The U.S. Economy in 1990 and 1991: Continued Expansion Likely

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As the seventh year of economic expansion draws to a close, inflation fears seem to have subsided. But in recent months some signs of rising inflation and slowing growth have emerged. These signs have caused many economists to predict that inflation will be higher and real growth slower in 1990 than they were in 1989. In contrast, a model used by researchers at the Federal Reserve Bank of Minneapolis suggests that those forecasters' predictions are too pessimistic. The model predicts that strong consumption growth will sustain the expansion in both 1990 and 1991 and that inflation will remain under control.

Still Walking a Fine Line?

In a *Quarterly Review* article published early in 1989, Preston Miller and I argued that the economy had to walk a fine line between recession and accelerating inflation (Miller and Runkle 1989). We suggested that real output in 1989 could not grow much faster than 3.1 percent without an increase in inflation. At the time, the Minneapolis Fed's Bayesian vector autoregression (BVAR) model of the U.S. economy predicted moderate real growth and moderate inflation for 1989. The model's predictions were largely correct: It now looks as if real gross national product (GNP, adjusted for inflation) will grow by about 2.4 percent and inflation, as measured by the GNP deflator, will be 3.9 percent. These numbers seem to indicate that the economy has managed to walk a fine line in 1989.

Since the middle of 1989, however, there have been some signs that the economy may be weakening. Employment in manufacturing has declined steadily during the last half of 1989. Between the beginning of June and the end of December, nearly 200,000 manufacturing jobs are likely to be lost. New sales of domestically produced autos in October and November fell to an annual rate of 6 million units—their lowest level in six years for any two consecutive months. As a result of these signs, many economists are predicting a decline in real consumer spending during the fourth quarter of 1989. There has also been a recent decline in new orders for manufactured goods, one indicator of future economic activity.

At the same time that real growth appears to be slowing, some data on price changes suggest that the low inflation during the third quarter of 1989 was an aberration and that inflation may rise in 1990. In October, both the consumer price index (CPI) and the producer price index rose at annual rates of more than 5 percent after four months of slow growth. These rising rates have cast some doubt on the claim that inflation is finally under control and have caused some analysts to revert to their pessimistic inflation forecasts made early in 1989.

The recent data suggest that we must reconsider whether or not the economy will continue to walk a fine line between recession and accelerating inflation in 1990–91.

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The Current Consensus . . .

Although most economists now predict that inflation will not accelerate dramatically and that the economy will not enter a recession, the consensus among them is that inflation will be higher and real growth will be lower in 1990 than in 1989. The September 1989 Business Outlook Survey of professional forecasters, conducted by the American Statistical Association (ASA) and the National Bureau of Economic Research (NBER), shows that the forecasters' median prediction calls for the GNP deflator to rise by 4.4 percent from the fourth quarter of 1989 until the fourth quarter of 1990.[1] This prediction is half a percentage point higher than the BVAR model's current estimates of deflator growth in 1989. The ASA–NBER forecasters also believe real growth will slow slightly in 1990. Their median forecast is that real GNP will grow by only 2.1 percent during 1990, or three-tenths of a percentage point lower than the model's current estimates of real growth in 1989.

The main reason for this pessimism among the ASA–NBER forecasters seems to be a belief that the recent low inflation in the third quarter of 1989 was an aberration whereas the current weakness in consumer spending will continue into 1990. The median forecast in the ASA–NBER survey is that real consumption will grow by only 2.5 percent in 1990. In comparison, annual consumption growth has averaged 3.8 percent since 1983, when the recovery was under way.

. . . Contradicted

Although many economists believe that real growth will slow in 1990, the Minneapolis Fed's national BVAR model predicts faster growth with moderate inflation. (See Litterman 1984 and Todd 1984 for

[1] See NBER 1989. The ASA–NBER survey, which was started in 1968, is the longest continuous survey of GNP predictions made by business economists. For more background on the survey, see Keane and Runkle 1989 and Zarnowitz 1969. I use the median ASA–NBER forecast instead of the better-known Blue Chip consensus forecast because the Blue Chip survey does not ask forecasters to predict consumption growth, whereas the ASA–NBER survey does.

A BVAR Model's Forecast for the U.S. Economy in 1990–91*

Indicator	Actual** 1989	Model Forecast 1990	Model Forecast 1991	1948–88 Average
Annual Growth Rates (4th Qtr. % Changes From Year Earlier)				
Real Gross National Product	2.4%	3.4%	3.8%	3.3%
Consumer Spending	2.4	4.0	3.8	3.4
Durable Goods	-1.1	8.5	5.1	5.1
Nondurable Goods and Services	3.1	3.2	3.5	3.2
Investment	2.0	2.5	5.6	4.3
Business Fixed	4.3	3.4	5.7	3.4
Residential	-6.0	5.6	2.9	3.6
Government Purchases	1.0	1.7	0.8	4.1
Gross National Product Deflator	3.9%	3.1%	2.9%	4.2%
4th Quarter Levels				
Change in Business Inventories (1982 $)	23.1 bil.	13.1 bil.	18.9 bil.	13.5 bil.
Net Exports (1982 $) (Exports less Imports)	-60.1 bil.	-58.6 bil.	-50.8 bil.	-18.6 bil.
Civilian Unemployment Rate (Unemployment as a % of the Civilian Labor Force)	5.3%	5.4%	5.4%	5.7%

*This is the forecast of a Bayesian vector autoregression model using data available on November 30, 1989.

**Actual numbers are based on data for the first three quarters of 1989 and the BVAR model's forecast for the fourth quarter of 1989 (using data available on November 30, 1989).

Sources of actual data: U.S. Departments of Commerce and Labor

background information on BVAR models like this one.) The model's forecast for 1990 and 1991 is summarized in the accompanying table. The model predicts that the current weakness in growth will be reversed early in 1990. It predicts that real GNP will increase by 3.4 percent from the fourth quarter of 1989 until the fourth quarter of 1990 and by 3.8 percent between then and the fourth quarter of 1991. The model also predicts that the GNP deflator will increase by only 3.1 percent in 1990 and by 2.9 percent in 1991.

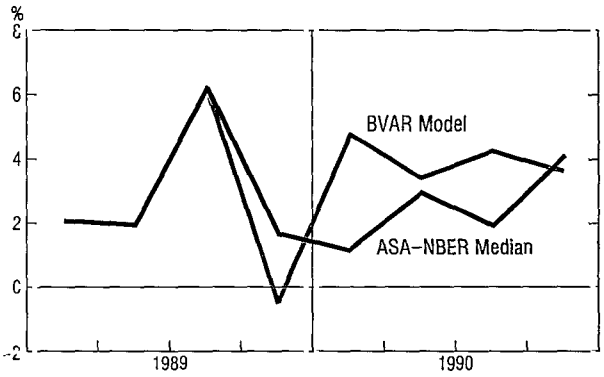
The model's strong forecast for real consumption growth is the main reason its prediction for real growth in 1990 is so much stronger than the forecasts of many business economists. The model predicts that real consumer spending will increase by 4 percent in 1990—almost twice the rate of growth predicted by the median forecast in the ASA–NBER survey. (See Chart 1.) This difference in consumption growth predictions accounts for more than 90 percent of the difference between the model's GNP growth forecast for 1990 and that of the median ASA–NBER forecast.

Because the model forecasts that the moderate inflation between May and September of 1989 is likely to persist, its inflation predictions are more optimistic than those of the median ASA–NBER forecast. Using data on inflation through October 1989, the model predicts that during the second half of 1989 the GNP deflator will grow at an annual rate of 3.6 percent and that the CPI will grow at an annual rate of 3.1 percent. The model's predictions for low inflation in 1990 and 1991 are extrapolations of those low inflation rates, nudged downward by recent drops in interest rates. (Whenever interest rates fall, the model predicts that inflation will fall, too. The model makes this prediction because in the past, falling interest rates have been followed, on average, by falling inflation.)

Chart 1

Differences in Consumption Growth Forecasts for 1990

% Changes at an Annual Rate*



*The 1989 data are actual—except for the fourth quarter.
Source of actual data: U.S. Department of Commerce

Which Forecast Seems More Likely?

Although the model's forecasts for both inflation and real growth are more optimistic than the median ASA–NBER forecast, the outlook for real growth seems to be the focus for most current discussions of economic policy. Since the model's forecast takes a much more optimistic view of the effect of current economic weakness on future real growth than does the median ASA–NBER forecast, we need to determine which of these predictions is more likely.

There are four kinds of evidence that support the BVAR model's predictions:

- Current data on factors affecting future consumption.
- Historical data about what has happened after slowdowns during the current recovery and expansion.
- An evaluation of the internal consistency of the median ASA–NBER forecast.
- A comparison of the recent accuracy of forecasts made by the BVAR model and the median ASA–NBER forecast.

Data Affecting Future Consumption

Although forecasters generally agree that consumption growth will be weak in the fourth quarter of 1989, they disagree about how quickly consumption growth will return to its previous rates. The effects of Hurricane Hugo, the San Francisco earthquake, and the newly resolved Boeing strike have added to the confusion in interpreting fourth-quarter data. But several indicators suggest that consumption should remain strong.

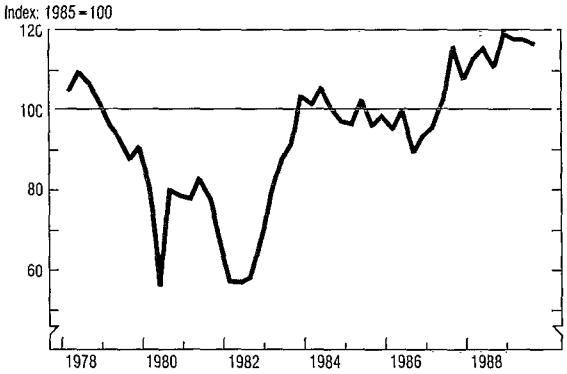
One of these indicators is the Conference Board's Consumer Confidence Index, which has been published since 1978. The index is currently at near-record levels (see Chart 2). Only in four previous years (1983, 1984, 1987, and 1988) has the index averaged over 100 during the final two months of a year. The years with high year-end consumer confidence were followed by years with, on average, 3.7 percent real consumption

Chart 2

Consumers Have the Confidence to Spend . . .

Consumer Confidence Index

Quarterly, 1978:1–1989:3



Source: Conference Board

growth. Since, as of October 1989, the index was 116.4, high consumption growth next year seems likely.[2]

The optimism suggested by the Consumer Confidence Index is reinforced by recent data that confirm consumers' ability to spend. Real disposable income has increased by 4 percent since the fourth quarter of 1988—its sixth fastest growth rate during the past two decades. Real disposable income per capita is at record levels (see Chart 3). Real net worth per household is also at a record high (see Chart 4). These data show that people have income to spend and money in the bank—hardly indicators of slow consumption growth.

The strength in consumption growth during the first three quarters of 1989 offers additional support for the prediction that consumption growth will rebound soon. (See Chart 1 again.) During the first three quarters, real consumption grew at an annual rate of 3.4 percent. In the third quarter, growth was particularly strong, at 6.2 percent.

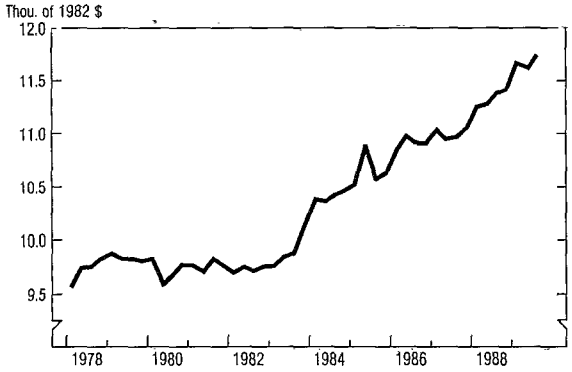
Some analysts have claimed that rapid new car sales caused most of the strength in consumption during the third quarter and that the fourth-quarter weakness in auto sales indicates weak total consumption for 1990. But these analysts have ignored the recent strength in consumption of nondurable goods and services, which make up 84 percent of total consumption. Even though durable-goods consumption grew at an annual rate of 13.2 percent in the third quarter, increases in spending for nondurable goods and services actually accounted for two-thirds of the growth in real consumption in that quarter. Strong growth in the consumption of nondurable goods and services has occurred throughout the first three quarters of 1989. During that time, real

Charts 3 and 4

. . . And the Ability

Chart 3 Real Disposable Income Per Capita

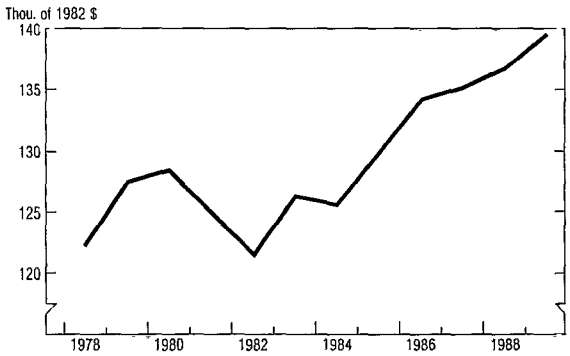
Quarterly, 1978:1–1989:3



Source: U.S. Department of Commerce

Chart 4 Real Net Worth Per Household

Annual, 1978–1989*



*Amounts are fourth-quarter levels—except for that in 1989, which is the second-quarter level.

Source: Board of Governors of the Federal Reserve System

[2] Another index, the Michigan Index of Consumer Sentiment, does not show the same rapid rise after 1987 that the Conference Board's index shows. Even so, the level of the Michigan index in October 1989 was still above its average since 1983.

consumption of nondurable goods and services grew at an annual rate of 2.9 percent. If this consumption continued to grow at that rate in 1990, then even with zero growth in durable-goods consumption, total consumption would grow by at least 2.5 percent. This fact suggests that the pessimism of the median ASA–NBER forecast may be unwarranted.

Historical Evidence

Another source of support for the BVAR model's forecast of strong growth for 1990 is historical evidence of the economy's resiliency since the current recovery began in 1982. Analysts have cited three pieces of data to suggest that the economy is now slowing: First, durable-goods consumption has declined; second, employment in manufacturing has fallen; third, the real value of new orders has dropped. Each of these events has happened before in the current expansion, yet none had any sustained effect on the expansion.

Most analysts expect that consumption of durable goods will fall sharply during the fourth quarter of 1989. Even the BVAR model predicts this decline. But many analysts are making dour predictions that this drop in durable-goods consumption will continue into 1990. The evidence from the current expansion, however, suggests that a sharp fall in durable-goods consumption during one quarter need not continue into subsequent quarters. In three quarters of the current recovery (1985:4, 1987:1, and 1987:4), real consumption of durable goods has declined at an annual rate of more than 13 percent in a single quarter. New car sales fell sharply in each of those quarters after sales incentives and costlier-than-usual advertising campaigns were curtailed. In each case, consumption growth during the next two quarters exceeded a 10 percent annual rate. Based on these precedents, the fourth-quarter weakness in durable-goods consumption does not necessarily mean that the weakness will continue into 1990, although continued weakness is certainly possible.

Evidence from the current expansion also suggests that neither a decline in manufacturing employment nor a drop in the real value of new orders for manufactured goods need result in slow growth. For instance, both manufacturing employment and new orders declined in every quarter of 1985, yet real GNP grew by 3.6 percent in that year.

Internal Consistency

An additional source of support for the BVAR model's forecast comes from using the model to check whether the median ASA–NBER real GNP growth forecast is consistent with the median ASA–NBER real consumption growth forecast. This check can be made using a method known as *conditional forecasting*. A conditional forecast is, essentially, a "What if?" exercise. Such a forecast assumes that the BVAR model correctly describes the relationships among different macroeconomic variables.

We can ask the BVAR model, for example, what real GNP growth forecast it would predict if it assumed that the median ASA–NBER real consumption growth forecast, rather than its own forecast of real consumption growth, were correct. This real GNP growth forecast would then be the model's conditional forecast because it is conditioned on the ASA–NBER consumption forecast. (The technical details of conditional forecasting with the BVAR model are discussed in the Appendix and in Doan, Litterman, and Sims 1984.)

I constructed a conditional forecast to check the internal consistency of the predictions made by the median ASA–NBER forecast. In this conditional forecast, the BVAR model based its predictions on the median ASA–NBER forecast of consumption growth from the fourth quarter of 1989 until the fourth quarter of 1990. One way to see whether the median ASA–NBER forecasts of real GNP growth and real consumption growth are reasonable is to compare the BVAR model's conditional forecast of real GNP growth with the median ASA–NBER forecast of real GNP growth. Since the BVAR model's conditional forecast shows the most likely real growth of GNP (given the ASA–NBER median forecast of consumption growth), that conditional forecast should be close to the ASA–NBER median real GNP growth forecast if the two ASA–NBER forecasts are consistent.

The BVAR model's conditional forecast predicts that real GNP growth would decline in 1990 if consumption were to grow as slowly as predicted by the median ASA–NBER forecast. The model's conditional forecast calls for real GNP to fall by 0.2 percent from the fourth quarter of 1989 to the fourth quarter of 1990. Since the median ASA–NBER forecast of real GNP growth in 1990 is 2.1 percent, that forecast and the conditional forecast differ substantially. Thus, if the BVAR model correctly captures the structure of the economy, it is unlikely that the ASA–NBER median forecasts of real consumption and real GNP growth are both correct.

Forecast Accuracy

One final source of support for the BVAR model's

forecast is the accuracy of its previous forecasts. After the last major changes to the model were made in 1986, it has been more accurate, on average, in predicting both real growth and inflation than has the median ASA–NBER forecast. This greater accuracy can be seen by comparing the published four-quarter-ahead predictions of the BVAR model and the median ASA–NBER forecast for real growth and inflation during the past three years with the initial announcements of those numbers. The comparison shows that the BVAR model was more accurate than the median ASA–NBER forecast two out of three times for each variable. It is not clear whether this accuracy is the result of good forecasting or good luck, but it provides some further support for the BVAR model's predictions.

But Are We Certain?

We have seen several kinds of evidence supporting the BVAR model's prediction that strong consumption growth will sustain the expansion for 1990–91. But, as with any prediction, the model's forecast could be wrong.

Recent data suggest one reason that the forecast could be wrong. The model's interpretation of the current weakness in real growth as an aberration could be incorrect. The model predicts that the weakness is an aberration, but other forecasters believe that the strength in real growth during the first three quarters of 1989 was an aberration. The model differs from these other forecasts in predicting that the economy will return to moderately rapid real growth despite the weak growth in the fourth quarter of 1989, whereas other forecasters believe that the weak fourth-quarter growth shows that the trend rate of growth has fallen. It is quite possible that the other forecasters are right and that the model is overly optimistic.

This uncertainty about how fast real GNP will grow next year suggests that it is important to assess how much uncertainty exists in the model's forecast. One significant feature of the BVAR model is that it can quantify the amount of uncertainty in its forecast from its own past forecast errors. The model estimates that the probability of a recession in 1990 and 1991 is about 30 percent. (I use the standard definition of *recession* as two consecutive quarters of negative real growth.) Thus, even though the model predicts moderate growth and moderate inflation, it shows that there is still a modest chance of a recession.

Even so, the model predicts that there is a smaller chance of a recession now than it predicted in 1984, after long-term interest rates rose 200 basis points, and in late 1987, after the October stock market crash.[3] In both of those cases, short-term weakness in the economy was reversed and the recovery continued. The BVAR model predicts that this reversal will happen again and that the expansion will continue through 1991.

[3]Since 1982, the model's prediction of the probability of a recession within the next eight quarters has varied from 10 percent to almost 80 percent.

Appendix
Conditional Forecasting With the BVAR Model

This appendix explains how I use the Bayesian vector autoregression (BVAR) model of the U.S. economy to make conditional forecasts like the one described in the text.

One long-unresolved problem with the national BVAR model is how to use it to make conditional projections of GNP and its components. The problem with making conditional forecasts based on these components arises because the model needs a way to reconcile the conflicting GNP forecasts made within the model. The complete model is composed of different sectors, which make their own forecasts. (For a description of the model's structure, see Litterman 1984.) But the GNP forecasts from the model's core sector will not usually be equal to the sum of the forecasts of the components of GNP made by the model's other sectors. Therefore, these differing forecasts must be reconciled.

Unfortunately, this reconciliation of conflicting GNP forecasts within the model has, until now, made it impossible to use the model to make conditional forecasts based on assumptions about the future path of real GNP or one of its components. Here I describe the method I used to solve this problem.

Without Reconciliation

In a simple BVAR model without different sectors or reconciliation, conditional projection is easy. Assume, for example, that we have estimated the following model:

$$\text{(A1)} \quad X_t = AX_{t-1} + \epsilon_t, \quad E(\epsilon\epsilon') = \Omega$$

where

X_t = a vector of stationary random variables
A = a matrix of regression coefficients
ϵ_t = a vector of innovations to X_t in time t.

Assume that X_t has two components: $x_{1,t}$ and $x_{2,t}$. Also assume that

$$\text{(A2)} \quad \Omega = \begin{bmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2^2 \end{bmatrix}.$$

Now suppose that after making a baseline forecast of the x's in period $t+1$ (denoted as $\bar{x}_{1,t+1}$ and $\bar{x}_{2,t+1}$), we want to see what the model would have predicted for $x_{2,t+1}$ if $x_{1,t+1}$ were equal to $\tilde{x}_{1,t+1}$ instead of $\bar{x}_{1,t+1}$. We can determine that effect by noting that to change our forecast of $x_{1,t+1}$ from $\bar{x}_{1,t+1}$ to $\tilde{x}_{1,t+1}$, we could add a shock of $(\tilde{x}_{1,t+1} - \bar{x}_{1,t+1})$ to the first component in $t+1$. However, if we do that, we cannot assume that the forecast for $x_{2,t+1}$ will remain at $\bar{x}_{2,t+1}$. In fact, the covariance matrix of the innovations implies that a one-unit shock to $x_{1,t+1}$ will, on average, be accompanied by a (σ_{12}/σ_1^2)-unit shock to $x_{2,t+1}$. Therefore, the forecast of $x_{2,t+1}$, conditioned on $x_{1,t+1} = \tilde{x}_{1,t+1}$, should be

$$\text{(A3)} \quad \tilde{x}_{2,t+1} = \bar{x}_{2,t+1} + (\sigma_{12}/\sigma_1^2)(\tilde{x}_{1,t+1} - \bar{x}_{1,t+1}).$$

From this description, it is easy to see that the correct-sized shock to change the forecast of $x_{1,t+1}$ from $\bar{x}_{1,t+1}$ to $\tilde{x}_{1,t+1}$ is extremely easy to determine.

With Reconciliation

It is not, however, so simple to determine the correct size of the shock with many variables in the current national BVAR model because the sectors' conflicting forecasts of those variables must be reconciled. If, for example, GNP in the core sector were shocked by $10 billion, the forecast of GNP for that period would not necessarily increase by $10 billion after the conflicting GNP forecasts were reconciled.

I have developed a relatively simple method for using the national model to make forecasts conditioned on a particular path for GNP or a linear combination of its components. I solve for the conditional forecast by iteratively determining the proper shock to GNP in the model's core sector in each time period so that GNP (or a linear combination of its components) will follow a particular path.

Suppose, for example, we wanted to see the effect on the model's overall forecast over the next year if GNP grew by $10 billion per month faster than its baseline forecast. We would start by shocking the core sector's value of GNP by some initial amount (probably larger than $10 billion) and shocking the nonfinancial variables in the core by that amount, scaled by the ratio of the covariance of the innovation in its equation with the innovation in GNP to the variance of GNP.[1] After making the revised one-step-ahead forecast for the core sector, we would make revised one-step-ahead

[1]The financial variables (the three-month Treasury-bill interest rate, the value of the Standard & Poor's 500-Stock Price Index, and the foreign-exchange value of the dollar) are not shocked because they are assumed to be exogenous with respect to GNP in a given month. This is made explicit in the national model by including contemporaneous values of the financial variables in the equations for the nonfinancial variables.

forecasts for each of the other sectors, then reconcile those forecasts.

Unfortunately, after the reconciliation, the new one-step-ahead forecast for GNP would almost certainly not be $10 billion higher than the baseline forecast. Thus, we would need to search for the proper-sized shock to give to GNP in the core sector to create a reconciled forecast that was $10 billion larger than the baseline forecast. This shock can be determined iteratively with line-search algorithms used in maximum-likelihood estimation. After the correct shock for the first forecasting period is determined, we can then determine the correct shocks for GNP in the core in each subsequent period by using the same iterative method for each period, sequentially. This procedure then gives the model's forecast conditioned on a specific path for GNP.

It is important to note that the shock to GNP in the core sector is assumed to be orthogonal to the innovations in the equations outside the core. At first glance, this assumption seems absurd, but it is reasonable because contemporaneous GNP is included as an independent variable in those other sectors.[2] Thus, by construction, the shock to GNP should be orthogonal to the shock to those equations because GNP is already included as an independent variable.

Caveat

Even though we now have a method for producing conditional forecasts, we should be cautious in interpreting these forecasts. Miller and Roberds (1987) give evidence that conditional forecasts may actually perform worse than unconditional forecasts because the structure of the economy changes in ways that a BVAR model cannot capture.

[2]Contemporaneous GNP is not included in the financial sector because the model assumes that the financial variables are exogenous with respect to GNP within a given month.

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The views expressed herein are those of the author and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.