When do Countercyclical Policies Increase Economic Stability?

Raj Chetty*

In an influential paper, Friedman (1953) showed that even countercyclical fiscal or monetary policies can be destabilizing if they are weakly correlated with the state of the economy. I show that this surprising conclusion is sensitive to the way in which uncertainty is measured. If the size of fluctuations are measured using mean absolute deviation instead of variance, every countercyclical policy that does not convert recessions into booms improves economic stability. However, efforts to "fine tune" the economy by responding to small fluctuations can reduce stability irrespective of the measure of uncertainty that is used.

Keywords: fiscal policy; monetary policy; aggregate fluctuations; loss function

JEL Classification: E4, E5

---

*E-mail: chetty@econ.berkeley.edu. I have benefited from comments by Martin Feldstein, Benjamin Friedman, Milton Friedman, Greg Mankiw, and Arnold Zellner. Support from the National Bureau of Economic Research is gratefully acknowledged.

Since the advent of Keynesian demand management, a large literature has examined the effects of fiscal and monetary policies, and has generally concluded that government intervention is rarely desirable. One important contribution was Friedman's (1953) surprising result that even countercyclical policies – which move the economy back toward full-employment on average – could destabilize the economy by increasing the total variance of output. Though the literature on stabilization has progressed considerably over the past fifty years, Friedman's elegant analysis remains influential in guiding the policy debate. For instance, in his commentary on Auerbach's (2002) analysis of recent trends in fiscal stabilization policies in the U.S., Feldstein (2002) remarks that one of the three main reasons that the "economics profession has rejected the [Keynesian] prescription....is the risk that well-intentioned fiscal policy will be destabilizing, a point emphasized many years ago by Milton Friedman (1953)."

In this paper, I show that Friedman's result follows from the particular way in which uncertainty is measured in the model. To illustrate this point, I characterize the optimal stabilization policy in Friedman's model of fluctuations when one's objective is to minimize the mean absolute deviation of output, rather than the variance of output. Friedman argues that a countercyclical policy can be destabilizing even if it never "goes so far as to convert what would otherwise be conditions of depression into conditions of boom, and conversely." He further notes that "we can measure the magnitude of fluctuations in many different ways, and it is somewhat arbitrary to select any one. At the same time I do not see that the results we reach will be critically affected by the particular measure we use, and it is mathematically most convenient to use the variance." This is in fact not true: If mean deviation is used instead of variance to measure the magnitude of fluctuations, *any* countercyclical policy that does not convert recessions into booms is stabilizing. Intuitively, when using variance as a measure of dispersion, one implicitly assumes that deviations from the desired level of output have increasing marginal costs. Even if a policy reduces the size of fluctuations on average, the costs when it worsens outcomes can outweigh the benefits when it improves them. Hence, the strength of Friedman's conclusions depend to a large extent on the convexity of the cost of output fluctuations.

However, some countercyclical stabilization policies are suboptimal irrespective of the way in which uncertainty is measured. In particular, efforts to "fine tune" based on limited knowledge can be destabilizing under any loss function. The reason is that such policies could reverse the state of the economy on occasion, e.g. by providing fiscal stimulus after the economy has already recovered from a recession. Hence, regardless of its objective function, a government with weak stabilization instruments can improve stability by responding only to large, persistent changes in the level of economic activity.

The remainder of this paper proceeds as follows. Section 1 sketches the basic structure of the Friedman model of output fluctuations. Section 2 gives the intuition for why the measure of uncertainty matters using a two-state example. Section 3 analyzes general case, and gives proofs of the main results on countercyclical policies and fine-tuning. The final section discusses the results.

I. A Model of Output Fluctuations

Notation:

X = deviation of output from full-employment trend

Y = effect of policy on output level

$Z = X + Y$ = deviation of output when policy is used

Let $\succ$ denote the preferences of the policy maker or society over output distributions and assume that there exists a loss function L derived from these preferences. A policy Y is "stabilizing" if the decision maker prefers to use it, i.e. iff $Z \succ X \Longrightarrow L(Z) < L(X)$.

The choice of L has important implications for the desirability of using a countercyclical policy. To illustrate this point, I focus on two loss functions here:

$L_1(X) = E|X|$

$L_2(X) = var(X) = EX^2$

The case of mean absolute deviation is useful for demonstrating how the shape of loss functions affects the analysis. Results for intermediate loss function of the form $L_\alpha = |X|^\alpha, \alpha \in (1, 2)$ are discussed in the concluding section. Of course, the loss function that is most appropriate for policy decisions depends on the actual cost of economic fluctuations, which is an empirical question that requires further research.

II. An Example

Suppose fluctuations are of a simple form: there are booms ($X = +1$) and recessions ($X = -1$) that occur with equal frequency. The policy maker wants to minimize deviations of output from the full employment level. She has an instrument Y – e.g., some type of fiscal or monetary intervention – that moves output back toward 0 with probability λ (i.e. acts with probability λ as a contractionary measure in booms and an expansionary measure in recessions).[†] This can be summarized as follows:

Pr	X	Y	Z	Z^2	$\lvert Z \rvert$
$\frac{1}{2}\lambda$	$+1$	-1	0	0	0
$\frac{1}{2}(1-\lambda)$	$+1$	$+1$	$+2$	4	2
$\frac{1}{2}\lambda$	-1	$+1$	0	0	0
$\frac{1}{2}(1-\lambda)$	-1	-1	-2	4	2

The policy maker must decide whether to actively manage demand fluctuations. At one extreme, if $\lambda = 1$, she has perfect knowledge of how to correct output fluctuations and can ensure that there are no fluctuations at all by using Y; such a policy should clearly be used. At the other extreme, if $\lambda = \frac{1}{2}$, the instrument is uncorrelated with the state of the economy and should not be used. The question is what critical level of λ is needed to justify use of the policy.

Let ρ denote the correlation between X and Y. Then $\rho = \frac{EXY}{(EX^2EY^2)^{\frac{1}{2}}} = 1 - 2\lambda$.

Under L_2, Y is stabilizing iff

$$var(Z) < var(X) \Longrightarrow 4(1-\lambda) < 1 \Longrightarrow \lambda > \tfrac{3}{4} \Longleftrightarrow \rho < -\tfrac{1}{2}$$

Note that $\rho < 0$ is *not* sufficient to justify use of Y [Friedman, 1953].

[†] To reduce the space of free parameters and simplify the exposition, the probability of "success" (λ) is assumed to be independent of the state of the economy.

Under L_1, Y is stabilizing iff

$$E(|Z|) < E(|X|) \Longrightarrow 2(1-\lambda) < 1 \Longrightarrow \lambda > \tfrac{1}{2} \Longleftrightarrow \rho < 0$$

According to L_1, Y should be used if it is countercyclical.

Why do the results differ? L_2 takes the expectation of a quadratic function: a deviation in output that is twice as large is *four* times as costly. Using Y causes deviations of ± 2 on occasion, whereas without the policy the only deviations are ± 1. A policy with $\lambda = \frac{1}{2}$ reduces the probability that a deviation will occur from 1 to $\frac{1}{2}$. But when deviations do occur, they are 4 times as costly as the natural deviations, making the policy with $\lambda = \frac{1}{2}$ yield a *strictly* greater loss ($var(Z) = 2$) than having no policy at all ($var(X) = 1$). A small increase in λ from $\frac{1}{2}$ to $\frac{1}{2} + \epsilon$ cannot overcome this loss of 1. Hence the policy may be destabilizing even if $\lambda > \frac{1}{2}$.

L_1 takes the expectation of a piecewise linear function: a deviation in output that is twice as large is twice as costly. As above, using a policy with $\lambda = \frac{1}{2}$ reduces the probability of a deviation from 1 to $\frac{1}{2}$. But now, when deviations occur, they are only twice as costly as the natural deviations. The policy with $\lambda = \frac{1}{2}$ has a loss of $E|Z| = 1$, the same as the expected loss without the policy, $E|X| = 1$. Since the policy is only weakly dominated when $\lambda = \frac{1}{2}$, a sufficient condition for the policy to be stabilizing is $\lambda > \frac{1}{2}$.

In using the variance as a measure of dispersion, one implicitly assumes that deviations have increasing marginal costs. A countercyclical policy that is weakly correlated with the state of the economy occasionally produces very large fluctuations. Since larger fluctuations are much more costly with the variance criterion than with the mean absolute deviation criterion, the former measure renders policies that are only weakly correlated with the state of the economy "destabilizing" while the latter does not.

III. The General Case

We have seen one example where countercyclicality implies stabilization under L_1. How generally does this result hold? I now characterize the set of policies for which countercyclicality guarantees stabilization. This requires a formal definition of countercyclicality:

Definition: Y is *countercyclical* if $E[Y|X > 0] < 0$ and $E[Y|X < 0] > 0$

This definition is intuitive: when there is a boom, the policy should be contractionary on average; conversely, when there is a recession, it should tend to be expansionary.[‡]

The following definition will also prove useful:

Definition: Y satisfies *no-reversals* if $X > 0 \Longrightarrow X + Y \geq 0$ and $X < 0 \Longrightarrow X + Y \leq 0$

Policies that satisfy this condition never reverse the sign of the natural deviation of output. In other words, such a policy never turns booms into recessions or the converse. Note that policies that seek to fine tune the economy by responding to small fluctuations are most likely to violate the no-reversals condition. To see this, consider policy rules of the form $Y = f(X) + \varepsilon$ where $\max(|\varepsilon|) < X^* \in (0, \infty)$ and $X > 0 \Rightarrow f(X) < 0$. If fine-tuning is interpreted as using Y even when $|X| < X^*$, the resulting policy violates the no-reversals condition; but if fine tuning is avoided, the condition is satisfied.

[‡]Note that I do not assume $EY = 0$, unlike in the preceding example.

A policy Y that satisfies no-reversals will not affect the mean deviation of output even if it is uncorrelated with X because it is equally likely to bring output back toward its natural level as it is to make the deviation larger. Such a policy is only weakly dominated if it is independent of X. Consequently, one expects that countercyclical policies satisfying this property will reduce the mean absolute deviation of output.

Proposition: Countercyclical policies that satisfy no-reversals are stabilizing under L_1.

Proof: Let $q = \Pr(X > 0)$.

$$E|X+Y| = qE[X+Y|X>0] + (1-q)E[-(X+Y)|X<0] \text{ by no-reversals}$$

$$= qE[X|X>0] + (1-q)E[-X|X<0] + qE[Y|X>0] + (1-q)E[-Y|X<0]$$

$$= E|X| + qE[Y|X>0] + (1-q)E[-Y|X<0]$$

$$< E|X| \text{ by countercyclicality.}$$

Corollary: If Y is a linear rule, i.e. $Y = bX + \varepsilon$ where $E\varepsilon|X = 0$, that satisfies no-reversals, then $\rho < 0 \Longrightarrow Y$ is stabilizing under L_1.

Proof: $EY|X = bX$ and $\rho < 0 \Longrightarrow b < 0 \Longrightarrow Y$ is countercyclical.

Friedman shows that any policy Y is stabilizing under L_2 iff $\rho < -\frac{1}{2}\frac{\sigma_Y}{\sigma_X}$. Hence, the proposition identifies a broad class of policies based on limited knowledge that are rejected under the variance criterion but accepted under the mean absolute deviation criterion. Among linear policy rules that satisfy the no-reversals condition, any policy that has a negative linear correlation with the state of the economy is desirable under L_1 but may be rejected under L_2.

IV. Discussion

Our analysis of absolute deviations as a measure of uncertainty yields two lessons. First, if one restricts attention to policies that do not reverse the state of the economy (e.g. by avoiding fine tuning), the decision of whether to use a countercyclical policy depends directly on the measure of uncertainty one uses. Any countercyclical policy should be used under mean deviation, but policies that are based on limited knowledge should not be used under the variance criterion. More generally, for loss functions with intermediate degrees of convexity – $L_\alpha = |X|^\alpha, \alpha \in (1,2)$ – the set of policies that are stabilizing will lie between the sets under the two loss functions studied here. For loss functions that are more convex than the variance ($\alpha > 2$), even greater knowledge is required to justify use of a countercyclical policy.

Second, these results show that attempts to "fine tune" with limited knowledge can be unproductive, irrespective of the measure of uncertainty one uses. This is because such efforts are likely to violate the no-reversals condition. The problem that arises when this condition is violated is easy to demonstrate using a simple example. Suppose X and Y follow a Bivariate Normal distribution: $(X, Y) \sim N(0, \Sigma)$. An instrument Y that has this form and is only weakly correlated with the state of the economy is harmful even under L_1. In fact, it can be shown that $X \sim N(0, \sigma^2) \implies E|X| = \sqrt{2}\pi\sigma$. It follows that $L_1(X+Y) < L_1(X)$ iff $var(X+Y) < var(X)$. Hence, the sets of policies that are stabilizing under L_1 and L_2 coincide, and policies that are weakly correlated with the state of the economy are inadmissible under both loss functions. It follows that even well-intentioned countercyclical policies can be destabilizing if they are based on limited knowledge and overpower the original deviation of the economy. In short, the consensus against fine-tuning that has emerged among policy makers and economists is consistent with any measure of uncertainty.

References

Auerbach, Alan. "Is There a Role for Discretionary Fiscal Policy?" in *Rethinking Stabilization Policy,* Federal Reserve Bank of Kansas City Papers and Proceedings (2002), pp. 109-150.

Feldstein, Martin. "Commentary: Is There a Role for Discretionary Fiscal Policy?" in *Rethinking Stabilization Policy,* Federal Reserve Bank of Kansas City Papers and Proceedings (2002), pp. 151-162.

Friedman, Milton. "The Effects of Full Employment Policy on Economic Stability: A Formal Analysis," in *Essays in Positive Economics*, Chicago: Univ. of Chicago Press, pp117-32, 1953.