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Notes on Covid-19, Potential GDP, and Hysteresis

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Abstract

Notes on Covid-19, Potential GDP, and Hysteresis
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This note provides a model framework for thinking about stabilization policies in the presence of hysteresis after a negative shock like the Covid-19 pandemic. Headline measures of so-called potential GDP published by the Congressional Budget Office represent only one of many possible inflation-neutral trajectories for output. The term potential GDP is misleading since potential implies a unique limit on output. It is much more accurate to consider a range of possible trajectories or multiple equilibria. Repairing the damages from a shock will require overshooting the inflation target and running the economy above its inflation-neutral equilibrium in order to restore the *status quo ante* level of output and employment. The model assumes constant trend growth so that path dependence takes the form of pure output-level effects.

Much of the public debate about supply constraints on stimulative fiscal and monetary responses to the Covid-19 pandemic uses estimates of potential GDP, most commonly those provided by the CBO although some other methods are available.[1] The premise is that too much stimulus will push the economy over the limit and usher in unsustainable inflation–the so-called accelerationist hypothesis that the Phillips curve is essentially vertical in the very long run. This framework remains solidly in place among mainstream economists; however, central bankers and economic journalists like Martin Sandbu (*Financial Times*) or Binyamin Appelbaum and Neil Irwin (*New York Times*) have openly challenged it. It is important for progressive economists and careful macroeconomics instructors to engage with this viewpoint constructively, by providing an alternative narrative grounded in good empirics and theory. It seems likely that the Biden relief package will keep the issue alive for the foreseeable future.

While it is possible to make a strong case for aggressive action within the conventional framework, an even stronger case arises once the central assumption of a nearly unique path for potential output is replaced by the (arguably) more convincing assumption of path dependence or hysteresis. Path dependence implies multiple possible paths for the evolution of potential output, defined as the level of GDP at which inflation stabilizes. A more accurate term for this level might be the inflation-neutral equilibrium level of GDP, or just equilibrium output.

The conventional approach is not as rigid as some critics maintain. While it treats potential output as supply determined, it recognizes that large shocks can affect the near-term evolution of potential, for example because slower investment leads to less capital and therefore a lower level of output. The theoretical framework followed explicitly by the CBO adopts the Solow growth model, which generates transitional dynamics in just this fashion. Nonetheless, the framework does not allow for temporary shocks to have long-run effects on the steady state, which is entirely determined by growth of the effective labor force and deep parameters like the saving rate.

Path dependence on the other hand recognizes both transitional effects and long-run effects from temporary demand and supply shocks. We can

[1]For a primer on the CBO methods, see Congressional Budget Office (2001). The Econbrowser blog (www.econbrowser.com) maintained by James Hamilton and Menzie Chinn is a good source for current thinking about the methodology of calculating potential GDP by conventional macroeconomists. The current note expands on Foley et al. (2019, Ch. 5).

operationalize hysteresis in the inflation-neutral equilibrium level of output, y^*, by using a simple model like

$$y^*_{+1} = (1+n)(\theta y + (1-\theta)y^*).$$

The time subscript represents $t+1$, with the t suppressed to reduce clutter. The parameter θ measures the strength of the hysteresis effect, and lies in the half-open interval $(0, 1]$. The equilibrium level of output is just a weighted average of the one-period lagged actual and equilibrium levels of output, with allowance for trend growth, n.

The actual path of output can be compared against a baseline path for equilibrium output in the absence of a shock which, assuming we begin at an equilibrium level in period 0, follows:

$$\bar{y} = y_0(1+n)^t.$$

This modeling choice ignores the short-term effects on official projections of potential output due to interruptions in capital accumulation from shocks but these could be included in an actual implementation of the approach outlined here.

There is a large literature establishing the plausibility of hysteresis effects although their size and nature are disputed, as is most everything in empirical macroeconomics. The after-effects of the Global Financial Crisis (GFC) made hysteresis an order of magnitude more plausible, yet many prominent economists (Blanchard, 2018) have concluded that the after-effects can be explained by a weaker mechanism (persistence) in which shocks wear off very slowly and are not permanent.

Another source of uncertainty is the symmetry of hysteresis. We are assuming it works to reduce equilibrium output after a negative shock but that a positive policy-delivered shock is capable of repairing the damage. There are few historical examples or natural experiments like the GFC to go by. Some political economists and economic historians (Mason and Bossie, 2020; Mathy, 2017) have argued that World War II was one such example of symmetric or two-way hysteresis undoing the effects of the Great Depression.

The parameter n is the "natural rate of growth" of the effective labor force which is assumed to be exogenous. The effective labor force grows as the population of workers increases and as the result of technological changes that make workers more productive. Many heterodox economists view labor force growth and technical change as endogenous. By taking n to

be parametric, we are adopting the conventional view that economic growth is ultimately exogenous. Perhaps this is defensible as a first approximation, or perhaps as a rhetorical gambit.

Because most of the debates about the policy response use CBO projections of potential GDP, it is necessary to step out of the usual static textbook framework and allow for trend growth. For example, suppose the economy is operating at the equilibrium level in period 0 and then experiences a shock in period 1. To model the policy response, we will assume that fiscal and monetary authorities are targeting a path of output, or some sequence $\{y_t\}_2^\infty$. A simple way to model the response would be to assume the level of output grows at a chosen rate, m, that is faster than the baseline for a discrete interval of T periods. It could be calibrated, for example, to rejoin the baseline path.[2] The following equation might apply for $t = [1, T+1]$, with m replaced by n for subsequent periods:

$$y_{+1} = (1 + m)y.$$

The objective here is less ambitious than the standard three-equation model. We are basically assuming only that the policy makers can project the baseline path of output and that they formulate a plan for recovering it (presumably based on imperfect knowledge of the structure of the economy). Then we can ask how their plans will pan out given alternative parameterizations.

This simple set-up produces three projections: the baseline path for equilibrium output, the path of equilibrium output, and the path of actual output. Note that this is a toy model: it leaves out important details like capital accumulation and utilization in order to make a first pass at the question at hand. Further work is needed to verify or qualify any conclusions we reach.

To provide another point of contact with the policy debates we can append a Phillips curve equation that describes the inflation (π) process as a function of expectations and the output gap such as

$$\pi = \chi\pi^L + (1 - \chi)\pi_{-1} + \alpha(y - y^*).$$

Here π^L represents the long-run component of inflation expectations, which is often taken with good reason to be the inflation target adopted

[2]To be more precise, setting $m = (1 + n)\sqrt[T]{\bar{y_1}/y_1} - 1$ will get us back to the baseline in period $T + 1$.

by the central bank (2 percent in the U.S.). The lagged inflation rate also influences expectations, either through adaptive expectations, inflation inertia, or the simple fact that negotiations over wage setting take it as the benchmark. The parameter χ represents the degree of anchoring of expectations and lies in the interval $[0, 1]$. Considerable evidence suggests that anchoring has gotten appreciably stronger in the last two decades. The parameter α represents how sensitive the wage and price-setting processes are to economic slack. Evidence suggests that this sensitivity has dropped significantly over the last two decades, and may have actually vanished, giving rise to some skepticism about the existence of a Phillips curve.

There are really four parameters that matter the most for the policy debate.

First, how aggressive should the policy response be, which relates to m and T. A more aggressive response will repair more of the damage done by the initial shock, but there may be some limits on how quickly this can be done. A longer planning horizon implies a lower growth rate during the adjustment period.

Second, how robust is the hysteresis process, which relates to θ. If θ is large, shocks will do more harm on impact but it may be possible to repair the damage more quickly, and even to return inflation to its target rate more rapidly.

Third, how well anchored are expectations, which relates to χ. Anchoring reduces the need to use slack to reduce inflation by making the expectation process self-stabilizing.

The obvious choice for the policy response would set the value of m and T to return the actual path to the projected equilibrium or baseline path. This response will guarantee sufficient growth to undo the damage from the negative shock given the assumption of two-way hysteresis. It will bring inflation back to its original level, generally by temporarily overshooting the target.

[Figure goes around here]

Figure 1 illustrates the dynamics of one parameterization under this assumption. Even though the baseline path is recovered rather quickly (5 periods), the system operates *above* the equilibrium level of output for longer. The inflation rate overshoots the 2 percent target in this simulation, and indeed it can be shown that it must overshoot to enable the equilibrium level

of output to recover the baseline path.[3] With this particular choice of parameters, inflation does reach its target after another 5 periods or so (not shown in the figure).

This result could underwrite the new "inflation averaging" approach adopted by the Powell Fed. Although other rationales were probably decisive in influencing the FOMC to change its policy framework, in the presence of hysteresis we can see that this choice is a salubrious one.

If the policy response is insufficient to recover the baseline path, the damages from a negative shock become locked in permanently. Moreover, in this case the inflation rate may never overshoot the target. This suggests an interpretation of the decade following the GFC. The serial downward revisions to the CBO estimates of potential output contributed to the reluctance of policy makers to apply sufficient stimulus.[4] The anemic performance of inflation–never convincingly achieving the target rate for over a decade–and painfully slow, incomplete recovery of employment resulted from this unhappy confluence of theory, reality and perception, calling to mind George Soros's idea of reflexivity.[5]

The lesson here for policy debates is that if the policy makers stick to the plan of recovering the projected equilibrium, they can succeed even if they are unaware of the true hysteretic structure of the economy. But this will require resistance to misinterpretation of any downward revisions in the official estimates of the equilibrium level of output, which would occur through mechanical re-estimation of the contemporaneous equilibrium using the realizations of inflation and output.

In short the CBO projections of equilibrium output have real value as benchmarks, but like any tool they can be abused.

For example, if hysteresis prevails it is technically misleading to refer to

[3]The exception occurs when there is no anchoring since then the cumulative stimulus needed to restore inflation just happens to be exactly what is needed to repair the damage from hysteresis so that there is no need to run a high-pressure labor market, assuming the central bank is following a Taylor rule that targets inflation. In this case, inflation converges on the target from below. See Michl and Oliver (2019) for proof that combating hysteresis requires inflation overshooting.

[4]Compare the middle panel of Figure 1 to Foley et al. (2019, Figure 12.1) showing actual and CBO potential GDP estimated after the GFC.

[5]With anchoring in the Phillips curve it is not necessary to run the system above the equilibrium level of output to get inflation to recover the target since $\Delta\pi = \chi(\pi^t - \pi_{-1}) + \alpha(y - y_e)$. Maintaining equilibrium implies that inflation gravitates toward the target as long-term expectations eventually prevail.

the CBO projections as "potential output" although like so many terms in macroeconomics where usage prevails (the NAIRU, for example, should be the non-increasing inflation rate of unemployment since most models of the Phillips curve predict acceleration of the price level, not of its rate of change) there is not much chance that this will be emended. A more aggressive policy response that intentionally raises the policy path above the projected equilibrium output trajectory, even temporarily, would permanently increase the trajectory of equilibrium output above the projected path. The projected levels of equilibrium output do not represent the economy's potential in a path dependent economy. Obviously, there must be some limits in principle to raising the equilibrium level of output but intellectual honesty demands that we admit how little is known about them.

It makes some sense to frame the question of limits in terms of the speed of adjustment required (i.e., the choice of m and T). Developed economies operate with reserves of spare capacity, often in the form of disguised unemployment, underemployment, or non-participation in the labor force. But mobilizing those reserves requires resource reallocations that may encounter bottlenecks or disruptions in economic life that create political problems, putting limits on the speed of adjustment.

On the other hand, taking the existing level of equilibrium output pre-Covid to be the benchmark seems to be fairly reasonable. Most commentators on the political left were happy to see evidence that employment levels were beginning to raise wages, particularly for low-wage workers, and reverse some of the income inequality created by the after effects of the GFC. But there is a deeper unresolved theoretical issue here, which is establishing an output target for policy makers in the presence of hysteresis.

The toy model in this paper is intended to make the implications of path dependency explicit and accessible. The model accepts the conventional assumption that growth is exogenous, so that path dependency will express itself as a pure level effect. We can view this as a rhetorical device to intervene into the existing conversation, or as a good first approximation to a real world policy decision. In a synthetic classical-Keynesian model with endogenous growth of technology and labor force driven by some combination of capital accumulation (Michl and Tavani, 2020) and aggregate demand (Taylor et al., 2019) exogenous shocks can affect the long-run rate of growth–sometimes called "superhysteresis." There is considerable debate within the heterodox community about the nature of long-run growth but the premise of the current note–that the level of output is subject to path dependence–

would probably receive broad support there. The main implication of the heterodox approach is that demand and supply limits on growth cannot be disentangled since they are mutually determined. The economy's future potential needs to be regarded as a range of possibilities, perhaps bounded by adjustment costs associated with rapid growth, rather than as a sequence of well-defined levels of output and employment.

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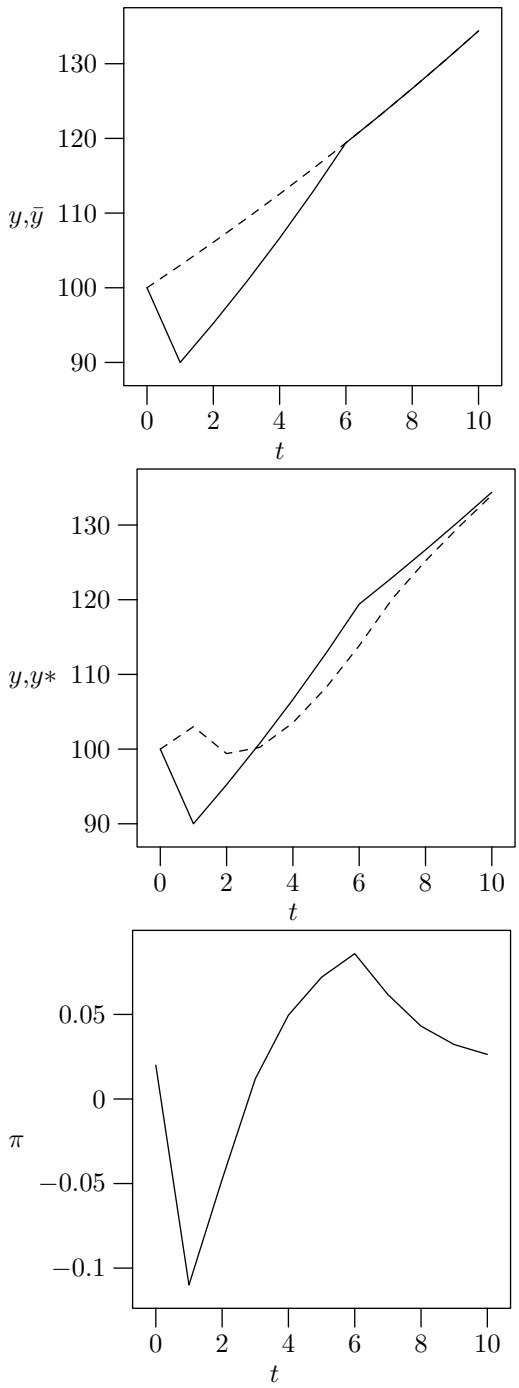

Figure 1: Top panel shows actual output (solid line) and baseline output (dashed). Middle panel shows actual output (solid line) and equilibrium output (dashed line). Bottom panel shows inflation. Parameters are $n = .03$, $y_1 = 90$, $y_0 = 100$, $\theta = .5$, $\chi = .8$, $\alpha = .01$, $\pi^L = .02$, and $T = 5$.