Consumption and the recession of 1990-1991

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The paper looks at the recession of 1990-91. It reaches two conclusions:

Not all recessions have the same dynamics. Decreases in output which come from other sources than consumption shocks tend to be short lived, and followed by sharp recoveries. Decreases in output which come from consumption shocks, decreases in consumption given income, tend to be longer lasting, and followed by weaker recoveries.

In contrast to its predecessors, the recession of 1990-91 was caused primarily by a consumption shock. Thus, conditional on the nature of those shocks, the slow recovery comes as no surprise. As of the end of 1992, the economy was nearly exactly on the track given by a dynamic forecast based on information up to the first quarter of 1991.
During the last two quarters of 1990 and the first quarter of 1991, the US economy experienced negative growth. These three quarters have now been designated as the 1990-1991 recession by the NBER. But both in the year preceding and the year following, growth was anemic as well. Growth since the beginning of 1989 has averaged 0.7% at an annual rate, a far cry from its post-1973 mean of 2.2%.

In contrast to its predecessors, this recession does not have an obvious proximate cause. And precisely because of that, explanations abound, ranging, to cite only the leading candidates, from a long expansion dying of old age, to consumer depression, a mix of debt overhang and the realization of lower growth prospects, to the credit crunch, the combination of imprudent behavior by financial institutions and the tightening of regulation, to the end of the Cold War and the decrease in defense spending, to structural adjustments required by global competition 1.

The purpose of this paper is to look at the data, putting just enough economic structure on the econometrics to pinpoint if not the deep, at least the proximate causes of the recession. The story which emerges is relatively clear. By far, the main proximate cause of the recession was a “consumption shock” a decrease in consumption in relation to its normal determinants. Because the effects of such shocks are long lasting, this also explains why, in contrast to previous recoveries, the recovery was a slow and weak one. The issue left unanswered is whether this “consumption shock” was due to animal spirits/taste shocks, or simply to anticipations of the slow growth to come. Circumstantial evidence points to a role of animal spirits, but will not convince all.
I. Looking at the Components of GNP.

A. Estimating a VAR.

A simple first pass is to estimate the joint behavior of the components of GNP, and look at the residuals. I thus decompose real GNP (Y), as the sum of consumption on non durables and services (C), consumption expenditures on durables (CD), residential investment (IR), non residential (INR) investment, government spending (G), inventory investment (INV) and net exports (NX). To achieve stationarity, I log-difference C, CD, IR, INR and G, and divide INV and NX by trend output, obtained by fitting a broken exponential trend to GNP, with a break in 1973.

I then run a VAR for the seven transformed variables, for the period 1959:1 to 1992:3, with 3 lags of each variable, a constant and a post-73 dummy in each equation. Issues such as treatment of trend, or the incorporation of cointegrating relations, while important if we were to look at impulse responses, are of little import when the focus is, as here, on the residuals to each equation.

Given the 7 estimated equations, an auxiliary equation is needed to characterize the behavior of GNP and its residual. Given the non-linear transformations of the individual series used to induce stationarity, there are two ways of doing this. The first is to construct GNP residuals for each period as a weighted average of the residuals in each equation, multiplied by the time varying ratios of each component to GNP. The other is to regress log-differenced GNP on the set of right hand side variables of the VAR, and use the residuals from this equation. This second approach yields results very similar to the first, and is simpler to implement. This is the one I use below.
B. Identifying the Shocks.

Denote the residuals to each equation by lower case letters, for example $c$ for the consumption equation, $y$ for the -auxiliary- output equation. These residuals are simply forecast errors. They are, not surprisingly, generally positively correlated across equations. This reflects their joint dependence on common underlying shocks, as well as their direct dependence on each other. To the extent that consumption responds to income within the quarter for example, part of the consumption residual, $c$, reflects also the shocks to other components.

We can make some progress and get closer to the underlying shocks by making two identifying assumptions. The first assumption is that, within the quarter, the components of GNP depend on each other only through GNP. Thus, I assume that, for example, $c$ depends only on $y$ -the residual to the output equation-, not separately on $i_r$, $inr$ and so on. The second assumption is that $g$, the government spending residual, is exogenous. Under those two assumptions, $g$ can be used as an instrument to estimate the effects of $y$ on each of the other six residuals. Denote the residuals from these instrumental variable regressions by $e$, thus using $e_c$ for consumption for example, and refer to them as the "shocks". These new residuals are still cross-correlated, but less so than the original ones.

The two identifying assumptions are crude, and forecast errors in government spending are not a very powerful instrument. Nevertheless, the estimates of the contemporaneous effects of $y$ on its components make sense. Using sample mean values to go from estimated elasticities to derivatives, the estimates imply that a one dollar increase in GNP increases consumption of non durables and services by 12 cents, durable consumption by 11 cents, residential investment by -1 cent, non residential investment by 6 cents, net exports by -8 cents, and inventory in-
Table 1. The source of shocks

<table>
<thead>
<tr>
<th>Quarter</th>
<th>$\sum(y/\sigma_y)$</th>
<th>$\sum(\epsilon_c/\sigma_c)$</th>
<th>$\sum(\epsilon_{ir}/\sigma_{ir})$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989:1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1990:2</td>
<td>2.32</td>
<td>-2.50</td>
<td>0.25</td>
</tr>
<tr>
<td>1990:3</td>
<td>1.38</td>
<td>-2.29</td>
<td>-1.15</td>
</tr>
<tr>
<td>1990:4</td>
<td>0.79</td>
<td>-4.07</td>
<td>-1.61</td>
</tr>
<tr>
<td>1991:1</td>
<td>-0.39</td>
<td>-5.42</td>
<td>-2.87</td>
</tr>
<tr>
<td>1991:2</td>
<td>0.18</td>
<td>-5.35</td>
<td>-2.17</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1992:3</td>
<td>0.46</td>
<td>-6.12</td>
<td>-0.15</td>
</tr>
</tbody>
</table>

The estimation of the shocks, the $\epsilon$'s, is described in the text. The accumulated series follow random walks with zero mean and unit standard deviation. Thus for example, starting at 0.00 in 1989:1, the distribution of the sum in 1992:3 has mean zero and standard deviation $\sqrt{14} = 3.74$. 
Recession

investment by -15 cents.

The next step is then to look at the sequence of shocks, the $\epsilon_x$'s, and look for unusually large individual shocks, or for sequences of shocks of the same sign. A convenient way to do so is to look at the accumulated shocks to the various components, each normalized by its estimated standard deviation, starting from some date which I choose to be the first quarter of slow growth, 1989:2. The main results are presented in table 1.

The first column gives the sum of normalized GNP residuals, $y/\sigma_y$. It shows that, despite the fact that output growth was below its mean in 1989 and early 1990, residuals to the output equation were, during that period, small but positive. Thus, the VAR explains the slowdown of output pre-1990:3 through the internal dynamics of the economy rather than through adverse shocks. It would be worth following this finding through; I have not done it yet.

The second and third columns give the sum of accumulated shocks to consumption of non-durables and services, and to residential investment respectively. These are the only two components of GNP which show large negative shocks (although, interestingly, even for those, no single residual is larger in absolute value than 2 standard deviations). A negative shock to residential investment dominates the first quarter of the recession, 1990:3. Two negative shocks to consumption dominate the next two quarters. While the largest shocks take place during the recession, the whole period since 1989:2 is dominated by negative shocks to consumption. The sum is still large in 1992:3. The rest of the paper focuses on those shocks, their nature and their implications.
II. Looking at Output and Consumption

A. From 7 to 2 Variables.

7-variable VAR's are unwieldy, their dynamics hard to understand and harder to describe. Fortunately, examination of the dynamic structure of the VAR above suggests a short cut. Tests of the significance of each variable in each equation (which, because of space constraints, are not reported) show the strong predictive power of non durables and services consumption for nearly all components of GNP, and the weak predictive power of most other components. This suggests that we may not lose too much by focusing on a bivariate system in output and consumption. This is what I do in this section.

I thus estimate a bivariate system in the logarithm of consumption of non durables and services, and the logarithm of GNP. There is weak evidence of cointegration, that the ratio of consumption to income is stationary. I thus specify the VAR in terms of first differences, allowing for three lags of each first-differenced variable, the lagged value of the log consumption to income ratio, a constant and a post-1973 dummy 2.

B. From Residuals to Shocks

Estimation of the system yields residuals for consumption and income, \( e \) and \( y \) respectively. I follow the same approach as before to get to consumption shocks, using the unexpected component of government spending as an instrument in a regression of \( e \) on \( y \). This yields an elasticity of .12 of consumption to income, thus an increase of consumption of 7 cents within the quarter for a dollar increase in income. The “consumption shock”, \( e_c \), is defined as the residual of this regression.
A regression of \( y \) in turn on \( \epsilon_c \) yields an elasticity of .51 (thus an increase of 96 cents in income for an increase in consumption of a dollar, a multiplier slightly below one within the quarter), and an "income shock" as the residual, \( \epsilon_y \). Summarizing, the mapping from residuals to shocks is given by:

\[
\begin{align*}
    c &= .12y + \epsilon_c \\
    y &= .51\epsilon_c + \epsilon_y
\end{align*}
\]

An examination of the sequence of realized shocks gives a picture similar to that in table 1. The first quarter of the recession, 1990:3 is dominated by an income shock, which we know from earlier can be traced mostly to non residential investment. The next two quarters are dominated by consumption shocks. This last finding is the key to understanding why the recovery has been so weak. To see why, I proceed in two steps, first looking at the dynamic effects of both income and consumption shocks, and then looking at dynamic forecasts of output as of 1991:1.

C. Impulse Responses, and the Weak Recovery.

The effects of one-standard-deviation negative consumption and income shocks are drawn in Figure 1. The figure has two main features. The first is that shocks to income have only transitory effects on consumption and income; their effect is largely gone within two years \(^3\). The second is that shocks to consumption have long lasting, hump shaped, effects on output, and to a lesser extent on consumption \(^4\).

Now consider Figure 2. Figure 2 gives both actual output and the dynamic forecast
for output based on the bivariate VAR using information up and including the last quarter of the recession, 1991:1 (Thus, both lines are the same up to and including 1991:1). What is striking is not only how weak the recovery has been since 1991, but also that a weak recovery is also what would have been predicted by the bivariate model as of the end of 1991:1. Indeed the actual recovery has been slightly faster than the dynamic forecast... (Note that the dynamic forecasts are independent of our identification of the shocks).

For comparison purposes, Figure 3 performs the same exercise for the previous recession, giving output, actual and forecast as of the last quarter of that recession, 1982:4. Note that, in that case, the same bivariate model largely predicts the strong recovery which followed.

Given our decomposition of the shocks, and the characterization of impulse responses, the key to Figure 2 and Figure 3 is easily given. More so than in previous recessions, the decrease in output in 1990-91 was due to adverse shifts in consumption. Those shifts have long, hump shaped effects on output, and their dynamic effects explain why the recovery has been slow. There is an important lesson: recessions are not necessarily followed by fast recoveries; this depends on the nature of the shocks which triggered the recession.

III. Foresight, or Animal Spirits?

I have so far established that the recession was associated with large negative “consumption shocks”, that such shocks have long lasting effects on output, and that this explains why the recovery has been so slow. This raises however the next set of questions. What are these “consumption shocks” and where do they come
from? And, in particular, where did those of 90-91 come from?

One interpretation, call it “foresight”, is that consumption shocks are simply the reflection of anticipations by consumers of other shocks and their effect on future income. The interpretation of impulse responses in Figure 1 is then that consumption shocks are simply followed by the changes in income which triggered them in the first place; consumption shocks are a mirror, not a cause. Another interpretation however is that consumption shocks reflect in part movements in consumption not due to changes in expectations of future income. Reasons may range from increasing prudence, to changes in intertemporal preferences, to —stepping outside of the usual maximizing model— sudden realizations of past overborrowing, panic, and so on. Under that interpretation, call it “animal spirits”, impulse responses in Figure 1 show how shifts in consumption lead through a combination of dynamic multiplier and accelerator effects to a hump shaped response of output.

Can one tell these two interpretations apart? To some extent, one can. Under the animal spirits interpretation, and under the plausible assumption that animal spirits have little or no long run effect on output, the impulse response of output to a consumption shock should eventually return to zero. This is clearly violated in Figure 1, suggesting that consumption shocks must reflect in part foresight of shocks with permanent effects. The foresight interpretation on the other hand imposes constraints on the relation of the consumption response to the subsequent response of income, and of the shape of the consumption impulse response itself. Following the route of putting more theoretical structure on the data to try to disentangle foresight and animal spirits would take me too far. I shall instead drop out of the above econometric framework, and offer my speculations on the
nature of the negative consumption shocks of 1990-91:

I see the overall evidence, from the timing of monthly declines in the index of consumer confidence (from the Michigan Survey of consumers), in the index of leading indicators, and in commercial forecasts of output, as pointing to more than consumer foresight at work. First, in contrast to earlier recessions, the decline in confidence was largely prior to—and much stronger than would have been predicted by—either the decline of leading indicators or commercial forecasts of the recession. Second, perhaps not coincidentally, the first large decline in confidence in August 1990, was associated with an important but largely non-economic event, the invasion of Kuwait by Iraq. Third, after having dropped, consumer confidence remained very low in the following two years, much lower than would have been predicted on the basis of historical relations with aggregate variables. Each piece of evidence can, with some effort, be reconciled with the foresight interpretation; together however, I find them suggestive of a role for a drop in confidence coming from more than the expectation of the recession.
References


Sinai, Allen, "What’s Wrong with the economy?", Challenge, forthcoming, 1992

Footnotes

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1 Two useful discussions of potential causes are given by Allen Sinai and Carl Walsh.

2 Such systems have been estimated by many others. John Cochrane in particular focuses also on the different dynamic effects of consumption and income shocks. His approach to identification is however somewhat different from that used in this paper.

3 The fact that the long run effect of a negative shock is positive is mildly embarrassing, but this long run effect is not significantly different from zero.

4 This point is also emphasized by Cochrane.

5 Results for the post-recession episodes of 1971 and 1975 are qualitatively similar to those for 1982, with fast predicted and actual growth following each recession.