

Edward M Gramlich: Oil shocks and monetary policy

Remarks by Mr Edward M Gramlich, Member of the Board of Governors of the US Federal Reserve System, at the Annual Economic Luncheon, Federal Reserve Bank of Kansas City, Kansas City, 16 September 2004.

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Oil shocks have confounded macroeconomists since they first arose on the scene in the 1970s. The oil price spikes of that time clearly had significant macroeconomic implications, representing one of the rare times that higher prices in an individual industry have importantly affected the overall macroeconomy. To account for these effects, structural-model builders had to disaggregate their systems into oil and non-oil, or energy and non-energy, sectors, dealing with effects on both the demand and the supply sides of the economy. The need to make such distinctions has greatly complicated the task of economic-model builders ever since.

The challenges are even more pronounced for policymakers - fiscal or monetary. In a world where all shocks are on the demand side, policymaking boils down to finding the optimal balance between inflation and unemployment, or in modern parlance, finding the strategy that hits the optimal point on the frontier relating the variances of inflation and unemployment around their target values. Such an exercise can be quite complicated, building in all sorts of lags and expectation effects; but the basic analytical model has been around for a long time, and the reasoning is familiar. With oil shocks, policymakers are confronted with a new dilemma. Policy must then balance competing objectives in the presence of a shock that normally implies more inflation, more unemployment, or a combination thereof. In this environment, the choices become more difficult, and the public perceptions of how well stabilization policy is doing will inevitably decline.

However, it is possible to distinguish between good and bad policy choices, even when no choice looks especially desirable. My remarks address these choices and how to make them. I will first review the evidence on the seriousness of oil shocks for the macroeconomy and then discuss how I think monetary policy should generally respond. I will follow this with a brief discussion of the current situation in the United States.

How serious are oil shocks?

Oil shocks have serious effects on the economy because they immediately raise prices for an important production input - oil - and important consumer goods - gasoline and heating oil. They are also likely to push up prices in other energy markets. These price increases are significant enough that they typically show up as temporary bursts in the overall rate of inflation. They may even get passed through to continuing rates of inflation if they become incorporated into price- and wage-setting behavior. Increases in oil prices also reduce consumer spending power, in much the same way as when a new excise tax is passed along by oil producers. To the extent that these producers are foreign, there should be a corresponding drop in domestic demand. Even if the oil producers are domestic, a drop in domestic demand could still occur if the producers do not spend as much of their new income as consumers would have or if they do not recycle their profits to shareholders.

Estimating the impact of these oil shocks on the real economy can be done in at least two ways. One approach, often associated with James Hamilton, measures the reduced-form correlation between oil price movements and subsequent movements in unemployment, or output gaps.¹ Such an analysis is shown in figure 1, which compares aggregate real oil prices with a measure of the overall output gap.²

The figure shows that since 1973 every upward spike in real oil prices has been followed by a jump in the output gap. However, some of these jumps seem much larger than can be accounted for by oil prices alone, and there appears not to be a symmetric macro response to downward oil price shocks. But this result is still impressive because most of these oil price shocks have been perceived as

¹ James D. Hamilton (1983), "Oil and the Macroeconomy since World War II," *Journal of Political Economy*, vol. 91, (April), pp. 228-48.

² Specifically, from a Hodrick-Prescott filter with a standard tuning parameter.

temporary, as measured by the difference between the oil spot price and far futures price (discussed further below). Presumably, the macroeconomic impact would have been even more powerful for price shocks that were perceived as permanent. Hamilton and others have run a series of causality tests to these macro data and do find significant causal effects for oil prices.

One can also analyze oil price shocks by using structural econometric models. These models would typically build in some sort of price-responsiveness behavior to measure pass-through effects. They would account for the effects of higher energy prices on the real disposable income and spending demands of the household sector. They would make similar calculations for business investment, working out the impact of oil prices on the cost of capital and business-cash flows, to the extent that these influence overall investment spending. When one does all this, as many economists are doing these days, one sees effects of about one-third of 1 percent on unemployment and slightly more for core inflation rates for a permanent shock in the price of oil of \$10 a barrel.³ With appropriate transformations, these structural effects appear to be a good bit smaller than the implications of the reduced-form correlations.

Why the difference? Many sources of discrepancy between the reduced form effects and the structural effects are possible. One involves consumers - perhaps a serious oil price shock could affect consumers' confidence or spending plans in a way that would not be captured by working out the effect of normal income and price elasticities. Capital investment may also be affected if the oil price shock encourages producers to substitute less-energy-intensive capital for more-energy-intensive capital. Of course, such a substitution will not necessarily lower aggregate demand if it requires *more* investment demand for new energy-saving equipment. Oil is a pervasive commodity, and other types of non-model effects are possible, but these consumption and investment effects seem the most obvious.

How should monetary policy respond to oil price shocks?

Monetary policy makers in this country have a dual mandate, to stabilize prices and to maximize sustainable employment in the long run. Their response to oil price increases should focus on these two objectives.

At one extreme, monetary policy makers might focus exclusively on the demand-reducing effect of oil shocks and try to stabilize unemployment rates. The risk from this approach is that prices would rise the full amount implied by the shock and would more likely be passed through into further wage and price increases. Continuing inflation rates could bump up the full amount of the initial boost in inflation. The continuing inflationary potential from the oil price shock would, in effect, be maximized.

At the other extreme, monetary policy makers could focus exclusively on neutralizing the initial impact of the shock on inflation. Given the initial oil price shock, this approach would entail reducing demand enough to stabilize overall, or core, inflation rates. If prices were at all sluggish in their response to changes in unemployment, this approach could entail large increases in unemployment from the shock.

Most observers would choose a policymaking approach somewhere between these two extremes. If, for example, monetary policy makers tried to keep overall nominal income on a steady path, the direct rise in nominal income from the oil price shock would be met by a fall in real income from somewhat higher unemployment. The result would be a temporary rise in both inflation and unemployment. Because the temporary rise in unemployment would damp price pressures, the chances that the initial oil price inflation would pass through into continuing inflation would be reduced. Most likely, the initial inflationary boost would prove temporary, permitting the rise in unemployment to be temporary as well.

But nominal income targeting has its own deficiencies. First, since a large share of U.S. oil is imported, a significant difference could exist between the value-added price deflator comprising nominal income and more-appropriate measures of true consumer price inflation. Monetary policy makers would be better off focusing directly on these more-appropriate measures. Second, as before, if prices were highly sensitive to supply shocks but not sensitive to output movements, even nominal income targeting could imply substantial increases in unemployment.

³ Core consumer price inflation is defined to exclude direct energy and food prices and hence more accurately measures the continuing effect of an oil price shock.

A better approach would be to follow a policy rule based directly on target values of unemployment and some appropriate measure of inflation. One example is a Taylor rule, under which monetary policy makers would move the short-term target interest rate - the federal funds rate in the United States - up or down to respond to deviations in core inflation and unemployment from their target values.⁴ The results would be qualitatively similar to those of the nominal income targeting rule, with a temporary rise in both inflation and unemployment, though the increases would now be more keyed to underlying monetary policy objectives. Because of the offsetting policy reactions, the real federal funds rate would be likely to remain approximately constant during this chain of events. If it did, the nominal funds rate would first rise and then fall with the inflation rate itself.

While not a perfect outcome, this targeted intermediate approach is probably about the best that can be done. Were policy to try to avoid any rise in unemployment, the initial oil price shock might get passed through to continuing inflation. Were policy to try to avoid any rise in inflation, the movement in unemployment would be substantial. The best approach is likely to be to accept some temporary rise in both inflation and unemployment, with the increases being based on underlying objectives. The rises would be temporary so long as inflation did not persistently deviate from its long-term price-stability target. But even in this preferred approach, the widely watched nominal federal funds rate would likely rise for a time.

Current events

With that backdrop, I will now turn to the current situation. As shown in figure 2, the spot price of oil (solid line) has recently spiked up, as it has several times since 1985.⁵ But in contrast to most other oil-price-spike episodes, this time the far futures price of oil - that is, the price for contracts seven years out - has also risen sharply. This correlation seems to indicate that the present oil price increase is not viewed as a purely temporary shock. At the same time, as shown in figure 3, which plots the difference between the spot price and the futures price, the current price is still greater than the far futures price, representing a phenomenon known as backwardation.⁶ Because of such backwardation, this oil price shock still seems to have an important temporary component.

One question that arises immediately is whether the source of the shock matters. In the 1970s and 1980s, most oil shocks seemed clearly to be on the supply side in that international producers withheld production from the world market, either because of attempts to gain more oil revenue or because of other supply interruptions, such as the Iranian Revolution. Today, the high price of oil is much more likely to be due to demand growth in the United States, China, India, and other countries. Does the source matter when trying to determine how monetary policy should respond?

If the demand growth that caused the oil price increases is domestic, it could mean that the price shock might be less permanent. The high oil prices would themselves cut into demand growth and tend to stabilize the system. If the demand growth is foreign, say from China and India, this feedback effect is still present but damped. Even foreign demand for oil might be influenced by reduced demand growth in the United States and its trading partners. It is certainly possible that oil shocks partially motivated by demand may be less permanent than true supply shocks, though that reasoning is contradicted by current-day oil futures prices. This whole issue, however, is new and imperfectly understood. It is not much of a silver lining, but the present price burst might provide some information on the qualitative difference between domestic and international demand and supply shocks.

A second question is whether the present shock is large enough to cause macroeconomic ripples. As figure 1 shows, even the present high real price of oil is only about half the real price in 1980, and the importance of energy in the overall economy is also less than half what it was then. At the same time, figure 2 suggests that the permanent oil price rise is on the order of \$15 a barrel. Since the United States now imports 4.5 billion barrels of oil per year, this price rise makes for an effective reduction in

⁴ Named after John B. Taylor (1983), "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy*, vol. 39 (December), pp. 195-214.

⁵ Astute chart-gazers will note that the commonly quoted price in figure 2, for a barrel of west Texas intermediate crude oil, is higher than the current price of oil in gross domestic product shown in figure 1. That is because, on average, the United States uses a lower quality of oil in its production of total output.

⁶ A stock exchange term for a percentage paid by a seller of stock for the privilege of delaying its delivery until some agreed on future date. In effect, the futures price is less than the spot price.

domestic income of \$68 billion. To the extent that dollars going to domestic oil producers are not fully recycled, the effective demand reduction could be even greater. There could also be important parallel effects in natural gas and other markets. The rise in consumer prices from all these sources, as well as the reduction in aggregate demand, could be noticeable. All things considered, although the present oil shock may not be as significant as the shocks we remember from the 1970s and 1980s, it will definitely register.

A final issue involves the initial position of the economy and monetary policy. In the usual exercise, one analyzes the economy in some sort of equilibrium position and posits an oil price shock, which normally results in the temporary increases in inflation and unemployment described earlier. When monetary policy begins with inordinately low nominal interest rates, the reasoning becomes more complicated. Now the response to the oil shock is, in effect, superimposed on any re-equilibration process built in for monetary policy. The ultimate response of the economy will blend the two responses, though not additively because of the complicated nonlinear structure of the economy.

The net effect of these factors is difficult to perceive in any more than broad outline. Without the oil shock, policymakers beginning from a period of low interest rates would try to keep the economy on an even growth path as they gradually raised nominal interest rates. With the shocks, nominal rates would still likely follow an upward path, though the economic reactions would be bumpier, with temporary rises in both inflation and unemployment.

Conclusion

As a new economic event of the 1970s, oil price shocks forced monetary policy makers to rethink all their rules and added new chapters to macroeconomic textbooks. Today the question of how to respond to oil price spikes is better understood, but the outcomes are no more pleasant. It is virtually inevitable that shocks will result in some combination of higher inflation and higher unemployment for a time. But I must stress that the worst possible outcome is not these temporary increases in inflation and unemployment. The worst possible outcome is for monetary policy makers to let inflation come loose from its moorings.

Figure 1
Output Gap and Real Oil Price



Figure 2
Crude Oil Spot and Far Futures Prices

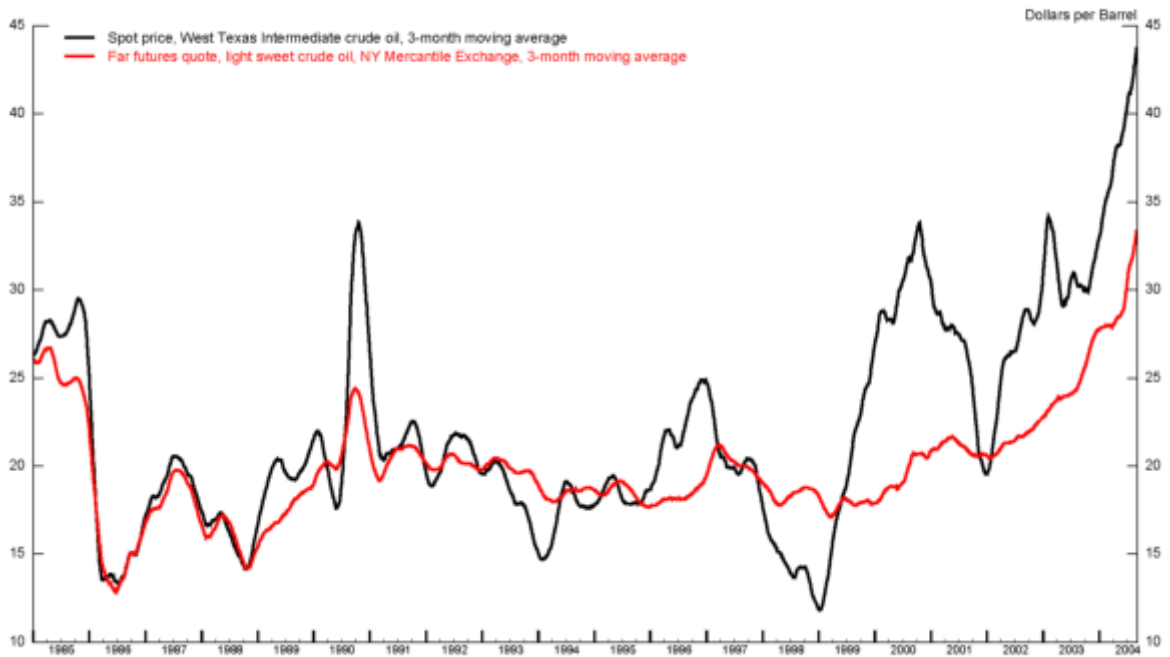


Figure 3
Crude Oil Basis (Spot price minus Far Futures price)

