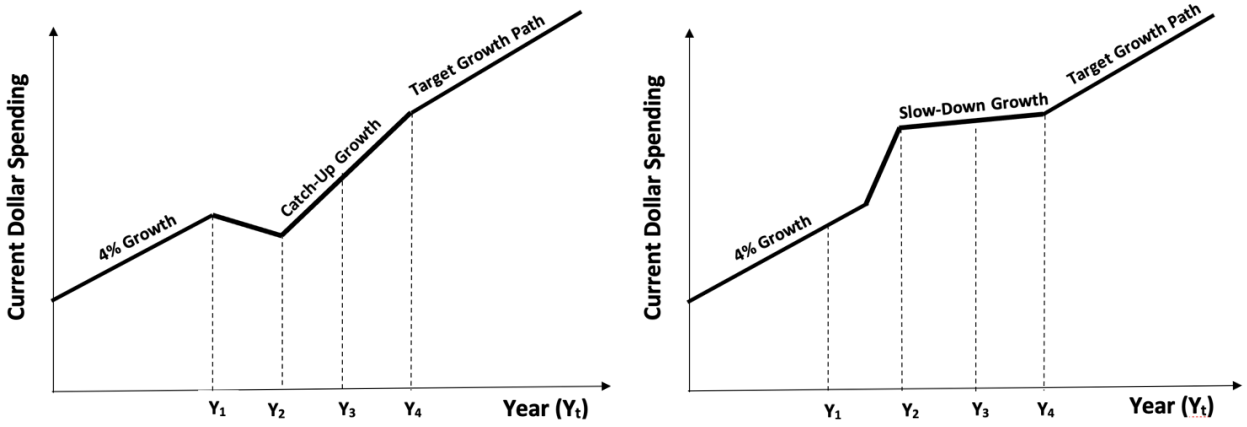
[15] More details on the two approaches to permanent supply shocks in an NGDPLT framework are provided in the appendix.

TABLE 1. Summary of MP-PC Model

Date	Type of Shock	$\Delta ngdp = \pi + \Delta y$
Year 1	No shock	4% = 2% + 2%
Year 2	Negative Supply Shock	4% = 3% + 1%
Year 3	No Shock	4% = 2% + 2%
Year 4	Positive Supply Shock	4% = 1% + 3%
Average		**4% = 2% + 2%**

Figure 2 assumes, for illustrative purposes, that NGDP will always be on its growth path target. Relaxing that assumption is not a problem because an NGDPLT by definition includes makeup policy for past misses of its target, from both above and below. This ensures aggregate demand is either on or returning to its targeted growth path and on average will conform to the outcomes seen in table 1. Figure 3 and its related table illustrate how this makeup policy would work.

FIGURE 3. Nominal GDP-Level Targeting at 4%



Hitting 4% Target	Y_0	Y_1	Y_2	Y_3	Y_4	Average
Dollar Size (Trillions)	$25.00	$26.00	$27.04	$28.12	$29.25	---
Growth Rate	4.00%	4.00%	4.00%	4.00%	4.00%	***4.00%***
Below 4% Target						
Dollar Size (Trillions)	$25.00	$24.75	$26.38	$28.12	$29.25	---
Growth Rate	4.00%	-1.00%	***6.59%***	***6.59%***	4.00%	***4.04%***
Above 4% Target						
Dollar Size (Trillions)	$25.00	$27.00	27.55%	$28.12	$29.25	---
Growth Rate	4.00%	8.00%	***2.05%***	***2.05%***	4.00%	***4.02%***

Like before, the Fed is assumed to be targeting 4 percent growth in NGDP each year and the US economy starts off at $25 trillion. The first set of rows in the table (under "Hitting 4% Target") shows what happens when the 4 percent growth objective is hit every year. The dollar size of the economy grows from $25 trillion in Y_1 to $29.25 trillion by Y_4. The second set of rows (under "Below 4% Target") shows what happens when NGDP grows below target and contracts 1 percent in Y_1. The Fed responds by growing aggregate demand at 6.59 percent for the next two years, which puts the dollar size of NGDP back on track. Also, the average growth rate over this period remains at 4 percent.

The third set of rows (under "Above 4% Target") shows what happens when NGDP grows above target at 8 percent in Y_1. The Fed responds by slowing down aggregate demand growth to 2.05 percent for the next two years, which puts the dollar size of NGDP back on track. Again, the average growth rate over this period stays at 4 percent.[16]

If this target were understood by the public and credible, it would create expectations of stable total dollar spending growth that become self-fulfilling. That is, households and firms would have less incentive to rapidly spend or hoard money if they believed the Fed would always correct past misses in its targeted aggregate demand growth path. A credible NGDP-level target, in other words, would lead to the public doing most of the adjustment in spending necessary to keep NGDP on its target growth path.[17]

NGDPLT, therefore, provides a way to maintain an inflation target over the medium run and preserves the desirable features of FAIT. How to reframe and salvage FAIT as a form of NGDPLT is considered next.

5. FAIT AS A NOMINAL GDP-LEVEL TARGET

To reframe and salvage FAIT as a form of NGDPLT, it is useful to begin with a Taylor rule, where the FAIT inflation target, π_t^{FAIT}, is used in place of regular inflation target, π^{IT}, and the "shortfalls from maximum employment" are reflected (via Okun's law) on the output gap term:[18]

$$i_t = i_t^n + \lambda_1(\pi_t - \pi_t^{FAIT}) + \lambda_2 min\{(y_t - y_t^P), 0\}. \quad (1)$$

Here, i_t is the prescribed target interest rate, i_t^n is the neutral nominal interest rate, $(\pi_t - \pi_t^{FAIT})$ is the inflation gap, and $min\{(y_t - y_t^P), 0\}$ is the output gap term that can only assume a negative value or zero. The output gap is measured as the difference between the natural log of real GDP and the natural log of potential real GDP. As noted above, FAIT attempts to see through supply shocks and make up for inflation below target when at the ELB. Consequently, the FAIT inflation target and its makeup term can be defined as follows:

$$\pi_t^{FAIT} = \pi^{IT} + \gamma\tilde{\pi}_t^D, \quad (2)$$

$$\tilde{\pi}_t^D = \left(\pi^{IT} - \frac{\sum_{i=1}^{n} \pi_{t-i}^D}{n}\right). \quad (3)$$

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[16] This point is also illustrated in the appendix using the macroeconomic model.

[17] Carola Binder (2020, 322) argues an NGDPLT could overcome the "deficit of understanding and . . . of trust" that plagues most inflation targeting.

[18] The February 2021 *Monetary Policy Report* from the Federal Reserve Board (2021) had a similar rule for shortfalls but stated in terms of the unemployment rate. Papell and Prodan (2022) provide an extensive treatment on how to modify Taylor rules for FAIT and what that means for monetary policy after the COVID-19 pandemic.

Here, $\tilde{\pi}_t^D$ is the makeup term that is equal to the average of *n* past inflation target misses caused by demand shocks.[19] The parameter γ is set equal to 1 in ELB environments and 0 elsewhere, so that $\tilde{\pi}_t^D$ is only activated at the ELB and reflects the asymmetric nature of FAIT.[20] Plugging these back into equation 1 gives the full FAIT Taylor rule:

$$i_t = i_t^n + \lambda_1(\pi_t - \pi^{IT} - \gamma\tilde{\pi}_t^D) + \lambda_2 min\{(y_t - y_t^P), 0\}. \quad (4)$$

This FAIT Taylor rule can be reframed in terms of an NGDPLT by first applying symmetry to the inflation and output gap terms. That is, the inflation gap term becomes $\lambda_1(\pi_t - \pi^{IT} - \tilde{\pi}_t^D)$, so that it is binding at all times, not just at the ELB, and the output gap becomes $\lambda_2(y_t - y_t^P) = \lambda_2\tilde{y}_t$. Note that as *n* gets larger, the inflation gap with its symmetric makeup term approximates a price-level gap, $\tilde{p}_t^D$, created by demand shocks that cause the price level to deviate from the price-level target implied by π^{IT}—that is, $(p_t - p^{IT})$.[21]

Incorporating these changes into equation 4 gives us a new symmetric version of FAIT:

$$i_t = i_t^n + \lambda_1\tilde{p}_t^D + \lambda_2\tilde{y}_t \quad (5)$$

Next, note that an NGDP-level target that gradually updates its targeted value in response to changes in potential real GDP implies that most of the output gap will be driven over time by demand shocks. That is, $\tilde{y}_t \approx \tilde{y}_t^D$, where $\tilde{y}_t^D$ is the portion of the output gap caused by demand shocks. Also, recall that an NGDP-level target assumes that $\lambda_1 = \lambda_2$. Applying these restrictions to equation 5 gives us $i_t = i_t^n + \lambda_1(\tilde{p}_t^D + \tilde{y}_t^D)$, which is a nominal GDP-level target version of FAIT. That is, the term $\tilde{p}_t^D + \tilde{y}_t^D$ is equal to $ngdp_t - ngdpt_t^{LT}$, the difference between the actual and targeted natural log level of nominal GDP. Defining $\Delta\widetilde{ngdp_t} = ngdp_t - ngdp_t^{LT}$, we can more succinctly state the nominal GDP-level target version of FAIT as follows:

$$i_t = i_t^n + \lambda_1\Delta\widetilde{ngdp}_t \quad (6)$$

FAIT, therefore, can be reframed and salvaged as an NGDPLT simply by making the new features of FAIT—makeup term and shortfalls from full employment—symmetric. As noted by Woodford (2013) and Hetzel (2021), this approach anchors medium-run inflation and can be thought of as a form of inflation targeting. Consequently, this paper proposes calling the approach the *FAIT-N framework* because inflation is being anchored by an NGDPLT.

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[19] A more general makeup term for a symmetric average inflation target (AIT) would be: $\tilde{\pi}_t = \pi^{IT} - \frac{\sum_{i=1}^{n}\pi_{t-i}}{n}$. AIT that includes inflation deviations caused by both demand and supply shocks would be: $\tilde{\pi}_t = \tilde{\pi}_t^D + \tilde{\pi}_t^S$. FAIT aims to set $\tilde{\pi}_t^S = 0$, so that it is only doing makeup policy for $\tilde{\pi}_t^D$.

[20] Note that when the economy is not at the ELB and the output gap is negative, equation 4 becomes a regular Taylor rule.

[21] The inflation gap term, $\lambda_1(\pi_t - \pi^{IT} - \gamma\tilde{\pi}_t^D)$, can be restated as $\lambda_1[(\pi_t - \pi^{IT}) - \gamma\tilde{\pi}_t^D]$. The first term, $(\pi_t - \pi^{IT})$, captures deviations of the inflation rate from target in the current period. The second term, -$\gamma\tilde{\pi}_t^D$, captures past misses of inflation from its target. As *n* gets larger, the makeup term effectively returns the price level to its implied targeted growth path as determined by π^{IT}. Note that there can also be supply shocks that push the price level away from its implied target and create a price-level gap, $\tilde{p}_t^S$. If we define the implied price-level target as p_t^{LT}, then $p_t = p_t^{LT} + \tilde{p}_t^D + \tilde{p}_t^S$. The above analysis is focused only on the price-level gap created by demand shocks: $\tilde{p}_t^D = p_t - \tilde{p}_t^S - p_t^{LT}$.

6. OPERATIONALIZING FAIT-N: THE NGDP GAP

One challenge to implementing a FAIT-N framework is that NGDP data come out quarterly and are subject to revisions. A workaround for this problem is the current and forecasted NGDP gap measure developed by Beckworth (2020b) and Martinez and Schibuola (2021). This measure provides a monthly update of current and forecasted deviations of quarterly NGDP from its neutral level. The NGDP gap, therefore, provides a natural measure of the $\Delta\widetilde{ngdp}_t$ term in equation 6.

The neutral level of NGDP is defined as the public's expected growth path of NGDP or nominal income. The rationale for this understanding is that the public makes economic decisions based on forecasts of their nominal incomes. Households, for example, take out mortgages and car loans and firms commit to multiyear contracts on plants, raw materials, and labor based on forecasts of their nominal incomes. The actual realization of nominal incomes can turn out to be very different from what was expected, and this can cause painful disruptions if the public cannot quickly adjust their economic plans. These disruptions can be avoided by maintaining NGDP on the growth path expected by the public.[22] Put differently, the neutral level of NGDP can be seen as an implicit NGDP-level target estimated by the public given their outlook for nominal economic activity and the decisions they made based on it.

The neutral level of NGDP is calculated by taking the average of the past 20 quarters of consensus forecasts for the current quarter's nominal GDP level, or more succinctly,[23]

$$NGDP_t^{Neutral} = \frac{\sum_{i=1}^{20} NGDP_{t-i}^{Forecast(t)}}{20}. \quad (7)$$

For example, the estimated neutral NGDP level for 2021:Q4 equals the average of every forecasted NGDP level beginning in 2016:Q4 through 2021:Q3. The NGDP gap for 2021:Q4, then, is the percentage difference between the actual level of NGDP and this estimated neutral level, or

$$NGDP_t^{Gap} = 100x\frac{NGDP_t - NGDP_t^{Neutral}}{NGDP_t^{Neutral}}. \quad (8)$$

Beckworth (2020b) and Martinez and Schibuola (2021) show that using this five-year window creates NGDP gaps that closely follow the timing and size of standard output and employment gap measures. The NGDP gap is also relatively robust to NGDP data revisions. Martinez and

[22] To be clear, each household and firm will have an idiosyncratic component to its nominal income forecast, but there will also be a common component reflecting broader nominal income trends. For example, Eric French, Taylor Kelleye, and An Qi (2013) have shown that across all age, income, and education groups of consumers, expected nominal incomes fell at a similar pace during the Great Recession and contributed to the decline in aggregate consumption. It is this common component that the Fed can shape and that is reflected in aggregate nominal income forecasts.

[23] Using the average of the previous 20 quarters of forecasts reflects the fact that even though the public's nominal income forecasts change over time, the economic decisions made based on those past forecasts constrains future economic activity. The moving average over five years, then, reflects not only updates to forecasts but also the gradual easing of constraints made by these past decisions as time passes.

Schibuola (2021) find that the first, second, and third revisions to NGDP data create relatively small changes in the NGDP gap and typically do not change its sign.[24]

The NGDP gap shown in equation 8 is only a current measure that reveals the NGDP gap *ex post*. A forward-looking measure can be created using the following equation:

$$NGDP_{t+h}^{Gap} = 100x\frac{NGDP_{t+h}^{Forecast} - NGDP_{t+h}^{Neutral}}{NGDP_{t+h}^{Neutral}}, \quad (9)$$

where the forecasted future neutral level of NGDP, $NGDP_{t+h}^{Neutral}$, is calculated as follows:

$$\sum_{h=1}^{20} NGDP_{t+h}^{Neutral} = \frac{\sum_{i=1}^{20-h} NGDP_{t-i}^{Forecast(t+h)} + h \cdot NGDP_{t}^{Forecast(t+h)}}{20}. \quad (10)$$

The $NGDP_{t+h}^{Neutral}$ is created by using the same NGDP forecasts as before, but it now uses the full range of the forecasts through the forecasted horizon *h*. As this forecast horizon increases, the number of forecasts available to construct the neutral level declines. So equation 10 compensates for this by using the forecast of period *t* for each forecast dropped due to lack of data. Given the definition of the forecasted NGDP gap in equation 9, this means that, eventually, the forecasted values of neutral NGDP and actual NGDP converge, and the NGDP gap goes to zero.

The original data source Beckworth (2020b) used for constructing the NGDP gap was the Survey of Professional Forecaster (SPF) data provided by the Philadelphia Federal Reserve bank. The Mercatus Center continues to use these data in its NGDP gap web page that provides quarterly updates to the NGDP gap series.[25] Martinez and Schibuola (2021) use data from the proprietary Blue Chip Forecast (BCF), which also provides forecasts for quarterly NGDP but with additional monthly updates.

Both SPF and BCF create almost identical NGDP gap series, as seen in the top-left graph of figure 4.[26] The advantage to using the SPF data is that they are free and publicly available, while the advantage to the BCF data is their monthly frequency. The top-right graph of figure 4 shows the actual and forecasted versions of the NGDP gap with 10th and 90th percentile bands added to help provide a sense of precision. It is constructed using both the SPF and BCF data. Specifically, the current and past values (blue lines) of the NGDP gap are created using the SPF data, whereas the forecasted values (red lines) are created using the BCF. This approach makes the underlying data and construction of the current and past values available to the public for inspection via the NGDP gap web page, while also providing forecasts for the NGDP gap that can be updated every month.[27] Monthly updates are useful for policy making and, in two recent cases, have shown to be a leading indicator of large unexpected changes in aggregate demand growth.

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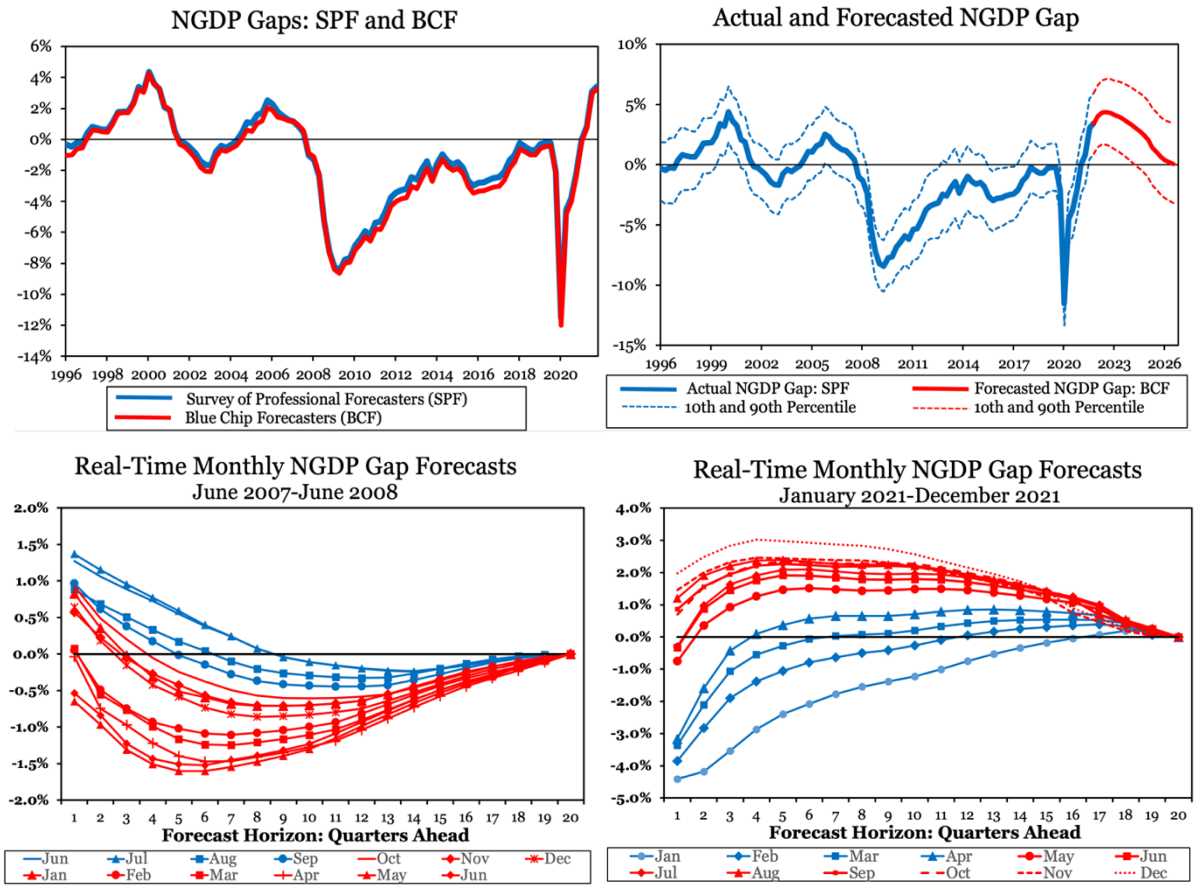
[24] Martinez and Schibuola (2021) show, however, that the comprehensive revisions that occur every five years can have a meaningful impact at times on the NGDP gap measure. Vintage data series used to reconstruct a real-time measure of the NGDP gap show that, in practice, the five-year revisions usually do not create problems for this measure.

[25] The NGDP gap, its accompanying data, and the vintage NGDP gap can be found here: https://www.mercatus.org/publications/monetary-policy/measuring-monetary-policy-ngdp-gap.

[26] The R^2 between the two NGDP gap series is 99 percent.

[27] The final BCF forecasted NGDP gap is also available on the NGDP gap web page, but its underlying data and construction are not available because the BCF is proprietary.

FIGURE 4: Actual and Forecasted NGDP Gap



Notably, the forecasted NGDP gap provided early warnings that NGDP was going to fall below its neutral level in 2008 and rise above it in 2021. The bottom-left graph of figure 4 shows the real-time monthly forecasts of the NGDP gap using vintage NGDP data between June 2007 and June 2008. These are, in other words, the monthly forecasted NGDP gaps that FOMC officials would have seen had they been looking at this series during this time period. The forecasts were showing positive NGDP gaps through September 2007 that turned modestly negative six to eight quarters ahead (shown in blue). Starting in October 2007, however, the forecasted NGDP gaps show larger negative values as early as three quarters ahead. By March 2008, there was a clear shift to persistently negative NGDP gaps that were forecasted to grow over the next five to eight quarters. The forecasts in red for October 2007 and beyond would have warned FOMC members that a large aggregate demand shortfall was imminent. This knowledge may have stopped the Fed from pausing rate cuts between April and October of 2008 and discouraged the rate-hike talk of many FOMC members during this time.[28]

[28] Beckworth (2016) shows evidence of this rate-hike talk by the fact that the one-year-ahead Fed fund futures rate grew from about 1.5 percent in April 2008 to 3.5 percent in June 2008. It started to gradually come down in late summer but remained near 2.5 percent through August 2008.

The bottom-right graph of figure 4 shows the real-time monthly forecasts of the NGDP gap for 2021. It reveals that for the first four months the NGDP gap was forecasted to be negative and large, followed by a return to zero or slightly above it (shown in blue). Starting in May 2021, however, there was a pronounced shift to positive and sustained NGDP gaps (shown in red). The size of these gaps continued to grow each month, and by summer it became an unmistakable warning of an unfolding aggregate demand overshoot. If the FOMC had been paying close attention to these forecasts, it may have tightened monetary policy in mid to late 2021 and avoided some of the high inflation that ensued.[29]

The NGDP gap thus provides a useful measure for the actual and projected growth path of aggregate demand. It has the desirable features of being forward-looking, easy to estimate using forecasts, relatively robust to data revisions, and available monthly. This understanding means the NGDP gap provides a practical way to estimate the $\Delta\widetilde{ngdp}_t$ term in a FAIT-N version of a Taylor rule, as in equation 6. These rules are considered next.

7. OPERATIONALIZING FAIT-N: NGDP GAP-BASED TAYLOR RULES

As argued above, FAIT can be salvaged as FAIT-N in the spirit of Woodford (2013) and Hetzel (2021). FAIT-N uses an NGDPLT to maintain an inflation target over the medium run and preserves the desirable features of FAIT. Implementing FAIT-N, however, requires the Fed to operationalize the interest rate reaction function in equation 6. As shown in the previous section, a practical way to do this would be to use the NGDP gap measure for the $\Delta\widetilde{ngdp}_t$ term. Because interest rate reaction functions are typically called Taylor rules, equation 6, which uses an NGDP gap, can be called an NGDP gap-based Taylor rule.

The previous section also showed that the NGDP gap can be constructed for current and future periods and, therefore, allows for different versions of equation 6 based on the forecast horizon. Consequently, three versions of the NGDP gap-based Taylor rule are considered in this section. The first uses the current NGDP gap, or $\Delta\widetilde{ngdp}_t$, and is stated as $i_t = i_t^n + \lambda_1\Delta\widetilde{ngdp}_t$. The second uses a weighted mix of the current and forecasted values of the NGDP gap and is stated as $i_t = i_t^n + \lambda_1\Delta\widetilde{ngdp}_t + \lambda_2\Delta\widetilde{ngdp}_{t+h}$. Here, the $\lambda_2\Delta\widetilde{ngdp}_{t+h}$ represents the NGDP gap at forecast horizon h. The third uses only the forecast version of the NGDP gap and is stated as $i_t = i_t^n + \lambda_1\Delta\widetilde{ngdp}_{t+h}$. The second and third versions follow the spirit of Svensson (2005) and Sumner (2013), who argue for targeting the forecast.[30]

As noted earlier, i_t^n is the neutral nominal interest rate, and it is generally viewed as being the neutral nominal interest rate over the medium term to avoid business cycle influences. Consequently, this paper uses the five-year, five-year forward inflation expectations rate because it is at a horizon sufficiently past the business cycle. To get a nominal neutral version of the five-year, five-year forward inflation expectations rate, the D'Amico, Kim, and Wei (2018) real

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[29] One might object to this claim by pointing out that countries with less monetary and fiscal easing in 2020–2021 also had high inflation. To be clear, although these forecasts would have helped avoid or at least mitigate inflation from excess demand, they would not have protected the United States against increases to the price level due to supply-side factors, such as disruptions to supply chains brought on by the COVID-19 pandemic or the Russia–Ukraine war. Also, given that much of the world's GDP is denominated in either dollars or currencies linked with the dollar, it is plausible that the United States effectively exported high inflation to other countries.

[30] One concern about NGDP targeting is that NGDP data for a given quarter do not come out until after that quarter, and this causes some to question how practical NGDP targeting is as a framework. The forecasted NGDP gap term in these last two forward-looking rules, however, is available on a monthly frequency and so provides a more regular update.

interest rate series at this horizon is used, with 2 percent added for the inflation target. This real interest rate series is based on market rates—the Treasury inflation protected security real yield—and adjusted for liquidity premium issues.[31] Adding the 2 percent is motivated by the findings that the FOMC was implicitly targeting 2 percent inflation in the early to mid-1990s, long before it officially adopted the target in 2012 (Ireland 2007; Stock and Watson 2010).

Taylor rules, like the three NGDP gap-based Taylor rules, are sometimes called "non-inertial" rules because the prescribed target interest rate fully adjusts to changes in the right-hand side variables. Following Clarida, Gali, and Gertler (1999), however, estimated Taylor-type rules are often "inertial" to incorporate the changes in the prescribed target interest rate, and so they include a lag of the target interest rate. These inertial Taylor rules reflect the Fed's tendency to gradually adjust its target interest rate, which is stated as $i_t = \rho i_{t-1} + (1-\rho) i_t^{Rule}$, where i_{t-1} is the last period's actual target interest rate value, i_t^{Rule} is the target interest rate prescribed by the Taylor rule for the current period, and ρ is ≤ 1. Table 2 summarizes the three NGDP gap-based Taylor rules and the inertial versions of them.

TABLE 2. NGDP-Based Taylor Rules

	NGDP Gap-Based Taylor Rule	Inertial NGDP Gap-Based Taylor Rule
Rule 1	$i_t = i_t^n + \lambda_1 \Delta n\widetilde{gdp}_t$	$i_t = \rho i_{t-1} + (1-\rho) i_t^{Rule\ 1}$
Rule 2	$i_t = i_t^n + \lambda_1 \Delta n\widetilde{gdp}_t + \lambda_2 \Delta n\widetilde{gdp}_{t+h}$	$i_t = \rho i_{t-1} + (1-\rho) i_t^{Rule\ 2}$
Rule 3	$i_t = i_t^n + \lambda_1 \Delta n\widetilde{gdp}_{t+h}$	$i_t = \rho i_{t-1} + (1-\rho) i_t^{Rule\ 3}$

Figure 5 shows what a fully operationalized FAIT-N interest rate path would look like under the various NGDP gap-based Taylor rules outlined above. In rule 1 and rule 3, $\lambda_1 = 1$, while in rule 2, $\lambda_1 = \lambda_2 = 0.5$. The graphs on the left use the one-year forecast of the NGDP gap for $\Delta n\widetilde{gdp}_{t+h}$, while the graphs on the right use the two-year forecast of the NGDP gap. Figure 5 and table 2 are constructed using the vintage data available at each period, and so they show how the prescriptions of a FAIT-N framework would have evolved in real time.

This example shows that FAIT-N would have created a similar path to the actual one for the federal funds rate with a few notable exceptions. First, FAIT-N would have lowered the federal funds rate sooner over the 2007–2008 period as the Great Recession was unfolding. This is especially true for the forward-looking versions of the NGDP gap-based Taylor rules. Second, like other Taylor rules, these rules would have called for negative interest rates during the ELB periods of 2008–2015 and 2020–2021. Finally, the NGDP gap-based Taylor rules would have raised the federal funds target much sooner and aggressively in 2021.

[31]The data for D'Amico, Kim, and Wei (2018) real interest rate series are updated monthly and can be found here: https://www.federalreserve.gov/econres/notes/feds-notes/tips-from-tips-update-and-discussions-20190521.htm.

FIGURE 5. NGDP Gap-Based Taylor Rules

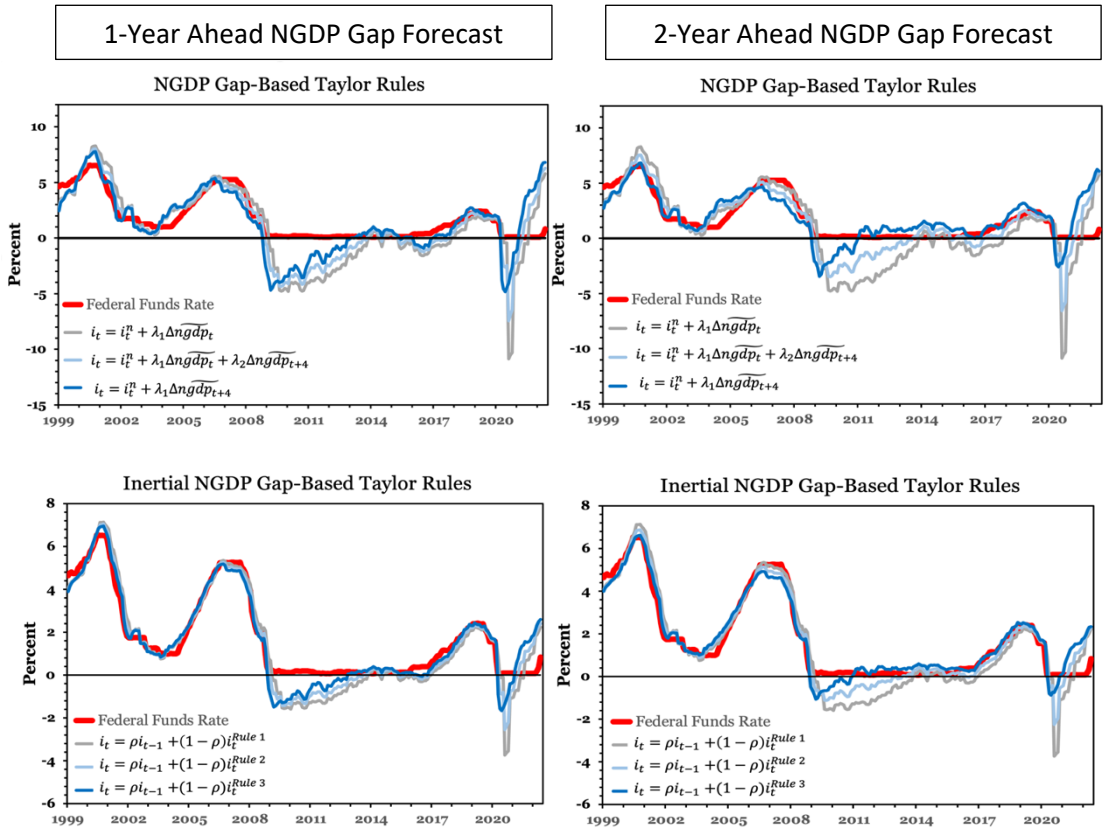

Table 3 shows the values for these rules starting in January 2021. All rules say the federal funds target should have started rising by August 2021, but to different degrees, depending on the NGDP forecast horizon used and whether the rule is a regular or inertial Taylor rule. Interestingly, the more forward-looking the rule, the earlier the call for raising the target interest rate.

TABLE 3. NGDP-Based Taylor Rules

1-Year Ahead NGDP Gap Forecast

	Regular Taylor Rules			Inertial Taylor Rules			
	Rule 1	Rule 2	Rule 3	Rule 1	Rule 2	Rule 3	Target FFR
01/2021	-3.14%	-2.08%	-1.03%	-1.04%	-0.67%	-0.30%	0.00-0.25%
02/2021	-2.30%	-0.85%	**0.60%**	-0.75%	-0.24%	**0.27%**	0.00-0.25%
03/2021	-2.17%	-0.32%	1.52%	-0.71%	-0.06%	0.59%	0.00-0.25%
04/2021	-2.18%	-0.02%	2.13%	-0.72%	0.04%	0.79%	0.00-0.25%
05/2021	-0.51%	**1.38%**	3.28%	-0.13%	**0.53%**	1.19%	0.00-0.25%
06/2021	-0.50%	1.62%	3.73%	-0.14%	0.60%	1.35%	0.00-0.25%
07/2021	-0.57%	1.62%	3.81%	-0.15%	0.62%	1.39%	0.00-0.25%
08/2021	**1.70%**	3.00%	4.30%	**0.66%**	1.11%	1.57%	0.00-0.25%
09/2021	1.81%	3.00%	4.20%	0.69%	1.11%	1.53%	0.00-0.25%
10/2021	1.86%	3.06%	4.26%	0.70%	1.12%	1.54%	0.00-0.25%
11/2021	2.56%	3.49%	4.42%	0.95%	1.27%	1.60%	0.00-0.25%
12/2021	2.64%	3.82%	4.99%	0.97%	1.39%	1.80%	0.00-0.25%
01/2022	2.80%	3.99%	5.18%	1.03%	1.45%	1.87%	0.00-0.25%
02/2022	5.00%	5.41%	5.81%	1.80%	1.94%	2.09%	0.00-0.25%
03/2022	5.21%	5.87%	6.53%	1.88%	2.11%	2.34%	0.25-0.50%
04/2022	5.40%	6.09%	6.77%	2.02%	2.26%	2.50%	0.25-0.50%

2-Year Ahead NGDP Gap Forecast

	Regular Taylor Rules			Inertial Taylor Rules			
	Rule 1	Rule 2	Rule 3	Rule 1	Rule 2	Rule 3	Target FFR
01/2021	-3.14%	-1.42%	0.30%	-1.04%	-0.44%	0.16%	0.00-0.25%
02/2021	-2.30%	-0.41%	**1.48%**	-0.75%	-0.08%	**0.58%**	0.00-0.25%
03/2021	-2.17%	-0.01%	2.15%	-0.71%	0.05%	0.80%	0.00-0.25%
04/2021	-2.18%	0.26%	2.70%	-0.72%	0.14%	0.99%	0.00-0.25%
05/2021	-0.51%	**1.47%**	3.45%	-0.13%	**0.56%**	1.25%	0.00-0.25%
06/2021	-0.50%	1.63%	3.76%	-0.14%	0.61%	1.36%	0.00-0.25%
07/2021	-0.57%	1.65%	3.87%	-0.15%	0.63%	1.41%	0.00-0.25%
08/2021	**1.70%**	2.93%	4.17%	**0.66%**	1.09%	1.52%	0.00-0.25%
09/2021	1.81%	2.99%	4.18%	0.69%	1.11%	1.52%	0.00-0.25%
10/2021	1.86%	3.07%	4.27%	0.70%	1.13%	1.55%	0.00-0.25%
11/2021	2.56%	3.45%	4.34%	0.95%	1.26%	1.57%	0.00-0.25%
12/2021	2.64%	3.72%	4.80%	0.97%	1.35%	1.73%	0.00-0.25%
01/2022	2.80%	3.92%	5.03%	1.03%	1.42%	1.81%	0.00-0.25%
02/2022	5.00%	5.20%	5.40%	1.80%	1.87%	1.94%	0.00-0.25%
03/2022	5.21%	5.59%	5.98%	1.88%	2.01%	2.14%	0.25-0.50%
04/2022	5.40%	5.82%	6.24%	2.02%	2.17%	2.31%	0.25-0.50%

The previous two sections have shown that FAIT-N can be operationalized using the NGDP gap in special versions of the Taylor rule to provide reasonable policy prescriptions when backtested with real-time data over the past few decades. FAIT-N, therefore, is a practical and straightforward way to improve on the shortcomings in the FAIT framework.

8. CONCLUSION

The confusion over the meaning of the FAIT framework and the Federal Reserve's failure to prevent the inflation surge of 2021–2022 have called FAIT framework's credibility into question. Some have even called for the Fed to abandon FAIT. This paper, however, makes the case that the Fed can salvage this framework by applying symmetry to its makeup policy and its treatment of supply shocks. Doing so gives FAIT the properties of a nominal GDP-level target and turns it into a framework that follows the spirit of Woodford (2013) and Hetzel (2021). This framework, called FAIT-N in this paper, would cause inflation to hit its target rate over the medium to long run and therefore still could be viewed as an inflation target.

This paper also shows how to implement FAIT-N using a Taylor rule that incorporates an NGDP gap term. The data for both the historical and forward-looking versions of the NGDP gap are available on the Mercatus Center's NGDP gap web page and are updated monthly. This is a ready tool for Fed officials when evaluating the stance of monetary policy and should be considered in the review of the Fed's framework in 2024–2025.

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APPENDIX

Further details on the MP-PC model presented in section 4 are provided in this appendix—specifically, how this model is derived, how it can be applied to NGDP-level targeting, and how to think about permanent supply shocks in an NGDP targeting framework.

Deriving the MP-PC Model

The MP-PC model begins with the equation of exchange identity: $M_t V_t = P_t Y_t$, where $M_t V_t$ is total dollar spending, or NGDP. Taking the first differences of the natural logs of the equation of exchange, which approximates growth rates, and denoting them in lowercase letters creates the following identity: $\Delta ngdp_t = \pi_t + \Delta y_t$. Here, $\Delta ngdp_t$ is the NGDP growth rate, π_t is the inflation rate (or $\pi_t = \Delta p_t$), and Δy_t is the real GDP growth rate. This framing puts the MP-PC model onto a two-dimensional space of π_t and Δy_t and, as noted earlier, is consistent with the popular notion of the economy being viewed in terms of inflation and real GDP growth. Everything else assumed about the model flows from this starting point.

Because NGDP is a measure of aggregate demand, the equation $\Delta ngdp_t = \pi_t + \Delta y_t$ implies a unit-elastic aggregate demand curve—that is, for a fixed $\Delta ngdp_t$, changes in Δy_t are perfectly offset by changes in π_t. This outcome is convenient when thinking about an NGDP target that aims for specific values of $\Delta ngdp_t$. Finally, a temporary aggregate demand shock that could arise from some non-monetary policy source, such as fiscal policy, is added to the equation. Putting this all together gives us the MP curve that reflects the aggregate demand side of the economy and monetary policy:

$$\text{MP: } \pi_t + \Delta y_t = \Delta ngdp_t^{Target} + e_t^{AD}. \tag{A1}$$

The real GDP growth rate, Δy_t, can be further decomposed into $\Delta y_t = \Delta y_t^P + \Delta \tilde{y}_t$, where Δy_t^P is the growth rate of potential real GDP and $\Delta \tilde{y}_t$ is the growth rate of the output gap. As noted previously, potential real GDP growth is defined as an autoregressive process that pins down full-employment output growth and defines the FE curve:

$$\text{FE: } \Delta y_t^P = \Delta y_{t-1}^P + e_t^{FE}. \tag{A2}$$

The FE equation has the growth rate of potential real GDP, Δy_t^P, equal to last period's potential real GDP growth rate plus a permanent supply shock, e_t^{FE}.

Short-run real GDP growth is defined by a short-run aggregate supply curve (SRAS), which is defined as $\Delta y_t = \Delta y_t^P + \alpha(\pi_t - E_t\pi_{t+1}) + e_t^{SRAS}$. Here, $\alpha = \frac{1}{\phi}$ and e_t^{SRAS} is a temporary supply shock to SRAS. This SRAS curve can be rearranged to get the Phillips curve (PC):

$$\text{PC: } \pi_t = E_t\pi_{t+1} + \phi\Delta\tilde{y}_t + e_t^{PC}. \tag{A3}$$

The output gap in the PC is in growth rate form $\Delta\tilde{y}_t = \Delta y_t - \Delta y_t^P$ because the model is derived in the two-dimensional space of π_t and Δy_t. The PC shock is defined as $e_t^{PC} = -\phi e_t^{SRAS}$ and is an inverse supply shock. Because this paper assumes the Fed can hit its desired NGDP growth rate and therefore has credible monetary policy, expected inflation becomes the difference between the targeted NGDP growth rate and the expected potential real GDP growth: $E_t\pi_{t+1} = \Delta ngdp^{Target} - E_t\Delta y_{t+1}^P$.

Combining the PC, MP, and FP equations and solving the model under the assumption of credible monetary policy, the equilibrium value for inflation and real GDP growth are as follows:[32]

$$\pi_t = (\Delta ngdp^{Target} - \Delta y^P_{t-1}) - e^{FE}_t + \frac{\phi}{(1+\phi)}(e^{AD}_t - e^{SRAS}_t) \quad \text{(A4)}$$

$$\Delta y_t = \Delta y^P_{t-1} + e^{FE}_t + \frac{1}{(1+\phi)} e^{AD}_t + \frac{\phi}{(1+\phi)} e^{SRAS}_t. \quad \text{(A5)}$$

When there are no shocks, these equilibriums are graphically depicted where the three curves intersect.

Applying the MP-PC Model to NGDP-Level Targeting

This paper makes the case for an NGDP-level target, a policy that keeps NGDP on a stable growth path and makes up for past misses. This appendix shows what NGDP-level targeting (NGDPLT) looks like graphically in the MP-PC model—specifically, what happens under NGDPLT when there are both positive and negative aggregate demand (AD) shocks that create above-target and below-target nominal spending. Like before, this paper assumes the Fed targets NGDP growth at 4 percent, potential real GDP is growing at 2 percent, and the medium-run inflation target is 2 percent.

The negative AD shock scenario is shown in figure A1 and summarized in table A1. The top-left graph in figure A1 shows the economy at equilibrium at point **a** in year 1. Then, shown in the top-right graph, a negative AD shock occurs in year 2 and shifts the MP curve inward to point **b**, temporarily lowering both inflation and real GDP growth to 1 percent, so that NGDP growth is now at 2 percent and below target. An NGDP-level target requires the Fed to make up for the 2 percent shortfall in NGDP growth in year 2 and generate the normal 4 percent NGDP growth for year 3. That means the Fed must run NGDP growth at 6 percent in year 3. This, shown in the bottom-left graph, causes both inflation and real GDP growth to rise to 3 percent at point **c**. Because the NGDPLT is a credible monetary policy that is understood by the public, this intentional makeup growth does not affect inflation expectations and keeps the PC pinned down. In year 4, shown in the bottom-right graph, the Fed returns NGDP growth to its regular 4 percent growth and brings both inflation and real GDP growth back to 2 percent.

[32] These solutions make use of rational expectations, such that $E_t(e^{FE}_{t+1}) = 0$. This makes $E_t \Delta y^P_{t+1} = E_t(\Delta y^P_t + e^{FE}_{t+1}) = \Delta y^P_t = \Delta y^P_{t-1} + e^{FE}_t$.

FIGURE A1. A 4 Percent NGDPLT, Negative AD Shock, and Makeup Growth

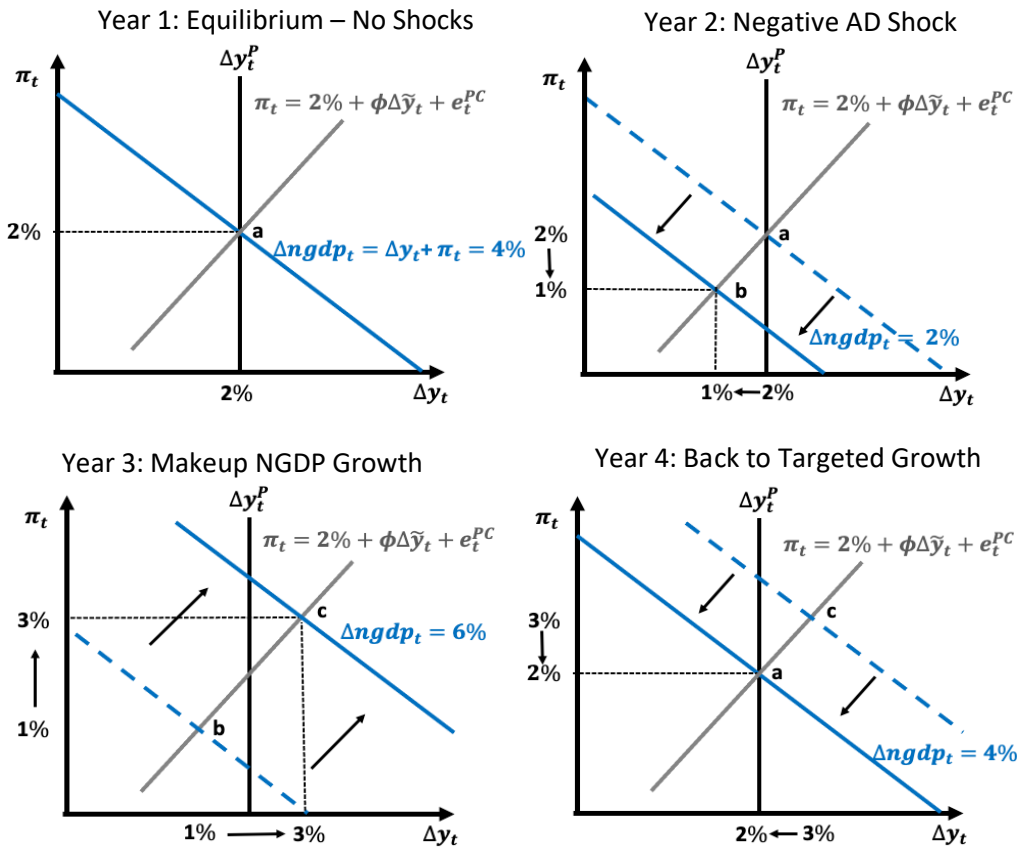


TABLE A1. Summary of MP-PC Model with Makeup Policy

Date	Shock/Makeup Policy	$\Delta ngdp = \pi + \Delta y$	Δy^p
Year 1	None	4% = 2% + 2%	2%
Year 2	Negative AD Shock	2% = 1% + 1%	2%
Year 3	Makeup AD Growth	6% = 3% + 3%	2%
Year 4	None	4% = 2% + 2%	2%
Average		**4% = 2% + 2%**	**2%**

Table A1 summarizes the inflation, real GDP growth, and potential real GDP growth over the four years from this example. It shows that the makeup policy causes average NGDP growth rate to be on target over the four years, which implies the level of NGDP is on target, too. Table A1 also shows that this outcome causes average inflation to be at its medium-run target of 2 percent and average real GDP growth to be in line with potential real GDP growth. NGDPLT works, therefore, to keep NGDP, inflation, and real GDP on stable growth paths over the medium term.

Figure A2 and table A2 show a similar outcome for a positive AD shock under NGDPLT. Makeup policy here requires slowdown growth that brings the averages over the four years back into line with the targeted values.

FIGURE A2. A 4 Percent NGDPLT, Positive AD Shock, and Makeup Growth

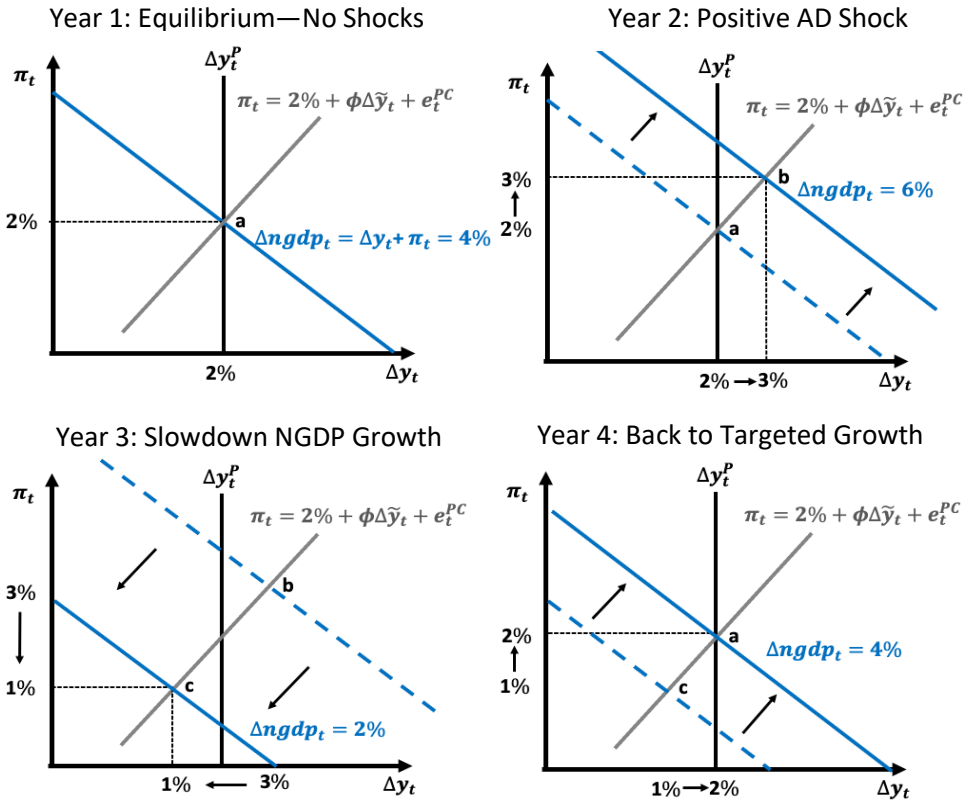


TABLE A2. Summary of MP-PC Model with Makeup Policy

Date	Shock/Makeup Policy	$\Delta ngdp = \pi + \Delta y$	Δy^p
Year 1	None	4% = 2% + 2%	2%
Year 2	Positive AD Shock	6% = 3% + 3%	2%
Year 3	Slowdown AD Growth	2% = 1% + 1%	2%
Year 4	None	4% = 2% + 2%	2%
Average		**4% = 2% + 2%**	**2%**

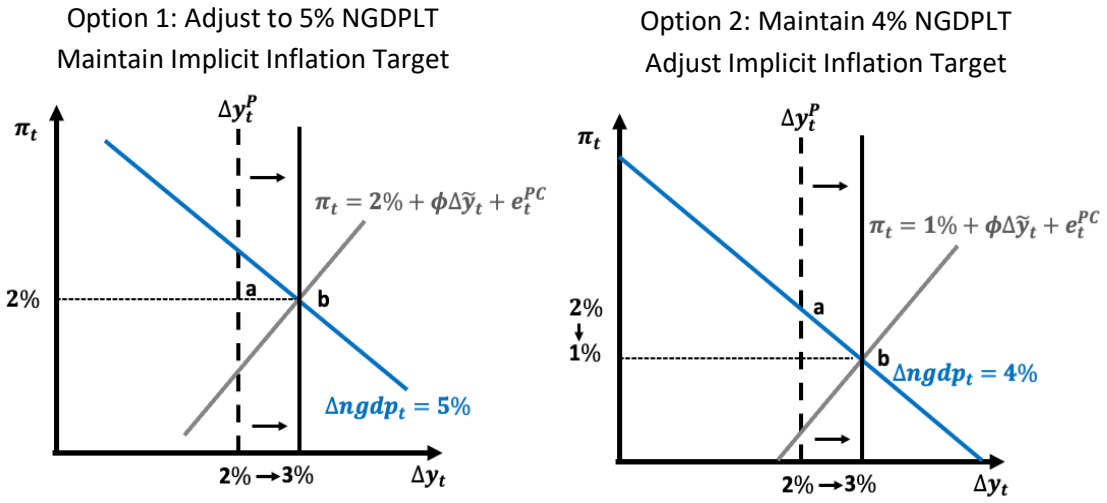
Supply Shock Concerns

As noted in this paper, one complicating factor for an NGDPLT is the supply shock, e_t^{FE}, because it causes permanent change in the potential real GDP growth rate. This shock would shift the FE line and force the Fed to choose to either update the NGDPLT to reflect the change in potential real GDP growth to maintain the existing inflation target, or update the inflation target to maintain the existing NGDPLT. Beckworth (2019a) discusses both options and notes that, historically, changes in potential real GDP growth rate have been gradual and therefore should be easy to

implement with an NGDPLT that gradually updates over time to reflect expected changes in potential real GDP growth. However, should there be large and sudden changes in potential real GDP, the disruptive nature may be better cushioned by keeping the NGDP-level target unchanged, because it would lead to better risk sharing across an economy with fixed nominal price financial contracts (Beckworth 2019b).

Figure A3 shows these two possible outcomes. Either way, the inflation rate will converge to the desired value over the medium run and, therefore, fulfill the price stability objectives of Woodford (2013) and Hetzel (2021).

FIGURE A3. A 4 Percent NGDPLT and a 1 Percent Permanent Positive Supply Shock



Another issue with the MP-PC model is that the SRAS is given unit elasticity. This assumption is adopted for convenience, but it may be a poor approximation to reality at really low and high levels of real GDP growth. But, as noted earlier, the MP-PC is a "toy model" and works well for illustrating and thinking about the baseline case for NGDPLT.