Commentary on "Beyond the Taylor Rule"[1]

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The inflation surge brought about by the post-Covid recovery and the Ukrainian war has put to test central banks' commitment to their inflation targets, as well as their ability to meet the latter while limiting the damage to the real economy. Central bank watchers of all sorts have monitored the decisions and communications of monetary policymakers in the face of the largest inflationary shock experienced by advanced economies since the widespread adoption of inflation targeting frameworks starting in the early nineties. The excellent paper by Nakamura, Riblier and Steinsson (NRS, henceforth) seeks to provide an assessment of monetary policy during that episode through the lens of monetary theory. A central motivation is the observation that during the inflation surge policy rates in many economies were raised less than one-for-one relative to inflation, seemingly contradicting a basic tenet of good monetary policy, the so-called Taylor principle. NRS provide several counterarguments to criticisms of monetary policy that hinge on that observation. They show, in particular, that in the presence of well anchored long run inflation expectations the optimal policy may have rendered further tightening unnecessary. This is in contrast with economies where inflation expectations may not have been

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well anchored, and where a more aggressive tightening may have been desirable. The empirical evidence provided by NRS seems consistent with that differential prediction. Overall, I believe the main message of the paper is to show the limitations of the Taylor rule as a one-size-fits-all guidepost for good policy.

In the present commentary I review different aspects of the NRS paper. Firstly, I summarize what in my view are their main findings, both empirical as well as theoretical. Secondly, I describe an approach to modeling monetary policy that I have advocated in recent work and that in my view holds some advantages relative to the type of Taylor rules widely adopted in the literature and that are the focus of the NRS paper. Finally, I discuss some of the challenges in measuring the extent of anchoring of inflation expectations.

1. Key Findings and Insights

Empirics

The first part of the NRS paper provides a careful exploration of the ability of the original Taylor rule (Taylor (1993)) as well as some variations thereof to account for the behavior of the Federal Funds rate in the U.S. over the period 1965-2025. As is well known, Taylor (1993) proposed a simple algebraic formula that approximated surprisingly well the Federal Reserve policy during the early years of Greenspan's tenure (1987-1992). Taylor's formula, widely known as the Taylor rule, makes the Federal Funds rate a linear function of the deviation of inflation from an implicit 2 percent target as well as the percent deviation of GDP from a deterministic trend, with coefficients 1.5 and 0.5 attached to those deviations, respectively, and with an intercept of 4.0 implying a steady state equilibrium real rate (r^*, for short) of 2 percent.

While the Taylor rule was originally intended as a *descriptive* tool (i.e. one that accounted for observed variations in the policy rate), two considerations helped give it also a *normative* value (i.e. a rule associated with "good" policy). Firstly, the rule provided a good description of Fed policy during a period characterized by low and stable inflation and unusually mild fluctuations in output and employment. The fact that such excellent macro outcomes coexisted with a policy well described by the Taylor rule led quite naturally to view that rule also as a guidepost for good policy. Secondly, several authors showed that the Taylor rule also performed well "in the lab," i.e. when embedded in a New Keynesian model, the workhorse model for monetary policy analysis. In fact, one could show that the optimal monetary policy in that model could often be implemented by some version of a Taylor rule (e.g. Clarida et al. (1999)). In the context of that research, an important aspect of the Taylor rule that plays a central role in the NRS paper was emphasized: the need for the inflation coefficient to be larger than one, thus implying a more than one-for-one response of the policy rate to variations in inflation. That property, properly qualified by the need to account for the size of the output coefficient as well, came to be known as the Taylor principle.[2] Failure to meet that principle is generally associated in the standard

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[2] See Woodford (2001)

model with multiplicity of equilibria and the possibility of fluctuations driven by self-fulfilling deviations in expectations independent of fundamental shocks (i.e. sunspot fluctuations). In fact, in some of my work with Rich Clarida and Mark Gertler we argued that the macro instability that characterized the U.S. economy in the pre-Volcker era may have been a consequence of a monetary policy that failed to respond with sufficient strength to fluctuations in inflation, thus violating the Taylor principle.[3]

In their paper, NRS revisit the evidence on the fit of the Taylor rule, pointing to sizable departures outside the period 1987-2008. They confirm a finding originally uncovered by Orphanides (2003), namely, that the bulk of the deviations between 1965 and 1979 vanish when real time data on inflation and the output gap are used. Some of the observed deviations since 2008 have a straightforward explanation: the presence of a binding zero lower bound (ZLB) at a time when the Taylor rule calls for *negative* rates. Less obvious, however, is the explanation for the sizable gap between the Federal Funds rate and the policy rate generated by the Taylor rule during the recent inflationary episode. That gap that results largely from the failure of the Fed funds rate to match (let alone overshoot) the observed rise in inflation, as called for by the Taylor rule. This observation, combined with the fact that inflation came under control despite the apparent weakness of the policy response, is the focus of the NRS's paper.

When NRS repeat the previous exercise using a battery of modified Taylor rules (including versions with inflation and output forecasts, alternative measures of

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[3] See Clarida et al. (2000)

inflation, different coefficients, or a first-difference specification) the fit is sometimes improved relative to the original Taylor rule but the qualitative findings above are not significantly altered. When they extend their evidence to other G7 countries as well as the euro area, they generally find a poor fit of the (original) Taylor rule, with the exception of the U.K.

The previous evidence leads NRS to dig further into the post-Covid episode. Here's where they come up with some novel cross-country evidence that I find particularly intriguing and thought-provoking. More specifically, they show the existence of a significant positive correlation across countries between (i) average inflation rate over the thirty-year period that preceded the pandemic and (ii) the size of the policy rate hikes during the post-Covid inflation surge. Furthermore, they show that countries with higher policy rate rises have been generally less successful in containing inflation during the recent episode; on the contrary, they appear to have experienced higher inflation. NRS interpret the previous findings as evidence of the gains from anchored inflation expectations (or the penalty paid from deanchored expectations). That observation paves the way for some the theoretical considerations in the second part of the paper.

1.b. Theory

The second part of the NRS paper contains a useful discussion of the implications of a weak response of monetary policy to inflation (and output), from a theoretical perspective. As the authors point out, much of the literature on the topic has focused on determining the conditions that a Taylor-type rule must satisfy in order to guarantee the (local) uniqueness (or determinacy) of a rational expectations equilibrium in a neighborhood of steady state. For the sake of concreteness consider a simple rule that responds to inflation only:[4]

$$i_t = r^* + \phi_\pi \pi_t$$

where i_t is the policy rate and π_t the rate of inflation between periods $t-1$ and t.

As is well known, the necessary and sufficient condition for a locally unique equilibrium when that rule is embedded into a standard New Keynesian model is given by $\phi_\pi > 1$, a condition known as the Taylor principle.[5] Thus, and as long as the central bank follows a rule like ([tr0]), evidence of a less than one-for-one changes in the policy rate relative to observed inflation should be interpreted of a policy potentially conducive to unnecessary macro instability and, hence, one that could be viewed as bad or undesirable.

As stressed by NRS, however, the previous interpretation would not necessarily be warranted once we consider more general rules. The simplest case corresponds to an extension of ([tr0]) with partial adjustment or inertia:

$$i_t = \phi_i i_{t-1} + (1-\phi_i)(r^* + \phi_\pi \pi_t)$$

with $\phi_i \in [0,1)$ idexes the degree of inertia. Once again it can be shown that $\phi_\pi > 1$ is a necessary and sufficient condition for local determinacy under the modified rule.[6]

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[4] Without loss of generality I am implicitly assuming a zero inflation target

[5] See e.g. Bullard and Mitra (2002).

[6] See, e.g. Woodford (2003)

Yet, and to the extent that $(1-\phi_i)\phi_\pi < 1$ the policy rate would respond less than one-for-one to changes in inflation, at least in the short run, which may lead an external observer to conclude that the policy pursued is not a desirable one due to the apparent failure of the Taylor principle. Perhaps more interesting is the case of a central bank that follows a rule given by:

$$i_t = i_t^* + \phi_\pi(\pi_t - \pi_t^*)$$

where $\{\pi_t^*, r_t^*, i_t^*\}$ denotes a *feasible* path for inflation and the real and nominal interest rates that the central bank seeks to implement, and where $i_t^* \equiv r_t^* + \mathbb{E}_t\{\pi_{t+1}^*\}$. In this case $\phi_\pi > 1$ is once again a requirement to guarantee that rule ([tr2]) effectively implements $\{\pi_t^*, r_t^*, i_t^*\}$ as a *unique* equilibrium. Yet, this is no reason to expect the policy rate i_t to respond more than one-for-one to *observed* variations in inflation for, whenever $\phi_\pi > 1$, the previous rule guarantees that $\pi_t = \pi_t^*$ for all t so that the second term on the right hand side will be zero in equilibrium, and there is no reason in principle why i_t^* should even comove positively with π_t^*, let alone display a pattern that can be approximated by a simple Taylor rule like ([tr0]) with $\phi_\pi > 1$. Put it differently, the Taylor principle in this case applies only to *off-equilibrium* paths that are not observed by an econometrician, what NRS refer to as a *minimalist* Taylor principle.

In order to illustrate the previous point NRS consider examples in which $\{\pi_t^*, r_t^*, i_t^*\}$ correspond to the solution to an optimal monetary policy problem, showing that the implied estimate of ϕ_π that would be recovered by an econometrician estimating a Taylor-type rule in that case would often imply an inflation coefficient less than unity.

They also discuss assumptions which may make it more likely for i_t^* to respond less than one-for-one to variations in π_t^* under the optimal policy. Those assumptions include a binding ZLB, the existence of long lags in the effects of policy on inflation (which render any response to a transitory shocks unnecessary), and correlated shocks (which may generate all sorts of patterns between i_t^* and π_t^* under the optimal policy). While NRS frame their discussion in terms of optimal policy, it should be clear that the argument applies more generally to any feasible equilibrium path $\{\pi_t^*, r_t^*, i_t^*\}$, optimal or not.

An additional set of theoretical results discussed by NRS deals with the implications for monetary policy design of modifications of the standard NK model that (i) reduce the degree of forward-lookingness of the latter as a result of finite-horizons planning, myopia or lack of common knowledge and (ii) de-anchor long term inflation expectations by making the latter respond to realized inflation. Interestingly, even small deviations from the standard model with regard to the previous dimensions appear to have important implications. In particular, and as analyzed in detail in the work of Dupraz and Marx (2025) cited by NRS, the presence of finite planning horizons rules out the possibility of equilibrium indeterminacy, while de-anchored expectations opens the door to inflation spirals in the absence of a sufficiently forceful monetary response to inflationary pressures.

2. The Taylor Rule: Some Limitations

As discussed above, the fact that the original Taylor rule as well as some its refinements provided a good fit of the path of policy rates in the U.S. during the Great Moderation period led to a normative interpretation of that rule, which came to be viewed as a useful guidepost for good monetary policy (albeit not necessarily one that should be followed mechanically). From that perspective, deviations from the Taylor rule have often been interpreted as a measure of an excessively tight or loose monetary policy. Taylor himself has been a forceful advocate of that normative use.[7]

As discussed by NRS, when that approach is applied to the recent inflation surge in the U.S. the Taylor rule gives a clear indication that policy rates were lifted late and, when they were finally lifted, their adjustment fell short of meeting the Taylor principle: the Federal Funds rate target was raised by slightly more than 5 percentage points in the face of a rise in inflation of about 8 percentage points.

But there are at least two considerations suggesting that such a mechanical assessment of monetary policy based on a Taylor rule may be highly misleading. Firstly, optimal monetary policy is not generally implementable by means of a simple Taylor rule and, when it is, its observable outcomes do not always satisfy the Taylor principle. This is illustrated by NRS by means of two examples, both using a basic New Keynesian model with cost-push shocks analyzed in Clarida et al. (1999). In their first

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[7] See, e.g. Taylor (2012).

example the central bank follows an *optimal discretionary policy* which gives rise to an *equilibrium* relationship of the form

$$i_t = r^* + \phi_\pi \pi_t$$

where $\phi_\pi > 0$ is a function of model parameters.[8] NRS show that ϕ_π may very well be less than one for a plausible range of parameter settings. This may give the impression that it is desirable for the central bank to lower the real rate in the face of an inflationary cost-push shock. But that conclusion would be misguided for, as stressed in Clarida et al. (1999), the previous relation can equivalently be written as

$$i_t = r^* + \gamma_\pi \mathbb{E}_t\{\pi_{t+1}\}$$

where γ_π is unambiguously larger than unity. Thus, the optimal policy necessarily implies an increase in the real rate $r_t \equiv i_t - \mathbb{E}_t\{\pi_{t+1}\}$ in response to an increase in *expected* inflation.

In their second example, NRS estimate a Taylor rule using interest rate, inflation and output data simulated under the *optimal policy with commitment*. For a number of model calibrations the estimated output coefficient is less than unity and, in some cases, it even switches sign and turns negative. But it is important to note that the policy under consideration is one that renders the price level stationary and can be better approximated with a simple interest rate rule that has the policy rate respond

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[8] Once again, a locally unique equilibrium is guaranteed by appending to the equilibrium expression above a term that has the policy rate respond more than one-for-one to deviations of inflation from its optimal path. In equilibrium that term is zero.

to the (log) deviations of the price level from a constant target, rather than with a Taylor-type rule that relates the policy rate to the rate of inflation.[9] Thus, under the optimal policy, and in response to an inflationary cost-push shock, the policy rate will generally remain high even when inflation turns negative as the price level reverts back to target. As a result, the size of the inflation coefficient in an estimated Taylor rule may be small, and could even be negative for some parameter values, as shown by NRS.

Secondly, it is worth stressing that versions of the Taylor rule with inertia or partial adjustment, like the one displayed in ([tr1]), which may imply a less than one-for-one short run response of the policy rate to inflation, have been shown to often perform better than a more conventional Taylor rule with a stronger short run response of the policy rate.[10]

3. An Alternative Approach: Long Real Rate Rules

In some ongoing work (Galí (2025)) I have advocated an approach to modelling monetary policy that focuses on the *long term real interest rate* as the relevant measure of the monetary policy stance. This is motivated by the fact that it is presumably that interest rate that is more closely related to the components of aggregate demand that play a key role in the transmission of monetary policy to

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[9] See Vestin (2006).

[10] See, e.g., Rotemberg and Woodford (1999).

output and employment and, subsequently, on inflation. This is in contrast to the standard Taylor rule, which focuses instead on a *short term nominal* rate.

The use of the long real rate has several advantages. Firstly, a positive relationship between the long real rate and equilibrium inflation can be shown to be a robust feature of optimal policy in the New Keynesian model. I refer to that property as the *long Taylor principle*, for it implies that the long nominal rate increases more than long run inflation expectations in response to an observed increase in inflation. The long Taylor principle can be thus used in the assessment of monetary policy, since it applies to the equilibrium (i.e. observed) variations in interest rates and inflation. This is in contrast with the conventional or *short* Taylor principle as applied to the policy rate (i.e. a short term nominal rate) which may or may not be satisfied in equilibrium under the optimal policy, as discussed above.

Secondly, it can be shown that the long Taylor principle is a desirable condition independently of the forward lookingness of the economy and the degree of anchoring. The reason is simple: stabilizing a rise in inflation caused by a cost-push shock requires a fall in the output gap; the latter can be brought about only if the long real rate increases. This is, again, in contrast with the conventional Taylor principle, which may fail to be observed in equilibrium under the optimal policy as illustrated in the analysis of Dupraz and Marx (2025) described by NRS.

Thirdly, the long Taylor principle can also be shown to be a sufficient condition for determinacy.

Fourthly, the long real rate makes it possible to capture the impact of forward guidance and QE on the monetary policy stance during ZLB episodes in which the policy rate remains persistently unchanged.

Finally, the adoption of a rule for the long real rate as a description of monetary policy in a standard monetary model often facilitates its analysis and equilibrium solution.

3.1. An Estimated Long Real Rate Rule for the U.S. Economy

Next I estimate a simple rule for the long real rate using quarterly U.S. data for the period 1991Q4-2024Q4. As a measure of the long real rate I use the difference between the yield on 10-year Treasury bonds and the (mean) 10-year inflation forecast from the Survey of Professional Forecasters. The resulting long real rate is displayed in Figure 1, with the shaded areas capturing the two ZLB episodes. Several features stand out. First, a clear downward trend is observed until the pandemic, most likely reflecting a downward trend in r^*. Secondly, there is no evidence of deflationary trap dynamics during the ZLB episodes, whereby a decline in inflation would lead to an increase in real rates that would lead to a further decline in inflation, etc. On the contrary, the Fed appears to have managed a significant reduction in the long real rate, more clearly so during the first ZLB episode, possibly through unconventional monetary policy interventions (forward guidance and QE). Such interventions, which may have played a role in limiting the deflationary pressures, are not captured by the policy rate. Thirdly, and more closely related to the NRS paper, we observe a substantial increase in the long real rate, starting as early as the second half of 2020 and ending in 2023, and thus in paralel to the rise in inflation. Accordingly, we see that the long Taylor principle was clearly satisfied during the recent inflation surge, in contrast with the seeming violation of the *short* Taylor principle.

Table 1 reports OLS estimates of a long real rate rule of the form:

$$r_t^L = \phi_0 + \phi_r r_{t-1}^L + \phi_\pi \pi_t + \phi_y y_t + \varepsilon_t$$

where r_t^L is the long real rate measure described above, π_t is denotes year-on-year core PCE inflation, and y_t is the percent deviation of GDP from its potential counterpart (as estimated by the CBO).

Different columns of Table 1 correspond to alternative specifications, including or excluding the output gap, and allowing or not for a multiplicative dummy interacting with inflation during the ZLB episodes and during the recent inflation surge. Three findings are worth noting. Firstly, the inflation coefficient is positive and highly significant in all the specifications considered, pointing to a systematic increase in the long real rate in response to an increase in inflation, a robust feature of any optimal policy. By contrast, the output gap coefficient is statistically insignificant in all but one specification, which suggests a clear focus on inflation by the Fed. Secondly, the coefficient on the ZLB dummy interacted with inflation is not statistically significant. This result confirms the findings in Debortoli et al. (2020) suggesting that the binding ZLB did not prevent the Fed from steering the long real rate in response to variations of inflation in a way similar to normal times. Finally, the insignificance of the coefficient on the dummy variable interacted with inflation for the recent inflation surge period suggests that the sensitivity of the long real rate to changes in inflation was not much different from earlier episodes, even if the policy rate response was weaker and more delayed.

3.2 A Tale of Two Countries: Brazil vs the U.S.

A comparison of the monetary policy developments in Brazil and the U.S. during the recent inflation surge helps illustrate how the use of the long real rate instead of the policy rate as an indicator of the monetary policy stance may lead to a significantly different assessment of the latter. Figure 2a displays the policy rate in both countries over the 2018-2025 period. As stressed by NRS, during the post-Covid inflation surge, the size of the increase in the policy rate in Brazil (or roughly 10 percentage points) was significantly larger than that observed in the U.S. over the same period (of 5 percentage points). NRS interpret that difference as the "price" that the central bank of Brazil had to pay as a consequence of poorly anchored inflation expectations. Leaving aside the interpretation of that difference, it is important to note that such a characterization of the relative degree of monetary policy tightening in the two countries is not invariant to the variable used as a measure of that stance. This is made clear in Figure 2b, which displays the evolution of the TIPS-based 10-year real interest rate in Brazil and the U.S. over the same period. In contrast with the policy rate, both the timing and size of the upward adjustment in the long real rate appears to be similar in the two economies. Thus, and to the extent that one views the long real rate as the correct measure of the monetary policy stance, the conclusion that the tightening of monetary policy was stronger in Brazil than in the U.S. during the recent inflation surge seems unwarranted.[11]

4. A Minor Quibble: Measuring the Extent of Inflation Expectations Deanchoring

A most interesting piece of evidence in the NRS paper is the one showing a strong positive relation across countries between (i) the size of the increase in the policy rate during the recent inflation surge and (ii) their average rate of inflation over the three decades ending in 2019. The authors interpret the latter variable as a measure of the extent of *de-anchoring* of inflation expectations. I do not find that interpretation fully satisfactory, for at least two reasons. First, it may be severely distorted by very high inflation episodes that occurred a long time ago and that may no longer be relevant, possibly because of the successful adoption and implementation of a new monetary policy regime under which inflation expectations may be fully anchored. Secondly, the measure used doesn't penalize de-anchoring on the downside, i.e. resulting from the persistence of inflation rates below the target. Thus, two countries with an identical average inflation record but with very different inflation volatilities would show in the NRS measure as having the same degree of anchoring.

[11] Of course, a different question is what led the central bank of Brazil not to run a tighter policy than the U.S. given that it was facing a much larger rise in inflation (and in inflation expectations).

Needless to say there are a number of alternative measures of de-anchoring, some of which have been used in the literature. Those include: (i) average absolute deviations from the inflation target, (ii) estimated sensitivity of long run inflation expectations to variations in realized inflation, and (iii) volatility of long run inflation expectations. It would be interesting to check the robustness of the NRS findings to the use of some of these alternative measures.

5. Conclusions

Overall, I find the NRS paper to be a highly welcome contribution to the monetary policy literature. There is much that both academics and policymakers can learn from it. Its main takeaway, in my opinion, is that one should be careful in using the original Taylor rule as a tool to assess mechanically the adequacy of monetary policy. In particular, it may be a mistake to label any significant deviation from the policy rate prescribed by the Taylor rule as evidence of "bad" monetary policy. The same applies to seeming violations of the Taylor principle. From that perspective I have argued that a positive comovement between the long real rate and inflation is a condition that a desirable policy in a variety of environments must satisfy, and one that can be easily checked.

References

Bullard, James, and Kaushik Mitra (2002): “Learning About Monetary Policy Rules,” *Journal of Monetary Economics*, vol. 49, no. 6, 1105-1130.

Clarida, Richard, Jordi Galí, and Mark Gertler (1999): “The Science of Monetary Policy: A New Keynesian Perspective,” *Journal of Economic Literature*, vol. 37, 1661-1707.

Clarida, Richard, Jordi Galí, and Mark Gertler (2000): “Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory,” *Quarterly Journal of Economics*, vol. 105, issue 1, 147-180.

Debortoli, Davide, Jordi Galí, and Luca Gambetti (2020): "On the empirical (ir) relevance of the zero lower bound constraint," *NBER Macroeconomics Annual* 34(1), 141-170.

Dupraz, Stéphane and Magali Marx (2025): "Keeping Control over Boundedly Rational Expectations," unpublished manuscript.

Galí, Jordi (2025): "Rethinking the New Keynesian Model," work in progress.

Orphanides, Athanasios (2003): “The Quest for Prosperity Without Inflation,” *Journal of Monetary Economics* 50, no. 3, 633-663.

Rotemberg, Julio and Michael Woodford (1999): "Interest Rate Rules in an Estimated Sticky Price Model," in Taylor, J. (ed.) *Monetary Policy Rules*, University of Chicago Press

Taylor, John B. (1993): "Discretion versus policy rules in practice." *Carnegie-Rochester Conference Series on Public Policy*. North-Holland, 195-214.

Taylor, John B. (2012): "The Great Deviation." in E.F. Koenig, R. Leeson and G.A. Kahn (eds.), *The Taylor Rule and the Transformation of Monetary Policy*, Hoover University Press, 163-172.

Vestin, David (2006): "Price-level versus Inflation Targeting," *Journal of Monetary Economics*, 53(7), 1361-1376.

Woodford, Michael (2001): "The Taylor Rule and Optimal Monetary Policy," *American Economic Review* vol. 91, no. 2, 232-237.

Woodford, Michael (2003): *Interest and Prices: Foundations of a Theory of Monetary Policy*, Princeton University Press.(Princeton, New Jersey)

Table 1. An Estimated Long Real Rate Rule for the U.S. Economy

	(1)	(2)	(3)	(4)	(5)	(6)
Inflation	0.08***	0.06**	0.09***	0.09***	0.10**	0.10**
Output Gap		0.02		0.04*		0.02
Inflation x ZLB			-0.04	-0.05		
Inflation x Surge					-0.01	-0.05

Note: See text for specification of the estimated rule. *, ** and *** denote statistical significance at the 10%, 5% and 1% respectively.

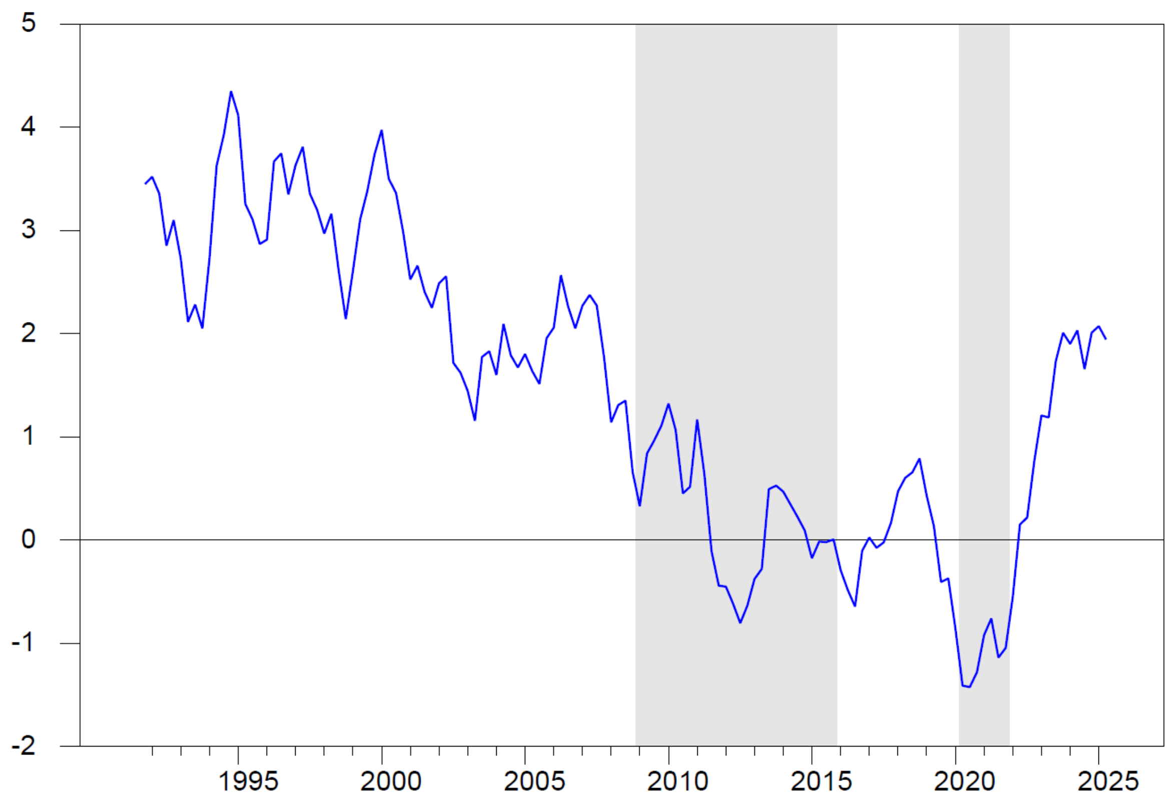

Figure 1. The U.S. Long Real Rate

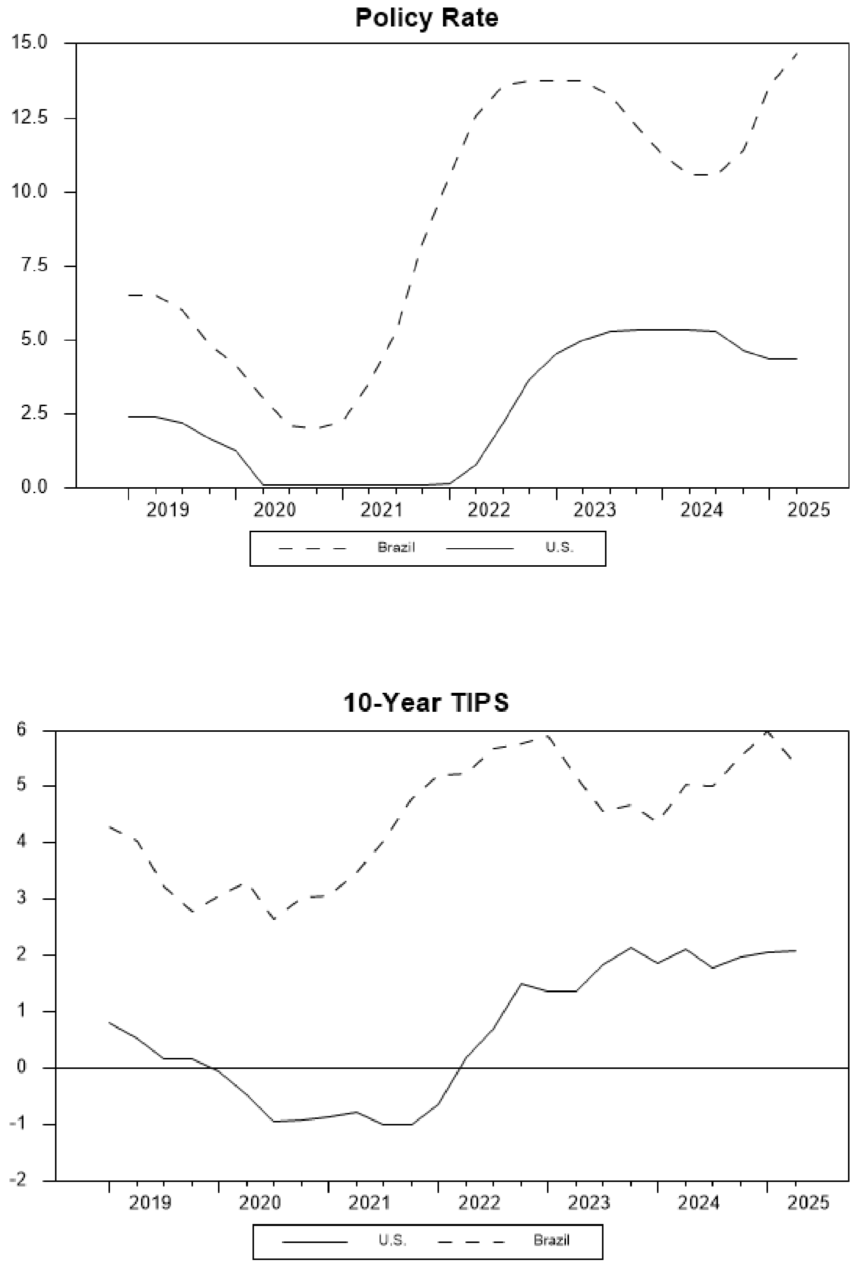

Figure 2. Policy vs Long Real Rates: U.S. and Brazil