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Policy Options and Responses to Business Cycle Fluctuations

In this set of notes, we will discuss to what extent policymakers may or may not want to respond to macroeconomic fluctuations. We will first cover general constraints faced by any policymakers who want to respond to business cycle fluctuations, then cover issues associated with credibility and effectiveness of possible policies.

Types of Countercyclical Policies

Policymakers have long sought ways to try and stabilize macroeconomic fluctuations. The use of policies for stabilization purposes is commonly referred to as ***countercyclical*** policies. These policies can take a number of forms, and policymakers have, to varying extent extents, experimented with many of these with varying degrees of success. With a degree of oversimplification, we can break stabilization policies into those which primarily focus on the supply-side of the economy and those which affect the demand-side, although as we will discuss, the distinction is never as clear-cut as one might hope.

We will focus primarily on ***demand-side policies***, i.e. those designed to affect the economy primarily through the aggregate demand component of the model. Within this class of policies, we will distinguish between ***fiscal*** policies (i.e. taxes and government spending) and ***monetary*** policies (i.e. actions taken by the central bank). Examples of fiscal policies include changes in unemployment insurance, stimulus packages, changes in tax burdens. Examples of monetary policy include changes in short-term interest rates (via open market operations), purchases of assets to influence long-term rates (also known as "quantitative easing"), changes in the discount rates, and changes in reserve requirements.

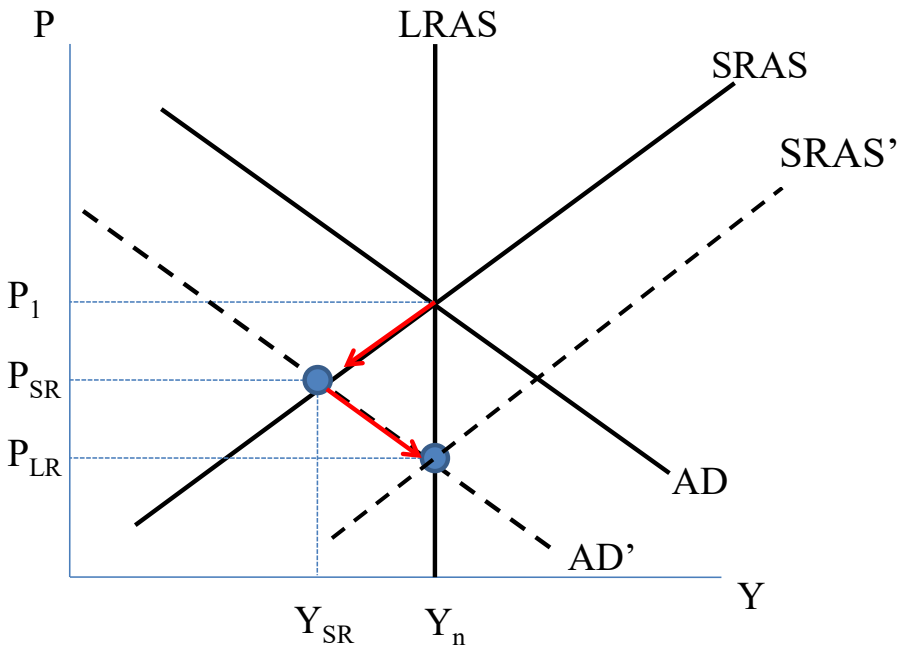
To a lesser extent, we will also discuss ***supply-side policies***, i.e. policies designed to affect the economy ***through*** the supply side of the model. Examples of such policies include deregulation of industries, structures surrounding labor and other markets, and the use of taxes and subsidies to alter economic behavior of firms and consumers.

To be clear, most policies will tend to have both supply and demand side effects. For example, tax reforms will ***typically*** affect aggregate demand (if total tax burdens change) as well as aggregate supply (if these affect incentives to work, save, etc.). But for analytical simplicity, we will try and focus on aggregate supply and demand effects separately to the extent that this is possible.

Theoretical Scope for Stabilization Policies

In previous sections, we argued that the comovement of prices and income during recessions was suggestive of business cycles being driven primarily by shocks to aggregate demand. A typical demand-driven business cycle, in the absence of policy responses, is illustrated in Figure 1 below. Starting from the initial long-run equilibrium, a negative demand-side shock will shift the aggregate demand curve left, thereby reducing both prices and output in the short-run. Over time, as expectations adjust, the short-run aggregate supply curve will shift right moving the economy to the new long-run equilibrium at the original (natural) level of output and a lower price level. Note that the economy here is ***self-stabilizing***: it returns to the original level of production and income even in the absence of any policy intervention.

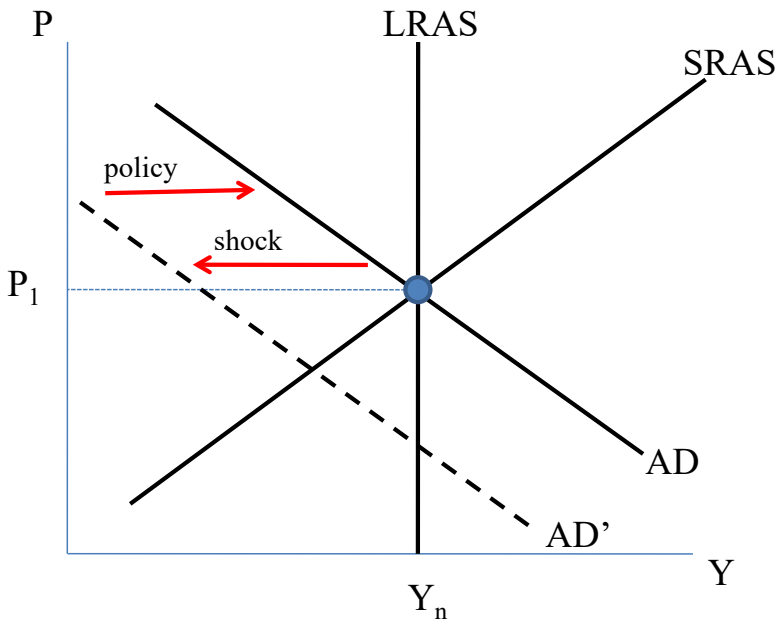
Figure 1: Negative Demand Shock and Self-Stabilizing Economy



The length and depth of the business cycle will in general depend on both the size of the shock to the economy as well as how rapidly expectations adjust to it. The empirical results from the effects of monetary policy shocks presented in previous sections suggest, however, that it can be years before the economy returns to the long-run equilibrium. As a result, and even though the economy will tend to return to its natural level even without policy responses, it is of immediate interest to consider whether policies can quicken the process.

The fact that the shock is to the demand-side of the economy suggests that policies which affect aggregate demand would be best-suited to address this kind of fluctuation. Indeed, to the extent that changes in either fiscal (G or T) or monetary (M) policies also shift the aggregate demand curve, a theoretically feasible outcome is for policy-makers to pursue expansionary fiscal policy (increase G and/or reduce T) and/or monetary policy (raise M) thereby shifting the aggregate demand curve back to its original level. Figure 2 below illustrates that if the aggregate demand curve is immediately brought back to its original level, policymakers would have succeeded in stabilizing both prices and output. *Thus, this result suggests that, at least in principle, complete stabilization of the economy is a theoretical possibility*.

Figure 2: Complete Economic Stabilization via Countercyclical Policies



However, in practice, there are a number of challenges faced by policymakers which render the complete elimination of business cycle fluctuations an unattainable objective.

Real-World Challenges in the Use of Stabilization Policies

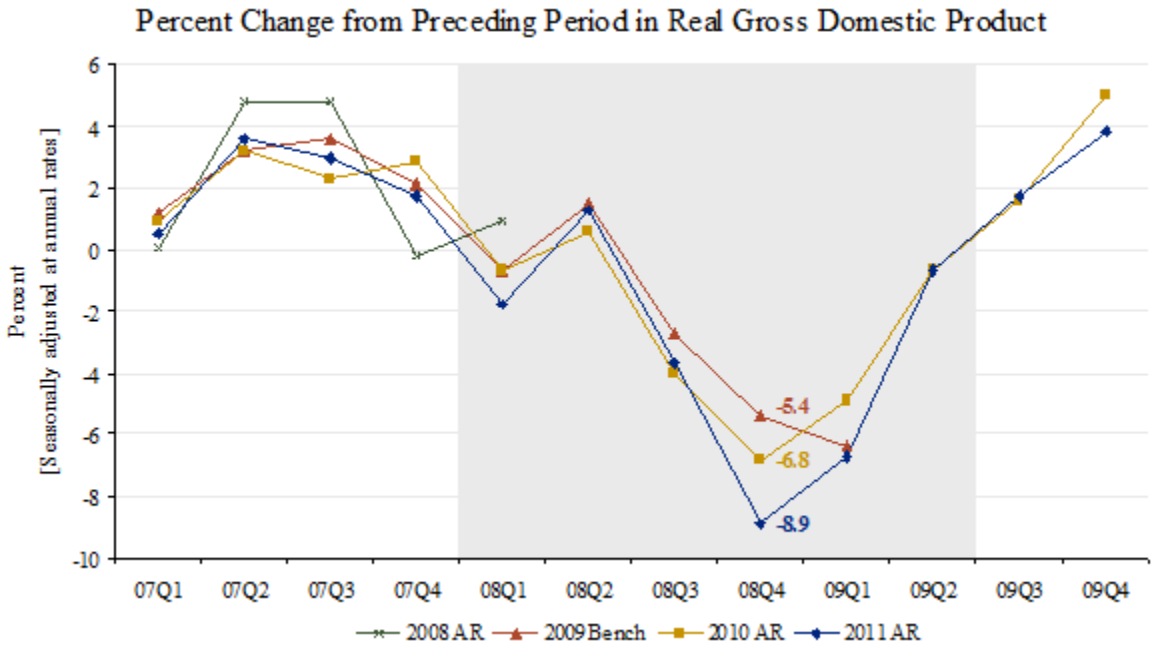
In this section, we will discuss a number of practical challenges faced by all policy-makers associated with the implementation of countercyclical policies.

I *Lags*

The first challenge involves timing issues, or lags, involved in policymaking. There are three such lags which can hamper the ability of policymakers to respond to economic fluctuations.

a) ***Information Lags***: These correspond to the time needed for policymakers to become aware of (or confident enough about) a shock hitting the economy. In some cases, information lags may be short or even non-existent: the September 11th, 2001, attacks are an extreme example of an economic shock which did not have significant information lags. But most shocks are not like this. For example, changes in consumer or firm expectations about the future may change rapidly, but the measurement of these expectations is imperfect. As a result, policymakers may want to wait for clear evidence that economic agents' optimism or pessimism has changed before considering responding to them. Another source of information lags is associated with the release of economic data. Some forms of economic data are available daily (e.g. stock prices, bond yields, and most other financial asset prices and returns), but others are measured only monthly (the CPI and unemployment numbers for example) or even quarterly (GDP data). In addition, many economic series are subject to significant revisions after initial numbers are released. For example, advance estimates of the GDP growth rate for the 4th quarter of 2008 pointed to an economy that was shrinking at an annual rate of 3.8%. Later (2011!) revisions showed that the economy was actually shrinking much more rapidly than initial numbers indicated, with the growth rate in the 4th quarter of 2008 being almost -9%. Figure 3 below shows revisions to the growth rate of GDP as measured by the Bureau of Economic Analysis over recent years.

Figure 3: GDP Revisions during the Great Recession

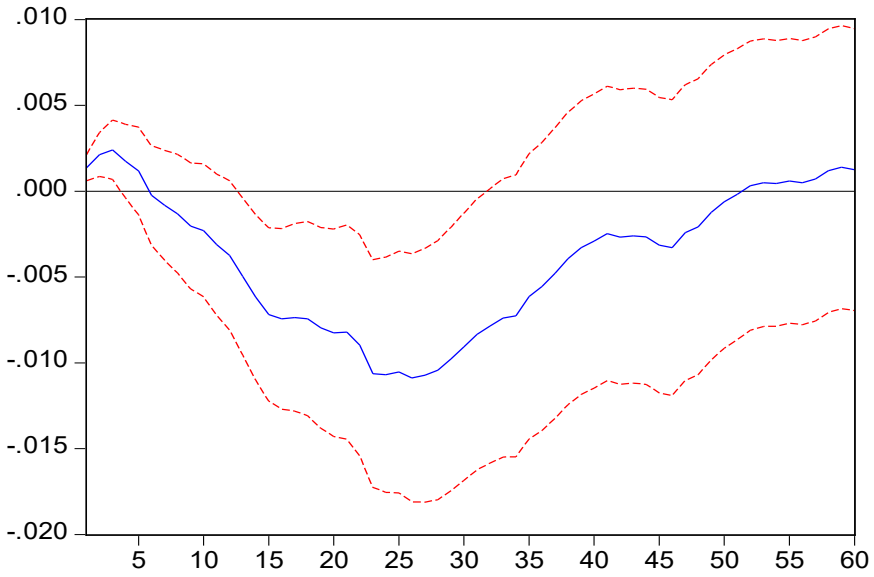


Source: Bureau of Economic Analysis

b) ***Decision lags:*** These correspond to the amount of time it takes for policy-makers to actually decide upon and implement a policy response. These lags vary substantially depending upon the kind of policy being implemented. For example, monetary policy-makers in the U.S. meet every 6 weeks and can readily decide upon policy changes at each meeting. Furthermore, they also have the ability to implement policy changes in between meetings of the Federal Open Market Committee (FOMC) if economic conditions dictate a rapid response. For example, the FOMC had a series of emergency meetings during the recent financial crisis. Fiscal policy changes, on the other hand, typically have much longer decision lags. Implementing new forms of government spending or changes to the tax code in the U.S. typically requires the passage of legislation in both chambers of Congress prior to the President's approval, a process which can be easily delayed or even stopped by minority opposition within the Congress. Sometimes, the Congress can move fast. For example, when the Congress failed to approve the $800-billion TARP program (Troubled Asset Relief Program) as the recent financial crises was unfolding, the stock market fell so much that the Congress rapidly reconsidered its decision and approved the program.

c) ***Impact lags***: These correspond to the amount of time it takes for policy actions to actually affect the economy. Again, these lags may differ dramatically across policy measures. For example, while some tax changes can be implemented almost without delay leading to immediate economic repercussions, some increases in government spending may be difficult to implement rapidly. Large infrastructure projects, for example, may require substantial planning stages as well as technical and environmental reviews before construction begins. And as discussed before, changes in monetary policy also tend to have very delayed effects on the economy. Figure 4 below, for example, shows that it takes approximately two years for contractionary monetary policy to have its peak effects on production in the U.S.

Figure 4: Response of Industrial Production to Contractionary Monetary Policy



Source: Impulse response of IP to Romer and Romer (AER 2004) monetary policy shocks. Horizontal axis indicates months since shock occurred. Red lines indicate one standard deviation confidence intervals.

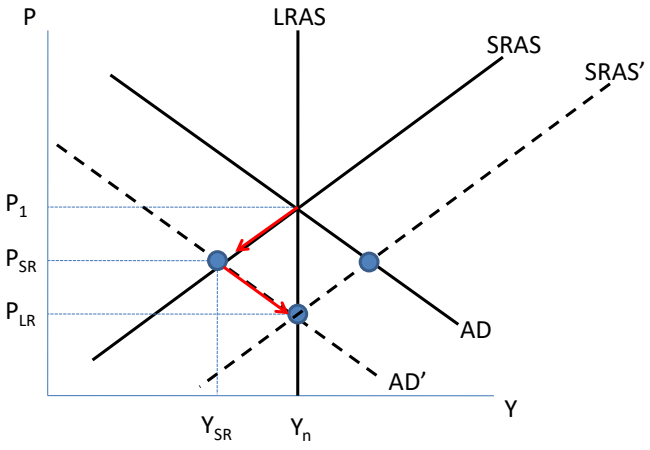
The presence of significant lags in countercyclical responses to business cycle fluctuations suggests that the ability of policymakers to stabilize economic fluctuations may not be as potent as suggested by Figure 2, in which complete economic stabilization is achieved. Indeed, if time lags are long enough, countercyclical policy may actually be *destabilizing* rather than stabilizing.

To see how this can occur, consider Figure 5 below. The panel on the left shows a negative shock to the economy. If lags involved in countercyclical policy are long enough, the economy may have fully adjusted to the shock (i.e. moved to the long-run equilibrium via a shift in Aggregate Supply) before countercyclical policies come into effect. But then, when these policies do come into effect, as illustrated in the right panel, they essentially introduce a new shock which generates more volatility. In this extreme setting, macroeconomic volatility is twice as high in the presence of countercyclical policy than it would be in its absence.

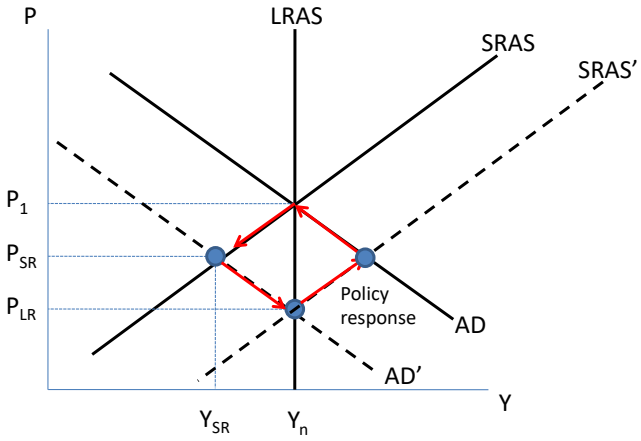
To be clear, this is an extreme example. But the broader point to keep in mind is that, even in principle, the ability of policymakers to stabilize the economy via countercyclical policies may be desirable only if time lags are short enough that the economic shock can be quickly recognized and policies can be decided upon, implemented and felt on the economy in a rapid fashion. Otherwise, not only will these policies fail to stabilize the economy, but they can also destabilize the economy.

Figure 5: Destabilizing Countercyclical Policies

Panel A: Negative Demand Shock



Panel B: Delayed Countercyclical Policy



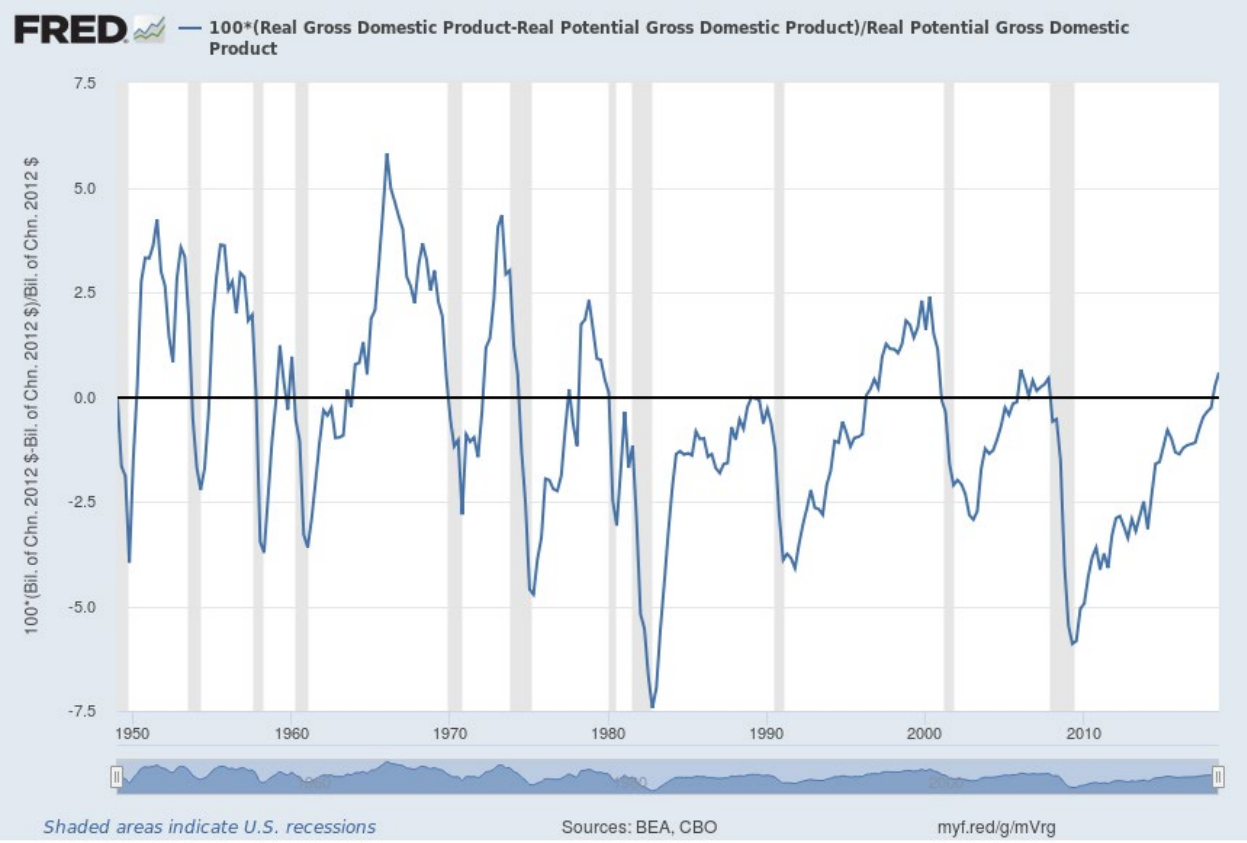
II *Unobservable Variables and Real-Time Estimates*

A second challenge for policy-makers has to do with measurement of economic concepts in real-time. For example, the "natural" level of output in our model is defined as the level of production in the economy if expected prices were equal to actual prices. This is an abstract concept which,

to the extent that price expectations may differ from actual prices at any moment in time, is not directly measurable. In practice, economists use statistical procedures to construct estimates of both the "natural" level of output and the ***output gap***, *defined as the percentage deviation of actual output from the natural level*.

Figure 6 below, for example, plots estimates of the output gap for the United States since 1950, using the Congressional Budget Office definition of potential output. Note that the output gap tends to fall rapidly in recessions, then gradually recovers over time. The lowest values of the output gap (that is, actual output is below potential) during this time period are in 1982 and 2010, when the output gap reached more than -5%.

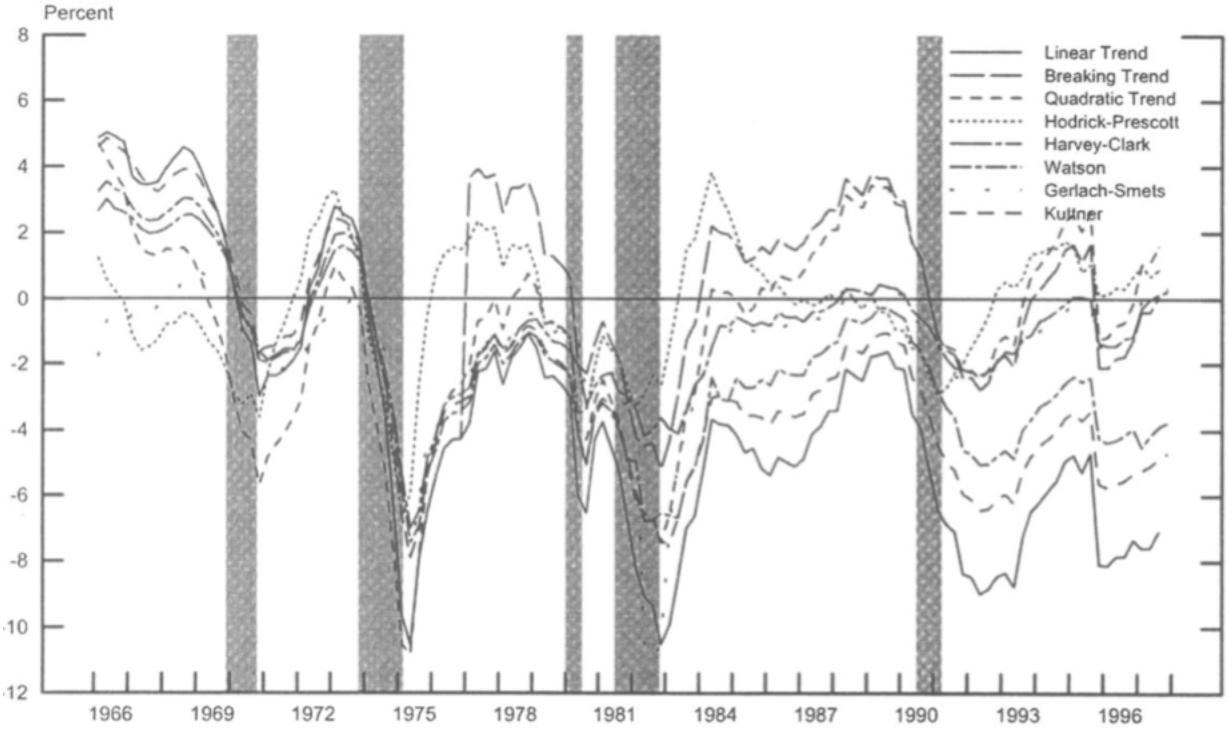
Figure 6: The Output Gap for the United States



The output gap is a very useful measure of the current state of the economy since it indicates whether current production levels are above or below the natural level of GDP. This is the key metric in our model which can be used to determine whether expansionary or contractionary policies may be needed.

A key difficulty for policymakers, however, is that measuring the "current" level of natural GDP (and therefore the output gap) can be extremely sensitive to the specific methodology used. Figure 7 below illustrates this issue. Two economists, Athanasios Orphanides and Simon Van Norden, applied several standard procedures that macroeconomists commonly used to construct measures of the output gap. But, the way they did it is equivalent to what policymakers would have observed in ***real-time***: for example, in the first quarter of 1966, policymakers had a certain amount of data available to them. Orphanides and van Norden applied the different methodologies to this specific data to construct estimates of the output gap for that quarter as would have been available to policymakers at the time. Doing this for every quarter, they got the results illustrated in the figure.

Figure 7: Real-Time Estimates of the Output Gap for the United States



The results are striking for the huge disparities in the estimates each period. For example, depending on the specific statistical method used, policymakers in 1987 observed estimates of the output gap ranging from -4% to 2%, a difference of 6 percentage points! An output gap of -4% would typically call for significant expansionary policy, with output well below the natural level. But a positive output gap of 2% would point toward the need for contractionary policy. Current

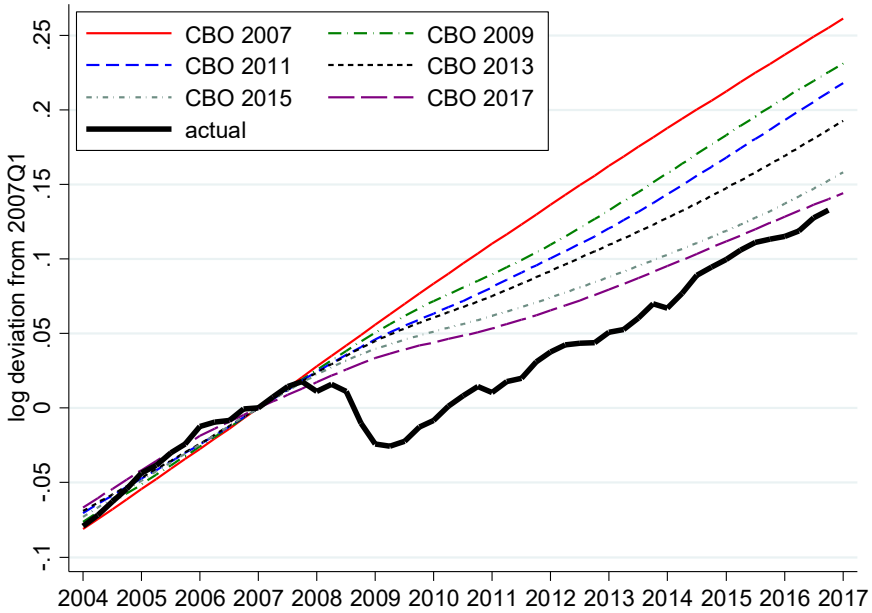
estimates of the output gap in 1987 (in Figure 6) indicate that the output gap during this time was actually close to zero, thus there was no need for either expansionary nor contractionary policy.

Similar issues are currently discussed in the context of the Great Recession. Figure 6 indicates that the output gap in the U.S. was around -6% in 2011. But some economists argue that the output gap may actually be much smaller. They emphasize the idea that the bursting of the housing bubble may have significantly lowered the natural level of GDP, so that current estimates of this measure overstate the output gap. This is crucial for policy decisions: an output gap of -6% is very large by historical standards, and would point toward the need for substantial expansionary policies, but these policies could be counterproductive if the output gap is actually much smaller.

One can also make an argument pointing in the other direction. Figure 8 demonstrates the evolution of potential output estimated by the CBO over time (to make the analysis easier, we normalize each line to be zero in 2007, the last pre-recession year). The red line shows that just before the recession, the CBO expected the U.S. economy to grow a brisk rate for the next 10 years. After the Great Recession started, actual output (the thick black line) deviated considerably from the pre-recession estimate of potential output (the red line). Note that actual output has not returned to the 2007 projected path of potential output and the difference between these two is quite large (i.e. output gap is very negative, there is a lot of underutilized capacity in the economy). This discrepancy should have led policymakers to continue stimulating the economy but instead we observe that policymakers talk about "normalization". Why? The CBO has been progressively revising its estimates of potential output to the point where the 2017 vintage of the estimate suggests that there is no gap, that is, the economy operates at full potential. This is striking because we normally think that actual output should return to potential output while in this historical episode it was potential output reverting to actual output. One way to reconcile these dynamics is to appeal to "hysteresis" and "scars" left by the Great Recession but there is a growing body of evidence suggesting that these revisions are statistical artifacts rather than genuine scars from a major recession.[1] In other words, CBO estimates of potential output could be too pessimistic and the U.S. economy can grow quite a bit more before it reaches its potential.

[1] For more details see Coibion, Gorodnichenko and Ulate "The Cyclical Sensitivity in Estimates of Potential Output," forthcoming in ***Brookings Papers on Economic Activity***.

Figure 8: Real-Time Estimates of the U.S. Output Gap during the Great Recession



III *Difficulties in Macroeconomic Forecasting*

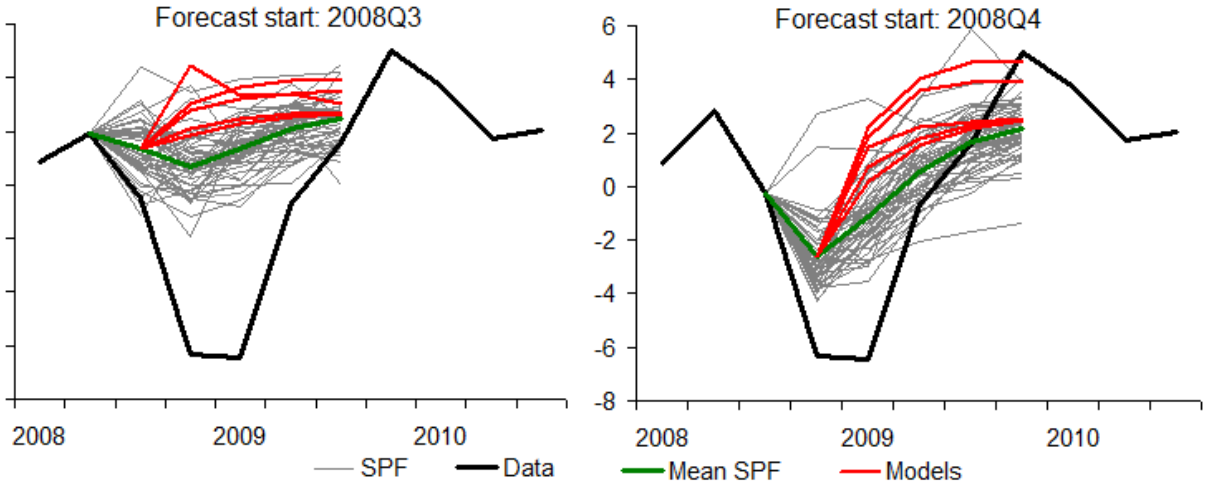
An additional difficulty is that, since policies take time to affect the economy, policy-makers should not try to stabilize the current economy but rather the expected state of the economy by the time policy changes kick in. For example, suppose the Federal Reserve is considering changing policy in January 2019. If it knows that monetary policy only affects the economy with a one-to-two year delay, then it knows that it cannot affect the January 2019 economy but only the economy in January 2020. Thus, what it should focus on is what it thinks the output gap will be then, which requires making forecasts of the future state of the economy.

Forecasting future values of macroeconomic variables is hard for several reasons. First, we do not know realizations of shocks that may hit the economy in the future. For example, in 2007 few observers and professional forecasters predicted a massive recession in a year or so. Then, through the course of the Great Recession, forecasters systematically underestimated how severe and prolonged the recession would be. Had policymakers correctly anticipated how severe and prolonged the downturn would be, they likely would have responded more strongly than they did. Second, even if we knew the future, current and past shocks, we do not know the model that

describes the dynamics of the economy. We have only estimated relationships. Given limited information contained in macroeconomic time series, a variety of models can be consistent with the observed data. But these models can give conflicting predictions on how the economy should respond to macroeconomic shocks or policy decisions. As a result, policymakers have to make decisions under considerable uncertainty.

Figure 9 shows the path of U.S. output predicted by professional forecasters in the third and fourth quarters in 2008, just before the Great Recession took a violent form. While professional forecasters anticipated a contraction, the expected magnitude was much smaller than the realized decline. Furthermore, the forecasters predicted a much faster recovery than was realized. Finally, notice that there is a dramatic heterogeneity in predictions, that is, professional forecasters strongly disagreed on the future course of the economy.

Figure 9: Real-time forecasts of U.S. output



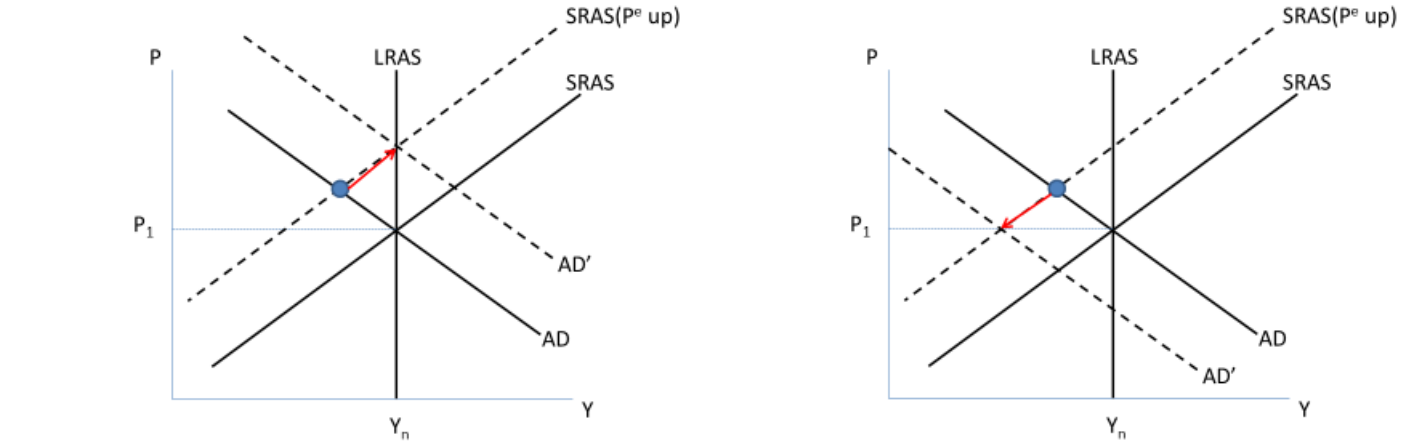
Notes: Solid black line shows annualized quarterly output growth (real-time data vintage until forecast starting point and revised data afterwards), grey lines show forecasts from the Survey of Professional Forecasters (SPF), green line shows mean forecast from the SPF, red lines show model forecasts conditional on the mean nowcast from the SPF. Source: https://voxeu.org/article/failed-forecasts-and-financial-crisis-how-resurrect-economic-modelling.

Policy responses to a negative supply shock

Our analysis above suggests that policymakers should be able to completely neutralize demand-driven recessions by compensating negative private demand shocks with expansionary fiscal/monetary policy. Contractions driven by supply-side shocks are more challenging because

policymakers cannot simultaneously achieve both stable prices and stable output. Figure 10 presents an example. Suppose economic agents' inflation expectations increase. This change in expectations leads workers to demand higher wages and thus translates into a negative supply shock (SRAS shifts up). In response to this negative supply shock, the central bank can increase the supply of money (option 1) which will stabilize output at the cost of having a higher level of prices (inflation). Alternatively (option 2), the central bank can reduce the supply of money which will stabilize the level of prices at the cost of an even lower level of output. Neither of the options is particularly attractive. To the extent that policy-makers try to stabilize both prices and output, supply-side shocks present them with a situation where they cannot achieve both but are instead forced to choose between these two objectives. Political pressure will often push toward stabilizing employment and ignoring inflation. One prominent example of such pressure is documented in the Nixon tapes.[2]

Figure 10: Policy responses to a negative supply shock



Option 1: Try to bring output back to natural level, ignore prices.

Option 2: Push prices back down, ignore output.

Dynamic inconsistency and rule-based policy

Our discussion of supply shocks above paints a grim picture for policymakers. In fact, if agents know that option 1 is a likely outcome, we can end up in a worse situation. Agents' expectations are fulfilled in this scenario: they expected higher inflation and, indeed, higher inflation is realized.

[2] Abrams, Burton, A. 2006. "How Richard Nixon Pressured Arthur Burns: Evidence from the Nixon Tapes." Journal of Economic Perspectives, 20 (4): 177-188.

Thus, irrespective of what triggered inflation expectations, we obtain higher inflation. If agents have higher inflation expectations for a reason unrelated to fundamentals of the economy, we still have more inflation. This situation is called a "sun spot" equilibrium to underscore that the trigger may be not linked to anything in the economy and, as a result, "animal spirits" (i.e., we just think inflation may be high) can generate macroeconomic volatility. This is costly in terms of welfare because we do not like volatility (recall that households would like to smooth consumption and business cycle prevent them from doing so). How can we avoid this unfortunate state of affairs?

To answer this question, we need to understand how option 1 could be avoided and how eliminating option 1 would change the behavior of agents. First, consider what happens when the central bank commits to always implement option 2. In this case, higher inflation expectations are met with elevated interest rates which can reduce consumption and investment which in turn reduce inflationary pressures in the economy. How high interest rates should go? The answer depends on the specifics of a model but the general principle (sometimes known as the Taylor principle) is that nominal rates should increase by more than one-for-one in response to an increase in inflation. In other words, if inflation increases by 1%, then nominal interest rates should increase by more than 1%. With this reaction, we know that a 1% inflation shock leads to an increase in real interest rates (recall that the real interest rate is equal to the nominal interest rate minus inflation). Because consumption and investment depend on real interest rates, this policy response will generate a contraction in consumption and investment after an inflationary shock. Thus, if agents think that inflation will be higher in the future, the realization of inflation will be inconsistent with their beliefs when the central bank implements option 2. The agents will learn about their mistake and correct their beliefs thus brining the economy back to the long-run equilibrium. As a result, this policy reaction eliminates "sun spot" equilibria, a desirable outcome.

Why would the central bank not implement option 2 all the time? To answer this question, we need to understand that the central bank typically faces a dynamic trade-off: the central bank may issue threats of being tough on inflation in the future, but it may fail to deliver the tough stance if/when inflation arrives. To derive this insight more formally, suppose that the central bank has the following loss function over inflation π and unemployment u:

$$L = \pi^2 + \lambda(u - \bar{u})^2$$

and the Phillips curve is given by

$$u = u^n - (\pi - \pi^e)$$

where $\bar{u}$ is the unemployment objective of the central bank, λ is the relative weight on deviation of unemployment from the target, u^n is the natural rate of unemployment, π^e is expected inflation. Note that we implicitly (and without loss of generality) assumed that the inflation objective of the central bank is zero. The Phillips curve suggests that when $\pi = \pi^e$, unemployment is at its natural level.

Consider a scenario where the central bank commits to deliver zero inflation (i.e., its inflation objective). If agents find this promise credible ($\pi^e = \pi_c^*$) and it is indeed delivered ($\pi_c^* = 0$), we have $\pi_c^* = \pi^e = 0$ and hence $u = u^n$ so that the loss is $L(\pi_c^*) = \lambda(u^n - \bar{u})^2$ where π_c^* denotes equilibrium inflation under commitment.

Is this sustainable? If expectations are anchored at $\pi^e = 0$, the loss for the central bank is

$$L(\pi^e = 0) = \pi^2 + \lambda(u^n - \bar{u} - \pi)^2$$

We know from calculus that the value of the loss function is minimized when the derivative of L with respect to the choice variable π is equal to zero. Using this knowledge, we can find that

$$\pi^* = \frac{\lambda}{1+\lambda}(u^n - \bar{u})$$

which results in loss $L(\pi^e = 0, \pi^*) = \frac{\lambda}{1+\lambda}(u^n - \bar{u})^2 \leq L(\pi_c^*)$. In other words, once the central bank anchors inflation expectations, it is tempted to deviate from its promise because such deviation leads to a smaller loss. This situation is called dynamic inconsistency: once promises are believed, the central bank has incentives to take advantage of these beliefs and deviate. Note that there is no temptation if $u^n = \bar{u}$ (the central bank targets the natural rate of unemployment) or $\lambda = 0$ (the central bank does not care about unemployment).

What happens if the central bank promises to deliver zero inflation but the central bank has discretion to deviate from its promise. To analyze this scenario, we plug the Phillips curve into the loss function to obtain:

$$L = \pi^2 + \lambda\big(u^n - \bar{u} - (\pi - \pi^e)\big)^2.$$

Using our calculus knowledge, we know that the loss is minimized at

$$\pi_d^* = \lambda\big(u^n - \bar{u} - (\pi_d^* - \pi^e)\big).$$

Note that in this calculation we take expected inflation π^e as given. That is, the central bank cannot directly influence expectations. However, we assume that the agents are rational and therefore their expectations should be consistent with realizations. That is, in equilibrium we have $\pi_d^* = \pi^e$. It follows that $\pi_d^* = \lambda(u^n - \bar{u})$. When we plug this inflation into the loss function, we find $L(\pi_d^*) = \lambda^2(u^n - \bar{u})^2 + \lambda(u^n - \bar{u})^2 \geq L(\pi_c^*)$. Clearly, the loss is greater than the loss when the central bank can commit.

This analysis suggests that the central bank may promise to implement option 2 but once agents believe this promise, the central bank can deviate, that is, the central bank may be willing to accept some inflation after it convinced the public that it will not tolerate any inflation. But this kind of behavior destroys trust; the central bank loses credibility and ends up with a worse outcome than it could attain if it were to fulfill its promises. What can we do rule out this suboptimal behavior?

Our simple model suggests that reducing λ is an option. This can be achieved by appointing an independent central banker (that is, somebody who is less likely to cave under political pressure) or a conservative central banker (that is, an inflation "hawk", somebody who cares only about inflation). Consistent with this insight, we observe less inflation in countries with more independent central banks (Figure 11).[3] Another option is to implement policy according to a rule. For example, one can imagine a simple formula that would direct actions of the central bank and we can ban the central bank from deviating from this formula. In this case, we tie the hands of the central bank so that even if it's tempted to deviate, it cannot do so. Consistent with this prediction, we observe that countries that committed to inflation targeting (a regime that mandates a central bank to deliver a target rate of inflation) could reduce their inflation. For example, New Zealand was the first country to formally adopt inflation targeting and lowered its inflation from double-digit levels to its target of 2 percent.

[3] For mode details, see Alesina, Alberto, and Lawrence Summers. 1993. "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence." Journal of Money, Credit and Banking 25: 151-62.

Figure 11: Central bank independence and inflation