Nowcasting GDP growth

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This note describes a procedure used to estimate a GDP tracking, or "nowcasting", model. It borrows heavily from the research on GDP nowcasting of many others and hopefully combines their approaches in a useful way. A brief synopsis of the approach is: (1) Forecast the components of GDP with a quarterly BVAR only using data through the last quarter. This step is used by Chin and Miller (1996). (2) Use a variant of the nowcasting model of Giannone, Reichlin and Small (2008) with a large number of data series to extract an underlying factor of economic activity akin to the Chicago Fed National Activity Index. (3) Following Stock and Watson (2002), include this factor in factor augmented autoregressions to forecast a large number of monthly data series. Next, for each series, aggregate the actual available data and the monthly forecasts to get a forecast of the quarterly percent (log) change of each variable. (4) Run "bridge equation" regressions of the quarterly GDP components on the predictions from (1) and the forecasts of the quarterly percent changes in one or more related higher frequency variables from (3)– for example capital goods shipments are related to equipment investment – to get updated forecasts of the quarterly GDP components. This step most closely follows Chin and Miller (1996). However using monthly indicators to forecast GDP components is an approach that has been used by many others; most notably perhaps by Lawrence Klein (see, for example, Klein and Sojo 1989). (5) Finally combine the quarterly forecasts of the components into a GDP forecast with the same chain-weighting methodology that the Bureau of Economic Analysis (BEA) uses to construct real GDP.

Detailed description

We assume that the Bureau of Economic Analysis has already an estimate of GDP growth for quarter *T* and we are interested in forming the nowcast for quarter *T+1*. We will need to mix quarterly and monthly data, so for the monthly data, let $x_{t,m}$ denote the value of x in the *m*th month (first, second or third) of quarter *t*. The quarterly average of x in quarter *t* is then $X_t = \frac{1}{3}(x_{t,1} + x_{t,2} + x_{t,3})$. Throughout this note, lower-case variables will be monthly series and upper-case variables will be quarterly.

Step 1: Compute the one-step ahead forecast of 16 real quantity components of GDP using a five lag 16-variable Bayesian vector autoregression (BVAR) model. The components included in the BVAR are listed in table 1 and the implementation of the prior, which closely follows, Banbura, Giannone, and Reichlin (2008), is described in the appendix. The estimation sample is 1968-present.

Label the forecasted growth rate of the *i*th component of GDP as $\Delta \log \hat{X}^i_{T+1}$. Additionally obtain fitted values for the BVAR from an initial date T_0 (1992q1 in our application) through quarter *T* and collect these in the vector

$$\widehat{\boldsymbol{S}^{\boldsymbol{i}}_{\boldsymbol{1}}} = [\Delta \log \hat{X}^i_{T_0}, \Delta \log \hat{X}^i_{T_0+1}, \ldots, , \Delta \log \hat{X}^i_{T-1}, \Delta \log \hat{X}^i_{T}]'$$

A similar 5-lag BVAR is run with the implicit quarterly price deflators of the same 16 components.

Step 1a: Some of the monthly series used in the next step are nominal series that first need to be deflated. In some instances the nominal series is available before the appropriate deflator is (e.g. when retail sales is released before the CPI) and therefore we need to use a forecast of the deflator. We generate these forecasts with a twelve lag 28-variable BVAR starting in 1983. The variables in this BVAR (all prices) are listed in Table 2. We use the conditional forecasting techniques described by Waggoner and Zha (1999) that allows the forecast to handle the "jagged edge" coming from the staggered release dates of the data.

Step 2: Estimate a single common latent factor for a large number (currently 107) of monthly time series. There is considerable overlap between the series we use and the series used to construct the Chicago Fed National Activity Index (CFNAI; see Federal Reserve Bank of Chicago (2011) for a description of the methodology used to calculate CFNAI). As is done when computing the CFNAI, the series are first transformed to be stationary (i.e. nontrending) and then standardized to have mean 0 and standard deviation 1. The transformation used to achieve stationarity often involves taking a monthly log change although there are some exceptions (e.g. the monthly ISM Manufacturing Index is left in levels). The estimated factor model is

$$(1)\quad f_{t,h} = \rho_1 f_{t,h-1} + \rho_2 f_{t,h-2} + \rho_3 f_{t,h-3} + u_{t,h}$$

$$(2)\quad y^i_{t,h} = \gamma^i_1 f_{t,h} + \varepsilon^i_{t,h}$$

The latent factor is $f_{t,h}$. To keep the notation of mixing monthly and quarterly data consistent throughout the note we adopt the notational convention that if $1 \leq h \leq 3$, then

$$\ldots = x_{t-1,h+3} = x_{t,h} = x_{t+1,h-3} = \cdots$$

I.e., in our notation, the fourth month of quarter t-1 is also the first month of quarter t. The $y^i_{t,h}$ terms in (2) are the 107 standardized transformed data series. The series used are listed in Table 3. Many of them are taken directly from Haver Analytics; these series generally have an "@" appearing in the series name. Other series need to be modified somehow; either because they are originally a nominal series and need to be deflated by a price, or because they are not available for the entire period and need to be spliced with another series (e.g. the NAICS based manufacturing and trade sales series need to be spliced with SIC based counterparts).

Doz, Giannone, and Reichlin (2006) show that the parameters and the variances of the error terms ($u_{t,h}$ and $\varepsilon^i_{t,h}$) in equations (1) and (2) can be consistently estimated by first estimating the latent

factor(s) with simple principal components[1] and then estimating both (1) and (2) with OLS. The latent factor can then be extracted with the Kalman filter and Kalman smoother. In an extension of the Doz, Giannone, and Reichlin (2006) model; Giannone, Reichlin, and Small (2008) show how a dynamic factor model of this type can be extended to handle non synchronous data releases where some series are released in a more timely fashion than others so that the data set has a "jagged edge". We follow the Giannone, Reichlin, and Small (2008) approach to generate an estimate of the time series of the smoothed factors. We also forecast future values of the factor using equation (1) and the last estimates of the factors. I.e. if month *h-1* in quarter *t* is the last month where we have data on at least some of the series, then we have estimates of $f_{t,h-1}, f_{t,h-2}$, and $f_{t,h-3}$ but not $f_{t,h}$. We then use (1) to forecast $f_{t,h}, f_{t,h+1}, \ldots$. This also follows Giannone, Reichlin, and Small (2008).

Step 3: Forecast the monthly series of interest using a variant of the Stock and Watson (2002) approach. Suppose we are interested in forecasting values for the series $y^i_{t,h}, y^i_{t,h+1}, \ldots$ where we the have observations $\ldots, y^i_{t,h-2}, y^i_{t,h-1}$. Similar to Stock and Watson (2002), we then run regressions of the form

$$(3)\quad \Delta \log(y^i_{t,h}) = \alpha_i + \sum_{k=1}^{q} \gamma^i_k \Delta \log(y^i_{t,h-k}) + \sum_{j=0}^{r} \beta^i_j f_{t,h-j}$$

where the estimated factors $f_{t,h}$ from step 2 are used. The number of lags of the dependent variable, *q*, and the number of lags of the factors, *r*, are selected with the Akaike Information Criterion where we restrict $1 \leq q \leq 12$ and $0 \leq r \leq 3$. In the case of the consumption variables we restrict $6 \leq q \leq 12$. Since we are able to forecast the factors as far out into the future as we'd like, we can recursively forecast $\Delta \log(y^i_{t,h})$, $\Delta \log(y^i_{t,h+1})$, … as well. This approach is different from Stock and Watson (2002) in the sense that they do not forecast future values of the factor and iteratively roll-over the one step ahead forecasts. Rather, they make *h*-step ahead projections directly with the available factors.

Step 4: Construct the projected quarterly (log) percent change in the monthly series of interest and the past projections of the quarterly (log) percent change in the monthly series. This approach is best illustrated by example. The National Association of Realtors existing single-family home sales series is used by the BEA to estimate quarterly brokers' commissions on the sale of residential structures. Brokers' commissions in turn are included in "other" [non-permanent site] residential investment which is one of the components of GDP. At the time of this writing, September 20, 2011, existing home sales

[1] Stock and Watson (2002) describe a method for estimating principal components when some series are missing at the beginning of the sample. In our application, an example of such a series is the ISM Nonmanufacturing Index which is only available starting July 1997. We implement Stock and Watson's method in our application.

were available through July 2011. Therefore, to estimate the quarterly log change in existing home sales for the third quarter of 2011, we need to project sales for August and September as well. We can do this using equation (3) to get $\hat{y}_{11q3,2}^{ExHome}$ and $\hat{y}_{11q3,3}^{ExHome}$. The projected 2011q3 quarterly log change in existing home sales is then

$$(4)\quad \Delta \log(\hat{Y}_{11q3}^{ExHome}) = \log\left(\frac{y_{11q3,1}^{ExHome} + \hat{y}_{11q3,2}^{ExHome} + \hat{y}_{11q3,3}^{ExHome}}{y_{11q2,1}^{ExHome} + y_{11q2,2}^{ExHome} + y_{11q2,3}^{ExHome}}\right)$$

Determining the statistical power of $\Delta \log(\hat{Y}_{11q3}^{ExHome})$ for predicting third quarter growth in "other" residential investment requires accounting for the fact that for the last two months of the quarter we do not have existing home sales data and have to use forecasted values instead. Therefore, we might put less weight on $\Delta \log(\hat{Y}_{11q3}^{ExHome})$ than we would if we had existing home sales through the end of the quarter (September 2011). To account for the missing data, we use the existing home sales through April 2011, the estimated factors (which we do *not* make a real-time adjustment for) and equation (3) to form the fitted values $\hat{y}_{11q2,2}^{ExHome}$ and $\hat{y}_{11q2,3}^{ExHome}$ and the quasi-fitted value

$$(5)\quad \Delta \log(\hat{Y}_{11q2}^{ExHome}) = \log\left(\frac{y_{11q2,1}^{ExHome} + \hat{y}_{11q2,2}^{ExHome} + \hat{y}_{11q2,3}^{ExHome}}{y_{11q1,1}^{ExHome} + y_{11q1,2}^{ExHome} + y_{11q1,3}^{ExHome}}\right)$$

Continuing in this fashion backwards in we obtain

$$\widehat{\boldsymbol{ExHomeGrowth}} = [\Delta \log(\hat{Y}_{92q1}^{ExHome}), \Delta \log(\hat{Y}_{92q2}^{ExHome}), \ldots, \Delta \log(\hat{Y}_{11q1}^{ExHome}), \Delta \log(\hat{Y}_{11q2}^{ExHome})]'$$

Step 5: Run "bridge equation" regressions. This involves regressing the (log) growth rate of GDP component *i* on a constant, the forecasted growth rate of component *i* computed in **step 1** and the forecasted quarterly growth of the series that are available at a monthly frequency and are closely related (or directly used as source input) to component *i*. For example, the vector of growth rates of "other" (non-permanent site) residential investment is regressed on $\widehat{\boldsymbol{S}}_{\boldsymbol{1}}^{\boldsymbol{OtherResInv}}$ from **step 1** , $\widehat{\boldsymbol{ExHomeGrowth}}$ from **step 4** and two other series also constructed in step 4: $\widehat{\boldsymbol{NewHomeGrowth}}$ which is the predicted quarterly growth rate in single family new home sales that uses actual monthly data where available and the factor augmented AR projections for months where the data was not available. This series is used because brokers also receive commissions on new home sales. The other series used is $\widehat{\boldsymbol{SplicedBuildingMaterials}}$ which we define as retail sales for "Building Materials, Garden Equipment & Supply Dealers" deflated by the "Houses under Construction: Price Deflator". This

series is meant to proxy for the "improvements" portion of other residential investment (and is one of the sources of that GDP component).

Table 4 lays out each GDP component side by side with their associated related serie(s) that is (are) available monthly and used to forecast the GDP component. The BEA thoroughly documents the monthly series used to estimate GDP[2], and we have also benefitted from the research by Macroeconomic Advisers (see especially Macroeconomic Advisers 2008) and Stock and Watson (2010) in choosing the relationship variables. Some other comments regarding the choice of series and any special treatment accorded to the monthly series:

HerzonCoreESQty (Real Investment in "core" equipment). As the BEA notes in Chapter 6 of the *NIPA Handbook: Concepts and Methods of the U.S. National Income and Product Accounts*[3], it is necessary to add imports to and subtract exports from U.S. manufacturer shipments in order to measure business investment. Therefore we separately forecast (or use available data) on "core" capital goods shipments, "core" capital goods exports, and "core" capital goods imports. All three series are deflated by the PPI for capital equipment. After forecasting the 3 series we add imports to and subtract exports from shipments to get our proxy for "core" equipment investment. See Payne (1999) for more about this method. Investment in computers is forecasted in a similar fashion.

FRSPZ@USNA (Private Investment: Permanent Site Residential Struct). U.S. Census Bureau data on value of construction put in place (VPIP) data is the primary source for this component, but that series is itself based on U.S. Census Bureau data on housing starts and new home sales (though the latter plays a less important role than starts). In translating single family starts to VPIP "the estimated cost of all single units started is … distributed into monthly value put in place by applying fixed patterns of monthly construction progress."[4] This implies the VPIP data can be anticipated somewhat from the housing starts data. Whenever single family starts are released we use the fixed construction pattern to forecast single-family VPIP for the same month. We do not forecast revisions to VPIP originating from housing starts revisions, but we may explore this approach in a future release. We also use a small BVAR with multifamily starts and (real) multifamily VPIP data to forecast multifamily VPIP for the same month as starts whenever housing starts come out.

XZ@USNA (Real Exports of Goods & Services). Because we project exports of capital goods in order to forecast equipment and software investment, it is important to maintain the same projection when forecasting total exports. These means separately forecasting capital goods exports (core capital and computer) and non-capital goods exports and then converting to a common price deflator in order to make the addition valid. Therefore in the forecast of "real" core capital goods export growth, which we deflated by the PPI for capital equipment, we add in the forecast for PPI capital equipment inflation and

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[2] See, for example, http://www.bea.gov/national/txt/gdp-srce.txt

[3] See http://www.bea.gov/national/pdf/NIPAhandbookch6.pdf

[4] See http://www.census.gov/const/C30/methodology.pdf

subtract out the forecast for total (BLS) export price inflation. A similar conversion is made to computers exports. These forecasts are then added to a separate forecast of non capital goods and computers exports, which is deflated by the BLS export price index. Imports are handled in an exactly analogous fashion.

Forecasting Real Net Exports. Forecasting net exports is tricky; Chin and Miller (1996) for example forecast net exports as a residual by forecasting GDP directly, forecasting all of the other components of GDP and backing out net exports. As they note, their net exports forecasts from this method are not very good. A major issue is being able to generate forecasts of exports and imports that do not get arbitrarily far apart (so that the trade deficit gets increasing large). For example, suppose that real export growth and real import growth are forecasted separately and that they are estimated to have the same steady state growth rates. Because exports exceed imports by a large amount, if they have the same growth rate then the difference between imports and exports will get larger and larger over time. This is not an appealing property for a net exports forecast to have. Our solution is the following: approximate the monthly contribution of real net exports (excluding capital goods and computers) to GDP growth as the log change in real exports (ex capital goods and computers) times the lag of nominal exports share of monthly nominal GDP (ex capital goods and computers) minus the log change in real imports (ex capital goods and computers) times the lag of nominal imports (ex capital goods and computers) over the lag of monthly GDP. Plug this contribution into $\Delta \log(y^i_{t,h})$ and the $\Delta \log(y^i_{t,h-k})$ into regression equation (3) omitting the constant term. This insures that the "steady state" contribution will be 0. Then, estimate the regression [selecting lag lengths with the AIC], generate a forecast and construct additive adjustment factors to the previously calculated real exports (ex capital goods and computers) and real imports (ex capital goods and computers) growth forecasts described above so that they are consistent with the net exports contribution forecast. Computers and capital goods imports and exports are directly forecasted separately as described above and the exports and imports categories are then combined. Finally, a bridge equation is not used since the monthly real exports and real imports measures aggregated to a quarterly percent change are very highly correlated with their GDP component analogs (both correlations are over 0.9).

Step 5b: Run "bridge equation" regressions for prices. This step is used to forecast the (implicit) price deflators for the different GDP components. Technically, these are needed as GDP is not calculated with fixed weights. However, this step is generally less important than the others as changes in the relative prices in the components do not have a large effect on quarter to quarter movements in real GDP.

Step 6: Forecast consumption directly. Since PCE consumption spending is already measured monthly, there is no need to use bridge equations. For the monthly consumption components that we use to break down total consumption, which are shown in table 5, we still forecast the months that are not available with equation (3). However, the break down we use is different than the durables/nondurables/services classification and is listed in table 5. As described by Chapter 5 of the *NIPA Handbook: Concepts and Methods of the U.S. National Income and Product Accounts*, the BEA uses the "retail control" method to estimate consumption for many durable and nondurable goods[5]. For

[5] See http://www.bea.gov/national/pdf/NIPAch5consumerspending.pdf

these goods, whenever retail sales from the U.S. Census Bureau is released (around the middle of the month), we use the latest growth rate in nominal sales for the "retail control" group – Retail Sales & Food Serv Excl Auto, Gas Stations & Building Materials –as a forecast of the growth rate in nominal consumption for the analogous PCE components. We also assume that revisions in retail sales will result in a proportional revision to the retail control basket in the PCE. The Consumer Price Index is also released around the middle of the month and these components can (almost exactly) be mapped into the price measures for the PCE retail control goods. Whenever the Consumer Price Index is released we use the appropriate components to nowcast what the next aggregate inflation rate for the PCE retail control basket is. Table 6 contains the mapping we use from CPI to PCE components for the retail control group.

The BEA does not use retail sales to estimate PCE new motor vehicle sales; but they do publish light-weight motor vehicle sales even before retail sales are released[6] and we use the growth rate of this to proxy for the growth rate of real PCE motor vehicle consumption whenever the unit sales number is available but the PCE number is not.

For the other PCE components we do not attempt to exploit other monthly releases to predict the latest month's numbers, although one could certainly attempt to do so.

Step 7: Forecast change in private inventories directly.

We use a different approach for forecasting inventory investment. The BEA gives a very detailed description its methodology for estimating the inventory stocks and investment in Chapter 7 of the *NIPA Handbook: Concepts and Methods of the U.S. National Income and Product Accounts*[7]. The key identity is:

$$(6) \quad CIPI^{i}_{BEA} = \Delta Invent^{i}_{BEA,Book} + IVA^{i}_{BEA}$$

This equation says that $CIPI^{i}_{BEA}$ -- the change in private inventories for sector *i* (durable goods manufacturers, merchant wholesalers, etc.) -- is equal to the change in the book value of inventories for the sector plus and an "inventory valuation adjustment". Series on the change in the book value of inventories are published by both the Census Bureau and the BEA. There are some differences between changes in book-values from the two sources primarily because of technical financial accounting reasons. However, the differences are generally very small and have much less of effect on tracking

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[6] See table 6 of http://www.bea.gov/national/xls/gap_hist.xls ; the Haver ticker is TLVAR@USECON.

[7] See http://www.bea.gov/national/pdf/NIPAhandbookch7.pdf

estimates of $CIPI^i_{BEA}$ than revisions to the book value data do. Therefore we will use the approximation

$$(7) \quad CIPI^i_{BEA} \cong \Delta Invent^i_{Census,Book} + IVA^i_{BEA}$$

Since the Census based book values are released before the BEA book values (and are the primary source data input for them), working with the Census book value data instead of the BEA book value data obviates the problem of worrying how revisions to the Census book values would impact the BEA revisions. The "inventory valuation adjustment" (IVA) is the negative of the holding gain that occurs when inventory prices increase. The NIPA accounting principle motivating inclusion of this term is that "production should be recorded at the time it occurs", so, hypothetically, if firms neither produced nor sold any goods in a period, but the value of their inventories increased due to a price increase, then GDP should *not* mechanically increase because of the increase in the book value of the inventories.

We jointly model changes in the book values of inventories and the inventory valuation terms in a fairly large seven lag BVAR that also includes data on shipments and sales, production and hours, international trade flows and prices. Changes in inventories are related to production and sales so that information on the latter, which are generally released first, should help forecast the former. The price terms are included to help forecast the IVA terms. They are also used to forecast the implicit price deflators for the sector specific inventory stocks. These implicit deflators are needed to convert nominal inventories to "real" inventories, which is needed to combine the inventory stocks of different sectors.

The full list of (36) variables in the BVAR is listed in table 7. Discussion of implementing the BVAR is in the appendix. As in the monthly price BVAR, we use the conditional forecasting techniques described in Waggoner and Zha (1999). In the BVAR the change in book values and the IVAs are each scaled by nominal sales; since sales are also included the BVAR, the nonscaled book values and IVAs are easily backed out. We included book-value and IVA terms for four different sectors: durable goods manufacturing, nondurable goods manufacturing, merchant wholesalers and retail sales ex autos. Since the Census autos inventory data is not used for estimating GDP we do not include it; instead for motor vehicle dealers and nonmerchant wholesalers (for which no Census book value data exists) we use the change in "real" inventories according to the BEA concept (i.e. IVAs are included as well) scaled by sales.

Using the end of period values of the real stocks of inventories from **two** quarters ago from NIPA Table 5.7.6, we can forecast the stock at the end of the next quarter with the equation.

$$(8) \quad RealInvent^i_{t,h} = RealInvent^i_{t,h-1} + \Delta RealInvent^i_{t,h}$$

Why two quarters ago? Because, as we mentioned, recent data on book values of inventories are heavily revised.

There is no monthly data for farm, construction+mining+utilities, or "other" inventories so we use very simple models to forecast inventory prices and quantities for these sectors. Finally, like the BEA, we estimate the combined stock of real inventories as a chain-weighted aggregate of inventory stocks for, in our case, nine detailed sectors. The forecast of the change in aggregate real private inventories is then the estimate of the real stock in the quarter being forecast minus the estimate of the real stock for the previous quarter (which, as we mentioned, can and often does differ from the latest BEA estimate). When computing real GDP growth, for the previous quarter [i.e. the quarter before the nowcast] we use the real change in private inventories as calculated by the BEA in the latest GDP release. We do not try and anticipate the revision, although this could certainly be done.

Step 8: Calculate real GDP growth with a Fisher chain weighting formula the price and quantity indexes forecasted in the previous steps.

A good description of chain weighting is Whelan (2000). In this step, one has to be sure to enter imports into to the formula with a minus sign. We are finished until the next data release!

References:

Banbura, Marta, Giannone, Domenico and Lucrezia Reichlin (2008). "Large Bayesian VARs." *European Central Bank Working Paper*, No. 966 (November 2008).

Chin, Daniel M. and Preston J. Miller (1996). "Using Monthly Data to Improve Quarterly Model Forecasts." *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 20, No. 2, Spring 1996, pp. 16-33.

Doz, Catherine, Giannone, Domenico and Lucrezia Reichlin. 2006. "A Quasi Maximum Likelihood Approach For Large Approximate Dynamic Factor Models." *European Central Bank Working Paper*, No. 674 (September 2006).

Federal Reserve Bank of Chicago (2011) "Background on the Chicago Fed National Activity Index." Available at http://www.chicagofed.org/digital_assets/publications/cfnai/background/cfnai_background.pdf

Giannone, Domenico, Reichlin, Lucrezia and David Small. 2008. "Nowcasting: The Real-Time Informational Content of Macroeconomic Data." *Journal of Monetary Economics*, No. 55 (2008) pp. 665-676.

Klein, L.R. and E. Sojo (1989). "Combinations of High and Low Frequency Data inMacroeconometric Models". In Klein and Marquez (eds), *Economics in Theory and Practice: An Eclectic Approach*. Dordrecht: Kluwer, pp. 3-16.

Macroeconomic Advisers (2008) "Macroeconomic Advisers' Measure of Monthly GDP." *Macroeconomic Advisers' Macro Focus*, Vol. 3, No. 3, February 29, 2008.

Payne David R. 1999. "Predicting the Producers' Durable Equipment Component of GDP – Gross Domestic Product." *Business Economics*, January 1999.

Stock, James H. and Mark W. Watson. 2002. "Macroeconomic Forecasting Using Diffusion Indexes." *Journal of Business and Economic Statistics*, Vol. 20, No. 2, pp. 147-162.

Stock, James H. and Mark W. Watson. 2010. "Distribution of quarterly values of GDP/GDI across months within the quarter." Research Memorandum to the NBER, September 19, 2010 available at http://www.princeton.edu/~mwatson/mgdp_gdi/Monthly_GDP_GDI_Sept20.pdf

Waggoner, Daniel F. and Tao Zha. 1998. "Conditional Forecasts in Dynamic Multivariate Models." *The Review of Economics and Statistics*, Vol. 81, No. 4 (Nov., 1999), pp. 639-651.

Whelan, Karl. 2000. "A Guide to the Use of Chain Aggregated NIPA Data." *Federal Reserve Board Finance and Economics Discussion Series Working Paper*, No. 2000-35.

Appendix: Implementing the BVARs:

We use the BVAR formulas described in Banbura, Giannone, and Reichlin (2008). This involves augmenting the data of an ordinary BVAR with so-called "dummy observations". The hyperparameters used to construct the dummy observations are described in Banbura, Giannone, and Reichlin (2008) as well. Briefly, each variable in the BVAR is associated with a parameter δ_i that reflects the prior belief that the variable is either a random walk or displays mean reversion. For variables entered in the BVARs in log-levels, the random walk prior is used and $\delta_i = 1$. For variables entered in the BVARs in levels, first differences, or log differences, the mean reversion prior is used and $\delta_i = 0$ is used. The hyperparameter λ controls the overall tightness of the prior, setting $\lambda = 0$ means the data are ignored and the estimation only uses prior information and setting $\lambda = \infty$ means prior information is not used at all and the BVAR is simply a VAR estimated by OLS. For $0 < \lambda < \infty$, small values of λ put a heavy weight on the prior information and large values of λ put little weight on the prior information. We follow Banbura, Giannone, and Reichlin (2008) in choosing λ so that the one step ahead forecast RMSE for three key variables in the BVAR is the same as it would be with a 3-variable VAR with the three key variables only. This keeps the BVAR from "overfitting" the data resulting in poor forecasts. The values of λ for the different BVARs are: GDP quantity component BVAR, $\lambda = 0.07$; GDP price component BVAR, $\lambda = 0.10$; monthly price inflation BVAR, $\lambda = 0.10$; inventory BVAR, $\lambda = 0.02$. Finally for the all but the monthly price inflation BVAR, where the data are not entered in (log) levels, we include the prior on the sum of coefficients setting $\tau = 10\lambda$ as in Banbura, Giannone, and Reichlin (2008).

Table 1: Variables used in quarterly GDP component BVAR

CDZ@USNA	Personal Consumption Expenditures: Durable Goods (SAAR, Mil.Chn.2005.$)	LogLevel
CNZ@USNA	Personal Consumption Expenditures: Nondurable Goods (SAAR, Mil.Chn.2005.$)	LogLevel
CSZ@USNA	Personal Consumption Expenditures: Services (SAAR, Mil.Chn.2005.$)	LogLevel
HerzonCoreESQty	Constructed series of real equipment and software investment excluding computers, software, and new motor vehicles. Series is constructed by "Fisher subtraction" of FNENPZ@USNA, FNENSZ@USNA, and MVINZ@USNA from FNEZ@USNA "Real Private Nonresidential Investment: Equipment/Software (SAAR, Mil.Chn.2005$) ".	LogLevel
FNENPZ@USNA	Real Pvt Nonres Fixed Investment: Computers/Peripheral Eqpt (SAAR,Mil.Chn.2005$)	LogLevel
FNENSZ@USNA	Real Private Nonres Fixed Investment: Software (SAAR, Mil.Ch.2005$)	LogLevel
MVINZ@USNA	Real Private Fixed Investment in New Motor Vehicles (SAAR, Mil.Ch.2005$)	LogLevel
FNSZ@USNA	Real Private Nonresidential Investment: Structures (SAAR, Mil.Chn.2005$)	LogLevel
FRSPZ@USNA	Private Investment: Permanent Site Residential Struct (SAAR, Mil.Chn.2005$)	LogLevel
FRSOZ@USNA	Pvt Residential Investment: Other Structures (SAAR, Mil.Chn.2005$)	LogLevel
XZ@USNA	Real Exports of Goods & Services (SAAR, Mil.Chn.2005$)	LogLevel
MZ@USNA	Real Imports of Goods & Services (SAAR, Mil.Chn.2005$)	LogLevel
GFDZ@USNA	Real National Defense Consumption & Gross Investment (SAAR, Mil.Chn.2005$)	LogLevel
GFNZ@USNA	Real Federal Nondefense Consumption & Gross Investment(SAAR, Mil.Chn.2005$)	LogLevel
GSZ@USNA	Real State & Local Govt Consumption & Gross Investment (SAAR, Mil.Chn.2005$)	LogLevel
VZtoGDP	"VZ@USNA" Real Change in Private Inventories (SAAR, Mil.Chn.2005$) divided by the one period lag of "Real Gross Domestic Product (SAAR, Mil.Chn.2005$)" [GDPZ@USNA].	Level

Table 2: Variables used in monthly price BVAR

Variable Name	Variable Descrption	Transformation
PCU@USECON	CPI-U: All Items (SA, 1982-84=100)	LogDiff
PCUSLFE@USECON	CPI-U: All Items Less Food and Energy (SA, 1982-84=100)	LogDiff
PCUSND@USECON	CPI-U: Nondurables (SA, 1982-84=100)	LogDiff
PCUSSLE@USECON	CPI-U: Services Less Energy Services (SA, 1982-84=100)	LogDiff
UH@CPIDATA	CPI-U: Housing (SA, 1982-84=100)	LogDiff
HerzonCoreESDefInterp	Quarterly investment price deflator for "core" capital goods interpolated/extrapolated to a monthly frequency with SP3200@PPI - "PPI: Capital Equipment (SA, 1982=100) ". Uses proportional Denton method for interpolation.	LogDiff
SP2620@PPI	PPI: Nonmanufacturing Industries (SA, 1982=100)	LogDiff
SP3000@USECON	PPI: Finished Goods (SA, 1982=100)	LogDiff
SP2900@PPI	PPI: Intermediate Materials Less Food and Energy (SA, 1982=100)	LogDiff
sa(RMFG@PPIR)	PPI: Manufacturing (Dec-84=100) - Seasonal Adjustment, All	LogDiff
PZALL@USECON	KR-CRB Spot Commodity Price Index: All Commodities (1967=100)	LogDiff
PZTEXP@USECON	Spot Oil Price: West Texas Intermediate [Prior'82=Posted Price] ($/Barrel)	LogDiff
NAPMPI@USECON	ISM: Mfg: Prices Index (NSA, 50+ = Econ Expand)	Lev
SpliceRetailTradeDeflator	Sales Price Deflator: Retail Trade (SA, 2005=100) "DTSR@USNA", spliced together with SIC based equivalent DTSR1@USNA before 1997.	LogDiff
SpliceWholesaleTradeDeflator	Sales Price Deflator: Merchant Wholesale Trade Industries (SA, 2005=100) "DTSWM@USNA", spliced together with SIC based equivalent DTSW1@USNA before 1997.	LogDiff
SpliceManTradeDeflator	Sales Price Deflator: Manufacturing Industries (SA, 2005=100), "DTSM@USNA" spliced together with SIC based equivalent "DTSM1@USNA" before 1997.	LogDiff
SplicedMedian	FRB Cleveland Median CPI (SAAR, %chg) "CLEVFED@USECON" spliced together with discontinued median before 1983 CLEVM@USECON.	LogDiff
SplicedTrim	FRB Cleveland 16% Trimmed-Mean CPI (SAAR, %chg) "CLEVCPI@USECON" spliced together with discontinued median before 1983 CLEVT@USECON.	LogDiff
PMEA_USECONsplice	Where available use PMEA@USECON "Import Price Index: All Imports (NSA, 2000=100) ". However from 1982-1988 the index is not available each month and therefore it is interpolated with a combination of the quarterly Import price index in the NIPA accounts and the PPI for all commodities [P@PPI]. Uses proportional Denton method for interpolation.	LogDiff

PXEA_USECONsplice	Where available use PXEA@USECON "Export Price Index: All Imports (NSA, 2000=100) ". However from 1982-1988 the index is not available each month and therefore it is interpolated with a combination of the quarterly Export price index in the NIPA accounts and the PPI for finished goods [SP3000@PPI]. Uses proportional Denton method for interpolation.	LogDiff
CoreRealRetailPCEDef	This is a constructed Fisher price index of the PCE components that have counterparts in the "retail sales control" group. The Haver tickers for nominal expenditure categories are [CDMTM@USNA CDFDM@USNA CDOM@USNA CDRGM@USNA CNFOM@USNA CSFPM@USNA CNLM@USNA CNOOM@USNA] and the tickers for the real expenditure categories are [CDMTHM@USNA CDFDHM@USNA CDOHM@USNA CDRGHM@USNA CNFOHM@USNA CSFPHM@USNA CNLHM@USNA CNOOHM@USNA]. Prices are defined implicitly. When the Consumer Price Index release comes out, the index is updated by linking the detailed "retail control" PCE price components to their counterparts in the CPI.	LogDiff
HerzonServicesDef	Constructed Fisher price index for nonfood services plus used autos purchases.	LogDiff
CDMVNMDef	Implicit price deflator for Personal Consumption Expenditures: New Motor Vehicles	LogDiff
CNEMDef	Implicit price deflator for Personal Consumption Expenditures: Gasoline and Other Energy Goods	LogDiff
NResStructDefqtrInterp59	Quarterly investment price deflator nonresidential structures interpolated/extrapolated to monthly frequency with Chow-Lin disaggregation method using sa(PI012011@PPI) "PPI: Construction Materials (NSA, 1982=100) - Seasonal Adjustment, All" and sa(P112@PPI) "PPI: Construction Machinery and Equipment (NSA, 1982=100) - Seasonal Adjustment, All".	LogDiff
CCIHD@USECON	Houses under Construction: Price Deflator (NSA, 2005=100)	LogDiff
ESComputerDefqtrInterpSplice	Quarterly investment price deflator for computers interpolated/extrapolated to a monthly frequency using combination of "PPI: Electronic Computers and Computer Equipment (NSA, Dec-98=100) - Seasonal Adjustment, All" [sa(P115@PPI)] and "PCE: Personal Computers & Peripheral Equip Price Index (SA, 2005=100)" [JCDFCPM@USNA]. Uses proportional Denton method for interpolation.	LogDiff
SP3200@PPI	PPI: Capital Equipment (SA, 1982=100)	LogDiff

Table 3: Monthly indicators used in factor model			
Variable Name	**Variable description and/or construction description.**	**Transformation**	**Primary data release**
TLVAR@USECON	Light Weight Vehicle Sales {Autos+Light Trucks} (SAAR, Mil.Units)	LogDiff	Auto sales
FRBC@SURVEYS	Chicago Fed Midwest Manufacturing Index (SA, 2007=100)	DiffLev	Chicago Fed Survey
WeeklyClaims	Unemployment Insurance: Initial Claims, 4-Week Moving Average	LogDiff	Claims
CPVD@USECON	Private Construction: Nonresidential (SAAR, Mil.$) -- Deflated by NResStructDefqtrInterp59fr which is a monthly interpolated version of the nonresidential structures price deflator	LogDiff	Construction PIP
SplicedNewHousingConstruction	Private Construction: Residential: New Housing Units (SAAR, Mil.$) [CPVRH@USECON] deflated by "Houses under Construction: Price Deflator (NSA, 2005=100) " (CCIHD@USECON).	LogDiff	Construction PIP
CPG@USECON	Value of Public Construction Put in Place (SAAR, Mil.$). Deflated by Consumer Price Index (PCU@USECON).	LogDiff	Construction PIP
CCIN@USECON	Conference Board: Consumer Confidence (SA, 1985=100)	DiffLev	Consumer Confidence
CCIPSN@USECON	Conference Board: Consumer Confidence Present Situation (SA, 1985=100)	DiffLev	Consumer Confidence
CCIEN@USECON	Conference Board: Consumer Expectations (SA, 1985=100)	DiffLev	Consumer Confidence
SplicedMichSent	University of Michigan: Consumer Sentiment (NSA, Q1-66=100) -- CSENT@USECON. Pre 1978 survey was updated lower than monthly frequency; these observations are linearly interpolated.	DiffLev	Consumer Sentiment
SplicedMichExp	University of Michigan: Consumer Expectations (NSA, Q1-66=100) -- CEXP@USECON. Pre 1978 survey was updated lower than monthly frequency; these observations are linearly interpolated.	DiffLev	Consumer Sentiment
SplicedMichCur	University of Michigan: Current Economic Conditions (NSA, Q1-66=100) -- CCOND@USECON. Pre 1978 survey was updated lower than monthly frequency; these observations are linearly interpolated.	DiffLev	Consumer Sentiment
LAPRIVA@USECON	All Employees: Total Private Industries (SA, Thous)	LogDiff	Employment
LAGOODA@USECON	All Employees: Goods-producing Industries (SA, Thous)	LogDiff	Employment
LANAGRA@USECON	All Employees: Total Nonfarm (SA, Thous)	LogDiff	Employment
LAMANUA@USECON	All Employees: Manufacturing (SA, Thous)	LogDiff	Employment
LADURGA@USECON	All Employees: Durable Goods Manufacturing (SA, Thous)	LogDiff	Employment
LAPSRVA@USECON	All Employees: Private Service-providing Industries (SA, Thous)	LogDiff	Employment
LARTRDA@USECON	All Employees: Retail Trade (SA, Thous)	LogDiff	Employment
LAWTRDA@USECON	All Employees: Wholesale Trade (SA, Thous)	LogDiff	Employment
LANDURA@USECON	All Employees: Nondurable Goods Manufacturing (SA, Thous)	LogDiff	Employment
LACONSA@USECON	All Employees: Construction (SA, Thous)	LogDiff	Employment
LENA@USECON	Civilian Employment: Nonagricultural Industries: 16 yr + (SA, Thous)	LogDiff	Employment
LE@USECON	Civilian Employment: Sixteen Years & Over (SA, Thous)	LogDiff	Employment
LRM25@USECON	Civilian Unemployment Rate: Men, 25-54 Years (SA, %)	DiffLev	Employment
LAFIREA@USECON	All Employees: Financial Activities (SA, Thous)	LogDiff	Employment
LRMANUA@USECON	Average Weekly Hours: Prod & Nonsupervisory: Manufacturing (SA, Hrs)	DiffLev	Employment

LOMANUA@USECON	Average Weekly Hours: Prod & Nonsupervisory: Overtime: Manufacturing (SA, Hrs)	DiffLev	Employment
LAMINGA@USECON	All Employees: Mining (SA, Thous)	LogDiff	Employment
LUMD@USECON	Median Duration of Unemployment (SA, Weeks)	DiffLev	Employment
LAPBSVA@USECON	All Employees: Professional & Business Services (SA, Thous)	LogDiff	Employment
LAEDUHA@USECON	All Employees: Education & Health Services (SA, Thous)	LogDiff	Employment
LALEIHA@USECON	All Employees: Leisure & Hospitality (SA, Thous)	LogDiff	Employment
LASRVOA@USECON	All Employees: Other Services (SA, Thous)	LogDiff	Employment
LRPRIVA@USECON	Average Weekly Hours: Prod & Nonsupervisory: Private Industries (SA, Hrs)	LogDiff	Employment
LoserOnLayoff	Civilians Unemployed: Job Losers On Layoff (SA, Thous.) -- LUJLL@USECON, series is divided by size of labor force.	DiffLev	Employment
URUnround	Unemployed, 16 Years & Over: 16 yr + (SA, Thous) -- LTU@USECON, series is divided by size of labor force.	DiffLev	Employment
LFPRUnround	Civilian Labor Force: 16 yr + (SA, Thous) -- LF@USECON, series is divided by size of population.	LogDiff	Employment
LAP15A@USECON	All Employees: Computer Systems Design & Related Services (SA, Thous)	LogDiff	Employment
GovernmentEmploymentExCensus	"All Employees: Government (SA, Thous)" [LAGOVTA@USECON] minus "All Employees: Fed Gov Decennial Census Temp & Intermittent Workers(NSA,Thous) " [LAFGT@USECON]	LogDiff	Employment
YPWGM@USNA	Wage and Salary Disbursements: Government (SAAR, Bil.$) -- Deflated by Consumer Price Index (PCU@USECON).	LogDiff	Employment
StateLocalEmp	Sum of LASGOVA@USECON "All Employees: State Government (SA, Thous) " and LALGOVA@USECON "All Employees: Local Government (SA, Thous) ".	LogDiff	Employment
HX1US@USECON	Existing 1-Family Home Sales: United States (SAAR, Thous)	LogDiff	Existing Home Sales
HST@USECON	Housing Starts (SAAR, Thous.Units)	DiffLev	Housing Starts
HPT@USECON	New Pvt Housing Units Authorized by Building Permit (SAAR, Thous.Units)	DiffLev	Housing Starts
HSTW@USECON	Housing Starts: West (SAAR, Thous.Units)	DiffLev	Housing Starts
HSTS@USECON	Housing Starts: South (SAAR, Thous.Units)	DiffLev	Housing Starts
HSTMW@USECON	Housing Starts: Midwest (SAAR, Thous.Units)	DiffLev	Housing Starts
HSTNE@USECON	Housing Starts: Northeast (SAAR, Thous.Units)	DiffLev	Housing Starts
HST1@USECON	Housing Starts: 1 Unit (SAAR, Thous.Units)	DiffLev	Housing Starts
NomSingleStarts	Housing Starts: 1 Unit (HST1@USECON) multiplied by "New 1-Family Houses: Average Sales Price (Dollars) - Seasonal Adjustment, All" (sa(HN1PA@USECON)). Series is then deflated by "Houses under Construction: Price Deflator (NSA, 2005=100)" (CCIHD@USECON).	LogDiff	Housing Starts
HSTM@USECON	Housing Starts: Total Multifamily (SAAR, Thous.Units)	DiffLev	Housing Starts
ExportsComputersAndRelated	Sum of "Exports: Computers (SA, Mil.$)" and "Exports: Computer Accessories (SA, Mil.$). TX21300@USINT+TX21301@USINT. Series deflated by interpolated deflator for computers equipment investment	LogDiff	International Trade
CoreCapGoodsExports	Exports: Capital Goods, except Automotive (SA, Mil.$) TXG2@USINT. Then exports for other noncore categories are subtracted. (TX21300@USINT,TX21301@USINT,TX22000@USINT,TX22010@USINT,TX22020@USINT,TX22220@USINT,TX21320@USINT,TX21100@USINT, and TX20005@USINT) Series is then deflated by PPI: Capital Equipment (SA, 1982=100) [SP3200@PPI].	LogDiff	International Trade
SplicedNonCoreNonComputerExports	Exports: Goods and Services, BOP Basis (SA, Mil.$) -- BGSX@USECON. Both exports for "core shipments" and "computer shipments" are subtracted out. Series deflated by Export Price Index: All Exports (NSA, 2000=100) [PXEA@USECON].	LogDiff	International Trade

ImportsComputersAndRelated	Sum of "Imports: Computers (SA, Mil.$)" and "Imports: Computer Accessories (SA, Mil.$). TM21300@USINT+TM21301@USINT. Series deflated by interpolated deflator for computers equipment investment	LogDiff	International Trade
CoreCapGoodsImports	Imports: Capital Goods, except Automotive (SA, Mil.$) TMG2@USINT. Then exports for other noncore categories are subtracted. (TM21300@USINT,TM21301@USINT,TM22000@USINT,TM22010@USINT,TM22020@USINT,TM22220@USINT,TM21320@USINT,TM21100@USINT, and TM20005@USINT) Series is then deflated by PPI: Capital Equipment (SA, 1982=100) [SP3200@PPI].	LogDiff	International Trade
SplicedNonCoreNonComputerImports	Imports: Goods and Services, BOP Basis (SA, Mil.$) -- BGSM@USECON. Both imports for "core shipments" and "computer shipments" are subtracted out. Series deflated by Export Price Index: All Exports (NSA, 2000=100) [PXEA@USECON].	LogDiff	International Trade
IPMFG@IP	IP: Manufacturing (SIC) (SA, 2007=100)	LogDiff	IP
IP@IP	IP: Total Index (SA, 2007=100)	LogDiff	IP
CUMFG@IP	Capacity Utilization: Manufacturing [SIC] (SA, % of Capacity)	LogDiff	IP
IPTP@IP	IP: Final Products and Nonindustrial Supplies (SA, 2007=100)	LogDiff	IP
IP54@IP	IP: Nonindustrial Supplies (SA, 2007=100)	LogDiff	IP
IP53@IP	IP: Materials (SA, 2007=100)	LogDiff	IP
IPFP@IP	IP: Final Products {Mkt Group} (SA, 2007=100)	LogDiff	IP
IP521@IP	IP: Business Equipment (SA, 2007=100)	LogDiff	IP
IP51@IP	IP: Consumer Goods (SA, 2007=100)	LogDiff	IP
IP511@IP	IP: Durable Consumer Goods (SA, 2007=100)	LogDiff	IP
IP512@IP	IP: Nondurable Consumer Goods (SA, 2007=100)	LogDiff	IP
CUT@IP	Capacity Utilization: Total Index (SA, % of Capacity)	LogDiff	IP
NAPMC@USECON	ISM Mfg: PMI Composite Index (SA, 50+ = Econ Expand)	Lev	ISM Manuf
NAPMOI@USECON	ISM Mfg: Production Index (SA, 50+ = Econ Expand)	Lev	ISM Manuf
NAPMEI@USECON	ISM Mfg: Employment Index (SA, 50+ = Econ Expand)	Lev	ISM Manuf
NAPMNI@USECON	ISM Mfg: New Orders Index (SA, 50+ = Econ Expand)	Lev	ISM Manuf
NAPMII@USECON	ISM Mfg: Inventories Index (SA, 50+ = Econ Expand)	Lev	ISM Manuf
NAPMVDI@USECON	ISM Mfg: Supplier Deliveries Index (SA, 50+ = Slower)	Lev	ISM Manuf
NMFC@SURVEYS	ISM Nonmanufacturing: NMI Composite Index (SA, 50+=Increasing)	Lev	ISM NonManuf
HSM@USECON	Manufacturers' Shipments of Mobile Homes (SAAR, Thous.Units)	DiffLev	M3/Shipments
SplicedDurableGoodsOrders	Constructed (Real) Manufacturers' New Orders: Durable Goods (SA, Mil.$). NAICS based nominal series is NMODG@USECON deflated by SP3200@PPI.	LogDiff	M3/Shipments
NMS@USECON	Mfrs' Shipments: All Manufacturing Industries (SA, Mil.$). Converted to real by dividing by SpliceManTradeDeflator	LogDiff	M3/Shipments
ManInvShipRatio	Manuf I/S ratio. NMI@USECON/NMS@USECON. Mfrs' Inventories: All Manufacturing Industries (EOP, SA, Mil.$) divided by Mfrs' Shipments: All Manufacturing Industries (SA, Mil.$)	LogDiff	M3/Shipments
RealCapitalShipments	Mfrs' Shipments: Nondefense Capital Goods ex Aircraft (SA, Mil.$) deflated by PPI: Capital Equipment (SA, 1982=100) (NMSCNX@USECON/SP3200@PPI)	LogDiff	M3/Shipments
CoreCapGoodsShipments	Mfrs' Shipments: Nondefense Capital Goods ex Aircraft (SA, Mil.$) minus computer shipments (NMSG41A@USECON, NMSG41B@USECON and NMSG41C@USECON). Series is then deflated by Series is then deflated by PPI: Capital Equipment (SA, 1982=100) .	LogDiff	M3/Shipments

ComputersShipments	Computer shipments (NMSG41A@USECON, NMSG41B@USECON and NMSG41C@USECON). Series is then deflated by Series is then deflated by interpolated deflator for computers equipment investment.	LogDiff	M3/Shipments
DefenseShipments	"Manufacturers' Shipments: Defense Capital Goods (SA, Mil.$) " [MSCD@USECON] deflated by Consumer Price Index [PCU@USECON].	LogDiff	M3/Shipments
HN1MT@USECON	New 1-Family Houses For Sale: Months Supply (SA, Ratio)	LogDiff	New Home Sales
HN1SUS@USECON	New 1-Family Houses For Sale: United States (SA, Thous)	DiffLev	New Home Sales
HN1US@USECON	New 1-Family Houses Sold: United States (SAAR, Thous)	DiffLev	New Home Sales
YPLTPMH@USECON	Real Personal Income Less Transfer Payments (SAAR, Bil.Chn.2005$)	LogDiff	PCE/Personal Income
YPDHM@USECON	Real Disposable Personal Income (SAAR, Bil.Chn.2005$)	LogDiff	PCE/Personal Income
CBHM@USECON	Real Personal Consumption Expenditures (SAAR, Bil.Chn.2005$)	LogDiff	PCE/Personal Income
CDBHM@USECON	Real Personal Consumption Expenditures: Durable Goods (SAAR, Bil.Chn.2005$)	LogDiff	PCE/Personal Income
CSBHM@USECON	Real Personal Consumption Expenditures: Services (SAAR, Bil.Chn.2005$)	LogDiff	PCE/Personal Income
CNBHM@USECON	Real Personal Consumption Expenditures: Nondurable Goods (SAAR, Bil.Chn.2005$)	LogDiff	PCE/Personal Income
BOFGX@SURVEYS	Philadelphia Fed Business Outlook Survey: Future Activity Index (SA, %Bal)	Lev	Philly Fed Survey
BOISM@SURVEYS	Philly Fed Bus Outlook: Current Activity Diffusion Index, ISM-Adj (SA, >50=Inc)	Lev	Philly Fed Survey
CoreRetailSales	Constructed (Real) Retail Sales & Food Serv Excl Auto, Gas Stations & Building Materials(SA, Mil.$). Nominal NAICS based series is NRSXMI47@USECON. Deflated by constructed Core Retail PCE Deflator.	LogDiff	Retail trade
ADS@USECON	Domestic Retail Auto Sales (SAAR, Mil.Units)	LogDiff	Auto sales
NRST@USECON	Retail Sales & Food Services (SA, Mil.$) deflated by constructed retail trade deflator	LogDiff	Retail trade
RetailInvSalesRatio	Inventory to sales ratio for retail: Total Excl Motor Vehicle & Parts Dealers NRIXM@USECON/NRSXM@USECON	LogDiff	Retail trade
SplicedBuildingMaterials	Retail Sales: Building Materials, Garden Equipment & Supply Dealers (SA, Mil.$) -- (NRSI4@USECON). Deflated by "Houses under Construction: Price Deflator (NSA, 2005=100) " (CCIHD@USECON).	LogDiff	Retail trade
SP500@USECON	Stock Price Index: Standard & Poor's 500 Composite (1941-43=10)	LogDiff	S&P 500
SDY5COMM@USECON	S&P: Composite 500, Dividend Yield (%)	DiffLev	S&P 500
sa(FTOD@USECON)	Federal Outlays: National Defense (Mil.$) - Seasonal Adjustment, All -- Deflated by Consumer Price Index (PCU@USECON).	LogDiff	Treasury
sa(FTO@USECON)	Federal Outlays (Mil.$) - Seasonal Adjustment, All -- Deflated by Consumer Price Index (PCU@USECON).	LogDiff	Treasury
NWSH@USECON	Merchant Wholesalers: Sales: Total (SA, Mil.$). Deflated by Wholesale Trade Deflator.	LogDiff	Wholesale
WholeSaleInvSalesRatio	Merchant Wholesalers: Inventory to sales ratio.	LogDiff	Wholesale

Table 4: Monthly indicators used to forecast GDP components

Quarterly GDP Component	Description of GDP component	Predictor of GDP component	Description of Predictor
HerzonCoreESQty	Constructed series of real equipment and software investment excluding computers, software, and new motor vehicles. Series is constructed by "Fisher subtraction" of FNENPZ@USNA, FNENSZ@USNA, and MVINZ@USNA from FNEZ@USNA "Real Private Nonresidential Investment: Equipment/Software (SAAR, Mil.Chn.2005$) ".	{CoreCapGoodsShipments - CoreCapGoodsExports + CoreCapGoodsImports}	Sum of real core shipments less real "core" exports plus real "core" imports which are each defined in Table 3. The three series are forecasted separately and the forecasts are then added up.
FNENPZ@USNA	Real Pvt Nonres Fixed Investment: Computers/Peripheral Eqpt (SAAR,Mil.Chn.2005$)	{ComputersShipments - ExportsComputersAndRelated + ImportsComputersAndRelated}	Sum of real computer shipments less real computer exports plus real computer imports which are each defined in Table 3. The three series are forecasted separately and the forecasts are then added up.
FNENSZ@USNA	Real Private Nonres Fixed Investment: Software (SAAR, Mil.Ch.2005$)	LAPBSVA@USECON	All Employees: Professional & Business Services (SA, Thous)
MVINZ@USNA	Real Private Fixed Investment in New Motor Vehicles (SAAR, Mil.Ch.2005$)	TLVAR@USECON	Light Weight Vehicle Sales {Autos+Light Trucks} (SAAR, Mil.Units)
FNSZ@USNA	Real Private Nonresidential Investment: Structures (SAAR, Mil.Chn.2005$)	CPVD@USECON	Private Construction: Nonresidential (SAAR, Mil.$) -- Deflated by NResStructDefqtrInterp59fr which is a monthly interpolated version of the nonresidential structures price deflator
FRSPZ@USNA	Private Investment: Permanent Site Residential Struct (SAAR, Mil.Chn.2005$)	SplicedNewHousingConstruction	Private Construction: Residential: New Housing Units (SAAR, Mil.$) [CPVRH@USECON] deflated by "Houses under Construction: Price Deflator (NSA, 2005=100) " (CCIHD@USECON).
FRSOZ@USNA	Pvt Residential Investment: Other Structures (SAAR, Mil.Chn.2005$)	HX1US@USECON	Existing 1-Family Home Sales: United States (SAAR, Thous)
		HN1US@USECON	New 1-Family Houses Sold: United States (SAAR, Thous)
		SplicedBuildingMaterials	Retail Sales: Building Materials, Garden Equipment & Supply Dealers (SA, Mil.$) -- (NRSI4@USECON). Deflated by "Houses under Construction: Price Deflator (NSA, 2005=100) " (CCIHD@USECON).

XZ@USNA	Real Exports of Goods & Services (SAAR, Mil.Chn.2005$)	{SplicedNonCoreNonComputerExports + ExportsComputersAndRelated + CoreCapGoodsExports}	Sum of three exports series. Before the deflator for the series is converted to the export price deflator. This is possible because the separate forecasts for all the deflators are made.
MZ@USNA	Real Imports of Goods & Services (SAAR, Mil.Chn.2005$)	{SplicedNonCoreNonComputerImports + ImportsComputersAndRelated + CoreCapGoodsImports}	Sum of three import series. Before the deflator for the series is converted to the import price deflator. This is possible because the separate forecasts for all the deflators are made.
GFDZ@USNA	Real National Defense Consumption & Gross Investment (SAAR, Mil.Chn.2005$)	GovernmentEmploymentExCensus	"All Employees: Government (SA, Thous)" [LAGOVTA@USECON] minus "All Employees: Fed Gov Decennial Census Temp & Intermittent Workers(NSA,Thous) " [LAFGT@USECON]
		sa(FTOD@USECON)	Federal Outlays: National Defense (Mil.$) - Seasonal Adjustment, All -- Deflated by Consumer Price Index (PCU@USECON).
		sa(FTO@USECON)	Federal Outlays (Mil.$) - Seasonal Adjustment, All -- Deflated by Consumer Price Index (PCU@USECON).
GFNZ@USNA	Real Federal Nondefense Consumption & Gross Investment(SAAR, Mil.Chn.2005$)	GovernmentEmploymentExCensus	"All Employees: Government (SA, Thous)" [LAGOVTA@USECON] minus "All Employees: Fed Gov Decennial Census Temp & Intermittent Workers(NSA,Thous) " [LAFGT@USECON]
		sa(FTO@USECON)	Federal Outlays (Mil.$) - Seasonal Adjustment, All -- Deflated by Consumer Price Index (PCU@USECON).
		YPWGM@USNA	Wage and Salary Disbursements: Government (SAAR, Bil.$) -- Deflated by Consumer Price Index (PCU@USECON).
GSZ@USNA	Real State & Local Govt Consumption & Gross Investment (SAAR, Mil.Chn.2005$)	StateLocalEmp	Sum of LASGOVA@USECON "All Employees: State Government (SA, Thous) " and LALGOVA@USECON "All Employees: Local Government (SA, Thous) ".
		CPG@USECON	Value of Public Construction Put in Place (SAAR, Mil.$). Deflated by Consumer Price Index (PCU@USECON).

Table 5: Component breakdown used to forecast consumption

Consumption Variable Name	Consumption Variable Description	Method for "nowcasting" latest month
CDMVNHM@USNA	Personal Consumption Expenditures: New Motor Vehicles (SAAR, Mil.Chn.2005.$)	Latest number predicted with growth in "Light Weight Vehicle Sales {Autos+Light Trucks} (SAAR, Mil.Units)" -- TLVAR@USECON when available
CoreRealRetailPCEQty	Personal Consumption Expenditures: Components that map into retail control basket [retail trade series is NRSXMI47@USECON in Haver]	Latest number predicted with "Retail Sales & Food Serv Excl Auto, Gas Stations & Building Materials(SA, Mil.$) " -- NRSXMI47@USECON -- when available. NRSXMI47@USECON series is deflated by appropriate average of appropriate CPI components when available. Otherwise the deflator is forecast.
CNEHM@USNA	PCE: Gasoline & Other Energy Gds (SAAR, Mil.Chn.2005.$)	No other monthly indicator used.
RealOtherPCE	Personal Consumption Expenditures: Primarily nonfood services and used motor vehicle purchases.	No other monthly indicator used.

Table 6: CPI to PCE retail correspondence

CPI Price Component	CPI Price Description		PCE Price Component	PCE Price Description
UTCT@CPIDATA	CPI-U: Tires (SA, 1982-84=100)		JCDMTTM@USNA	Personal Consumption Expenditures: Tires Price Index (SA, 2005=100)
UTCOON@CPIDATA	CPI-U: Vehicle Parts & Eqpt ex Tires (NSA, 1982-84=100)		JCDMTVM@USNA	Personal Consumption Expenditures: Accessories & Parts Price Index(SA, 2005=100)
UHHF@CPIDATA	CPI-U: Household Furniture & Bedding (SA, 1982-84=100)		JCDFUM@USNA	Personal Consumption Expenditures: Furniture Price Index (SA, 2005=100)
UHHQCN@CPIDATA	CPI-U: Clocks, Lamps and Decorator Items (NSA, 1982-84=100)		JCDFOLM@USNA	PCE: Clock/Lamp/Lighting Fixture/Othr HH Decorative Item Price Idx(SA, 2005=100)
UHHWFN@CPIDATA	CPI-U: Floor Coverings (NSA, Dec-97=100)		JCDFOFM@USNA	PCE: Carpets & Other Floor Coverings Price Index (SA, 2005=100)
UHHWW@CPIDATA	CPI-U: Window Coverings (SA, Dec1997=100)		JCDFOTM@USNA	Personal Consumption Expenditures: Window Coverings Price Index (SA, 2005=100)
UHHPM@CPIDATA	CPI-U: Major appliances(SA, Dec-97=100)		JCDFKKM@USNA	PCE: Major Household Appliances Price Index (SA, 2005=100)
UHHPO@CPIDATA	CPI-U: Other Household Appliances (SA, Dec-97=100)		JCDFKSM@USNA	PCE: Small Elec Household Appliances Price Index (SA, 2005=100)
UHHQDN@CPIDATA	CPI-U: Dishes and Flatware (NSA, Dec-97=100)		JCDFGDM@USNA	Personal Consumption Expenditures: Dishes and Flatware Price Index(SA, 2005=100)
UHHQK@CPIDATA	CPI-U: Nonelectric Cookware and Tableware (SA, Dec1997=100)		JCDFGKM@USNA	PCE: Nonelectric Cookware & Tableware Price Index (SA, 2005=100)
UHHTTN@CPIDATA	CPI-U: Tools, Hardware and Supplies (NSA, Dec-97=100)		JCDFSTM@USNA	PCE: Tools, Hardware & Supplies Price Index (SA, 2005=100)
UHHTQ@CPIDATA	CPI-U: Outdoor Equipment and Supplies (SA, Dec-97=100)		JCDFSLM@USNA	PCE: Outdoor Equip & Supplies Price Index (SA, 2005=100)
UEVT@CPIDATA	CPI-U: Televisions (SA, 1982-84=100)		JCDFTVM@USNA	Personal Consumption Expenditures: Televisions Price Index (SA, 2005=100)
UEVQ@CPIDATA	CPI-U: Other Video Equipment (SA, Dec-97=100)		JCDFTOM@USNA	Personal Consumption Expenditures: Other Video Equip Price Index (SA, 2005=100)
UEVAN@CPIDATA	CPI-U: Audio Equipment (NSA, 1982-84=100)		JCDFTUM@USNA	Personal Consumption Expenditures: Audio Equipment Price Index (SA, 2005=100)

UEVADN@CPIDATA	CPI-U: Audio Discs, Tapes & Other Media (NSA, Dec-97=100)		JCDFTPM@USNA	PCE: Prerec/Blank Audio Disc/Tape/Digital Files/Download Price Idx(SA, 2005=100)
UEVDBN@CPIDATA	CPI-U: Video Cassettes & Discs, Blank & Prerecorded (NSA, Dec-97=100,		JCDFTCM@USNA	PCE: Video Cassettes & Discs, Blank & Prerecorded Price Index (SA, 2005=100)
UETPQ@CPIDATA	CPI-U: Photographic Equipment (SA, Dec-97=100)		JCDOWPM@USNA	Personal Consumption Expenditures: Photographic Equip Price Index (SA, 2005=100)
UDIIP@CPIDATA	CPI-U: Personal Computers and Peripheral Equipment (SA, Dec-07=100)		JCDFCPM@USNA	PCE: Personal Computers & Peripheral Equip Price Index (SA, 2005=100)
UDIISN@CPIDATA	CPI-U: Computer Software and Accessories (NSA, Dec 1997=100)		JCDFCSM@USNA	PCE: Computer Software & Acc Price Index (SA, 2005=100)
UDIION@CPIDATA	CPI-U: Telephone Hardware/Calculators/Other Cons Info Items (NSA, Dec 1997=100)		JCDFCOM@USNA	PCE: Calculators/Typewriters/Othr Info Processing Eqpt Price Idx(SA, 2005=100)
UEEON@CPIDATA	CPI-U: Sports Equipment (NSA, 1982-84=100)		JCDRSM@USNA	PCE: Sporting Equip, Supplies, Guns & Ammunition Price Index (SA, 2005=100)
UEES@CPIDATA	CPI-U: Sport Vehicles including Bicycles (SA, 1982-84=100)		JCDOWLM@USNA	Personal Consumption Expenditures: Motorcycles Price Index (SA, 2005=100)
UEES@CPIDATA	CPI-U: Sport Vehicles including Bicycles (SA, 1982-84=100)		JCDOWBM@USNA	Personal Consumption Expenditures: Bicycles & Acc Price Index (SA, 2005=100)
UEES@CPIDATA	CPI-U: Sport Vehicles including Bicycles (SA, 1982-84=100)		JCDBBBM@USNA	Personal Consumption Expenditures: Pleasure Boats Price Index (SA, 2005=100)
UEES@CPIDATA	CPI-U: Sport Vehicles including Bicycles (SA, 1982-84=100)		JCDBBPM@USNA	Personal Consumption Expenditures: Pleasure Aircraft Price Index (SA, 2005=100)
UEES@CPIDATA	CPI-U: Sport Vehicles including Bicycles (SA, 1982-84=100)		JCDBBOM@USNA	PCE: Other Recreational Vehicles Price Index (SA, 2005=100)
UERMN@CPIDATA	CPI-U: Recreational Books (NSA, Dec-97=100)		JCDRBM@USNA	Personal Consumption Expenditures: Recreational Books Price Index (SA, 2005=100)
UEGM@CPIDATA	CPI-U: Music Instruments and Accessories (SA, Dec-97=100)		JCDFTIM@USNA	Personal Consumption Expenditures: Musical Instruments Price Index(SA, 2005=100)
UAOWJ@CPIDATA	CPI-U: Jewelry (SA, Dec-86=100)		JCDOJJM@USNA	Personal Consumption Expenditures: Jewelry Price Index (SA, 2005=100)
UAOWW@CPIDATA	CPI-U: Watches (SA, Dec-86=100)		JCDOJWM@USNA	Personal Consumption Expenditures: Watches Price Index (SA, 2005=100)
UMQN@CPIDATA	CPI-U: Medical Equipment and Supplies (NSA, Dec-09=100)		JCDOOTM@USNA	PCE: Therapeutic Medical Equip Price Index (SA, 2005=100)
UMSPE@CPIDATA	CPI-U: Eyeglasses & Eye Care (SA, Dec-86=100)		JCDOOEM@USNA	PCE: Corrective Eyeglasses & Contact Lenses Price Index (SA, 2005=100)

UDES@CPIDATA	CPI-U: Educational Books & Supplies (SA, 1982-84=100)		JCDEBM@USNA	Personal Consumption Expenditures: Educational Books Price Index (SA, 2005=100)
P0441@PPI	PPI: Luggage and Small Leather Goods (NSA, 1982=100)		JCDOLM@USNA	PCE: Luggage & Similar Personal Items Price Index (SA, 2005=100)
UDIION@CPIDATA	CPI-U: Telephone Hardware/Calculators/Other Cons Info Items (NSA, Dec 1997=100)		JCDOTM@USNA	PCE: Telephone & Facsimile Equip Price Index (SA, 2005=100)
UFCC@CPIDATA	CPI-U: Cereals & Cereal Products (SA, 1982-84=100)		JCNFOFGM@USNA	Personal Consumption Expenditures: Cereals Price Index (SA, 2005=100)
UFCB@CPIDATA	CPI-U: Bakery Products (SA, 1982-84=100)		JCNFOFKM@USNA	Personal Consumption Expenditures: Bakery Products Price Index (SA, 2005=100)
UFMB@CPIDATA	CPI-U: Beef & Veal (SA, 1982-84=100)		JCNFOFBM@USNA	Personal Consumption Expenditures: Beef and Veal Price Index (SA, 2005=100)
UFMP@CPIDATA	CPI-U: Pork (SA, 1982-84=100)		JCNFOFPM@USNA	Personal Consumption Expenditures: Pork Price Index (SA, 2005=100)
UFMO@CPIDATA	CPI-U: Other Meats (SA, 1982-84=100)		JCNFOFRM@USNA	Personal Consumption Expenditures: Other Meats Price Index (SA, 2005=100)
UFMPP@CPIDATA	CPI-U: Poultry (SA, 1982-84=100)		JCNFOFJM@USNA	Personal Consumption Expenditures: Poultry Price Index (SA, 2005=100)
UFMS@CPIDATA	CPI-U: Fish & Seafood (SA, 1982-84=100)		JCNFOFLM@USNA	Personal Consumption Expenditures: Fish and Seafood Price Index (SA, 2005=100)
UFYF@CPIDATA	CPI-U: Milk (SA, Dec-97=100)		JCNFOFIM@USNA	Personal Consumption Expenditures: Fresh Milk Price Index (SA, 2005=100)
UFYPC@CPIDATA	CPI-U: Cheese and Related Products (SA, 1982-84=100)		JCNFOFDM@USNA	PCE: Processed Dairy Products Price Index (SA, 2005=100)
UFME@CPIDATA	CPI-U: Eggs (SA, 1982-84=100)		JCNFOFEM@USNA	Personal Consumption Expenditures: Eggs Price Index (SA, 2005=100)
UFOT@CPIDATA	CPI-U: Fats and Oils (SA, 1982-84=100)		JCNFOFWM@USNA	Personal Consumption Expenditures: Fats and Oils Price Index (SA, 2005=100)
UFFFF@CPIDATA	CPI-U: Fresh Fruits (SA, 1982-84=100)		JCNFOFFM@USNA	Personal Consumption Expenditures: Fresh Fruit Price Index (SA, 2005=100)
UFFVF@CPIDATA	CPI-U: Fresh Vegetables (SA, 1982-84=100)		JCNFOFVM@USNA	Personal Consumption Expenditures: Fresh Vegetables Price Index (SA, 2005=100)
UFFP@CPIDATA	CPI-U: Processed Fruits & Vegetables (SA, Dec-97=100)		JCNFOFTM@USNA	PCE: Processed Fruits & Vegetables Price Index (SA, 2005=100)
UFOS@CPIDATA	CPI-U: Sugar and Sweets (SA, 1982-84=100)		JCNFOFSM@USNA	Personal Consumption Expenditures: Sugar and Sweets Price Index (SA, 2005=100)

UFH@CPIDATA	CPI-U: Food At Home (SA, 1982-84=100)		JCNFOFOM@USNA	PCE: Food Products, Not Elsewhere Classified Price Index (SA, 2005=100)
UFBVM@CPIDATA	CPI-U: Beverage Materials Incl Coffee & Tea (SA, Dec-97=100)		JCNFOFCM@USNA	PCE: Coffee, Tea & Other Beverage Mtls Price Index (SA, 2005=100)
UFBVJ@CPIDATA	CPI-U: Juices & Nonalcoholic Drinks (SA, Dec-97=100)		JCNFOFNM@USNA	PCE: Mineral Waters, Soft Drinks & Vegetable Juices Price Index (SA, 2005=100)
UABHD@CPIDATA	CPI-U: Distilled Spirits At Home (SA, 1982-84=100)		JCNFOLDM@USNA	Personal Consumption Expenditures: Spirits Price Index (SA, 2005=100)
UABHW@CPIDATA	CPI-U: Wine At Home (SA, 1982-84=100)		JCNFOLEM@USNA	Personal Consumption Expenditures: Wine Price Index (SA, 2005=100)
UABHB@CPIDATA	CPI-U: Beer, Ale and Malt Beverages At Home (SA, 1982-84=100)		JCNFOLBM@USNA	Personal Consumption Expenditures: Beer Price Index (SA, 2005=100)
UFH@CPIDATA	CPI-U: Food At Home (SA, 1982-84=100)		JCNFEFM@USNA	PCE: Food Produced & Consumed on Farms Price Index (SA, 2005=100)
UAW@CPIDATA	CPI-U: Women's & Girls' Apparel (SA, 1982-84=100)		JCNLFFM@USNA	PCE: Women's & Girls' Clothing Price Index (SA, 2005=100)
UAM@CPIDATA	CPI-U: Men's & Boys' Apparel (SA, 1982-84=100)		JCNLMFM@USNA	PCE: Men's & Boys' Clothing Price Index (SA, 2005=100)
UAI@CPIDATA	CPI-U: Infants' & Toddlers' Apparel (SA, 1982-84=100)		JCNLFIM@USNA	PCE: Children's & Infants' Clothing Price Index (SA, 2005=100)
UEGW@CPIDATA	CPI-U: Sewing Machines, Fabric and Supplies (SA, Dec1997=100)		JCNLOLM@USNA	Personal Consumption Expenditures: Clothing Materials Price Index (SA, 2005=100)
UAMM@CPIDATA	CPI-U: Men's Apparel (SA, 1982-84=100)		JCNLXIM@USNA	PCE: Standard Clothing Issued to Military Personnel Price Index (SA, 2005=100)
UAF@CPIDATA	CPI-U: Footwear (SA, 1982-84=100)		JCNLSM@USNA	PCE: Shoes & Other Footwear Price Index (SA, 2005=100)
UMP@CPIDATA	CPI-U: Prescription Drugs & Medical Supplies (SA, 1982-84=100)		JCNODPM@USNA	Personal Consumption Expenditures: Prescription Drugs Price Index (SA, 2005=100)
UMGNN@CPIDATA	CPI-U: Nonprescription Drugs (NSA, Dec-09=100)		JCNODNM@USNA	PCE: Nonprescription Drugs Price Index (SA, 2005=100)
UMQN@CPIDATA	CPI-U: Medical Equipment and Supplies (NSA, Dec-09=100)		JCNODOM@USNA	PCE: Other Medical Products Price Index (SA, 2005=100)
UET@CPIDATA	CPI-U: Toys (SA, 1982-84=100)		JCNOGTM@USNA	PCE: Games, Toys & Hobbies Price Index (SA, 2005=100)
UEPTP@CPIDATA	CPI-U: Pets and Pet Products (SA, 82-84=100)		JCNRPM@USNA	PCE: Pets & Related Products Price Index (SA, 2005=100)
UHHQI@CPIDATA	CPI-U: Indoor Plants and Flowers (SA, Dec-90=100)		JCNGARM@USNA	PCE: Flowers, Seeds & Potted Plants Price Index (SA, 2005=100)

UETPFN@CPIDATA	CPI-U: Film and Photographic Supplies (NSA, Dec-97=100)		JCNOGFM@USNA	PCE: Film & Photographic Supplies Price Index (SA, 2005=100)
UHHKCN@CPIDATA	CPI-U: Household Cleaning Products (NSA, Dec-97=100)		JCNOLPM@USNA	PCE: Household Cleaning Products Price Index (SA, 2005=100)
UHHKRN@CPIDATA	CPI-U: Household Paper Products (NSA, Dec-97=100)		JCNOLFM@USNA	PCE: Household Paper Products Price Index (SA, 2005=100)
UHHWLN@CPIDATA	CPI-U: Other Household Linens (NSA, Dec-97=100)		JCNOLNM@USNA	Personal Consumption Expenditures: Household Linens Price Index (SA, 2005=100)
UEGW@CPIDATA	CPI-U: Sewing Machines, Fabric and Supplies (SA, Dec1997=100)		JCNOLSM@USNA	Personal Consumption Expenditures: Sewing Items Price Index (SA, 2005=100)
UHHKM@CPIDATA	CPI-U: Miscellaneous Household Products (SA, Dec-97=100)		JCNOLOM@USNA	PCE: Misc Household Products Price Index (SA, 2005=100)
UOPPMN@CPIDATA	CPI-U:Hair/Dental/Shaving/Misc Personal Care Prdcts (NSA, Dec-97=100)		JCNOPPM@USNA	PCE: Hair/Dental/Shave/Misc Pers Care Prods ex Elec Prod Price Idx(SA, 2005=100)
UOPPCN@CPIDATA	CPI-U: Cosmetics/Perfumes/Bath/Nail Preps & Impls(NSA, 1982-84=100)		JCNOPCM@USNA	PCE: Cosmetic/Perfumes/Bath/Nail Preparatns & Implements Price Idx(SA, 2005=100)
UOPPMN@CPIDATA	CPI-U:Hair/Dental/Shaving/Misc Personal Care Prdcts (NSA, Dec-97=100)		JCNOPEM@USNA	PCE: Elec Appliances for Personal Care Price Index (SA, 2005=100)
UOT@CPIDATA	CPI-U: Tobacco & Smoking Products (SA, 1982-84=100)		JCNOTM@USNA	Personal Consumption Expenditures: Tobacco Price Index (SA, 2005=100)
UERPN@CPIDATA	CPI-U: Newspapers and Magazines (NSA, Dec-97=100)		JCNMGM@USNA	PCE: Newspapers & Periodicals Price Index (SA, 2005=100)
UOEES@CPIDATA	CPI-U: Stationery/Stationery Supplies/Gift Wrap (SA, 1982-84=100)		JCNONM@USNA	PCE: Stationery & Misc Printed Mtls Price Index (SA, 2005=100)
PCUSLFE@USECON	CPI-U: All Items Less Food and Energy (SA, 1982-84=100)	xxx	JCNOVGM@USNA	PCE: Govt Employees' Expenditures Abroad Price Index (SA, 2005=100)
PCUSLFE@USECON	CPI-U: All Items Less Food and Energy (SA, 1982-84=100)	xxx	JCNOVNM@USNA	PCE: Pvt Employees' Expenditures Abroad Price Index (SA, 2005=100)
PCUSLFE@USECON	CPI-U: All Items Less Food and Energy (SA, 1982-84=100)	xxx	JCNOVRM@USNA	PCE: Less: Personal Remittances in Kind to Nonresidents Price Idx (SA, 2005=100)
UFAHE@CPIDATA	CPI-U: Food at Employee Sites & Schools (SA, Dec-97=100)		JCSFPGM@USNA	PCE: Elementary & Secondary School Lunches Price Index (SA, 2005=100)
UFAHE@CPIDATA	CPI-U: Food at Employee Sites & Schools (SA, Dec-97=100)		JCSFPUM@USNA	PCE: Higher Education School Lunches Price Index (SA, 2005=100)
UFAHLN@CPIDATA	CPI-U: Limited Service Meals and Snacks (NSA, Dec-97=100)		JCSFPLM@USNA	PCE: Meals at Limited Service Eating Places Price Index (SA, 2005=100)

UFAHF@CPIDATA	CPI-U: Full Service Meals & Snacks (SA, Dec-97=100)		JCSFPEM@USNA	PCE: Meals at Other Eating Places Price Index (SA, 2005=100)
UFAHF@CPIDATA	CPI-U: Full Service Meals & Snacks (SA, Dec-97=100)		JCSFPDM@USNA	PCE: Meals at Drinking Places Price Index (SA, 2005=100)
UABE@CPIDATA	CPI-U: Alcoholic Beverages Away From Home (SA, 1982-84=100)		JCSFPBM@USNA	PCE: Alcohol in Purchased Meals Price Index (SA, 2005=100)

xxx No match can be determined

Table 7: Variables in inventory BVAR

Variable Name		***Variable Descrption***		**Transformation**
dDurManufInvtoSales		*Change in ratio: book value of durable goods inventories to durable goods shipments*		Level
dNonDurManufInvtoSales		*Change in ratio: book value of nondurable goods inventories to nondurable goods shipments*		Level
dMerWholesaleInvtoSales		*Change in ratio: book value of merchant wholesale goods inventories to merchant wholesale sales*		Level
dRetExAutoInvtoSales		*Change in ratio: book value of retail ex autos goods inventories to retail ex autos sales*		Level
DurManufIVAtoSales		*Ratio: Inventory valuation adjustment for durable goods manufacturers to durable goods shipments*		Level
NonDurManufIVAtoSales		*Ratio: Inventory valuation adjustment for nondurable goods manufacturers to durable goods shipments*		Level
MerWholesaleIVAtoSales		*Ratio: Inventory valuation adjustment for merchant wholesalers to merchant wholesale sales*		Level
IVARetExAutotoSales		*Ratio: Inventory valuation adjustment for retail (ex auto) to retail sales ex autos*		Level
VNRDVHM_USNAtoSales		*Ratio (Real Inventory Change: Retail: Motor Vehicle Dealers) to (total nominal Retail Sales: Motor Vehicle & Parts Dealers)*		Level
VNWWHM_USNAtoSales		*Ratio (Real Inventory Change: Nonmerchant Wholesalers) to (total nominal Merchant Wholesalers: Sales)*		Level
lNWSH_USECON		*Merchant Wholesalers: Sales: Total (SA, Mil.$)*		LogLevel
lNMSDG_USECON		*Manufacturers' Shipments: Durable Goods (SA, Mil.$)*		LogLevel
lNMODG_USECON		*Manufacturers' New Orders: Durable Goods (SA, Mil.$)*		LogLevel
lNMSNG_USECON		*Mfrs' Shipments: Nondurable Goods Industries (SA, Mil.$)*		LogLevel
lNRSXM_USECON		*Retail Sales: Total Excl Motor Vehicle & Parts Dealers (SA, Mil.$)*		LogLevel
lNRSI1_USECON		*Retail Sales: Motor Vehicle & Parts Dealers (SA, Mil.$)*		LogLevel
lTMXA_USINT		*Exports, f.a.s.: Total Goods, Census Basis (SA, Mil.$)*		LogLevel
lTMXA_USINT		*Imports, Customs Value: Goods (SA, Mil.$)*		LogLevel
lIPMDG_IP		*IP: Durable Manufacturing [NAICS] (SA, 2007=100)*		LogLevel
lIPMND_IP		*IP: Nondurable Manufacturing [NAICS] (SA, 2007=100)*		LogLevel
lLIDURGA_USECON		*Agg Wkly Hrs Index: Prod & Nonsupervisory: Durable Goods Mfg(SA, 2002=100)*		LogLevel
lLINDURA_USECON		*Agg Wkly Hrs Index: Prod & Nonsupervisory: Nondurable Goods Mfg(SA, 2002=100)*		LogLevel
NAPMC_USECON		*ISM Mfg: PMI Composite Index (SA, 50+ = Econ Expand)*		Level
NAPMII_USECON		*ISM Mfg: Inventories Index (SA, 50+ = Econ Expand)*		Level
lADS_USECON		*Domestic Retail Auto Sales (SAAR, Mil.Units)*		LogLevel

lIAU_IP		*IP: Motor Vehicle Assemblies (SAAR, Mil.Units)*		LogLevel
lSP3000_PPI		*PPI: Finished Goods (SA, 1982=100)*		LogLevel
lUCD_CPIDATA		*CPI-U: Durable Commodities (SA, 1982-84=100)*		LogLevel
lUCN_CPIDATA		*CPI-U: Nondurable Commodities (SA, 1982-84=100)*		LogLevel
lPZALL_USECON		*KR-CRB Spot Commodity Price Index: All Commodities (1967=100)*		LogLevel
lPZTEXP_USECON		*Spot Oil Price: West Texas Intermediate [Prior'82=Posted Price] ($/Barrel)*		LogLevel
lDTSMD_USNAsplice		*Sales Price Deflator: Mfg: Durable Goods Industries (SA, 2005=100)*		LogLevel
lDTSMN_USNAsplice		*Sales Price Deflator: Mfg: Nondurable Goods Industries (SA, 2005=100)*		LogLevel
lDTSWM_USNAsplice		*Sales Price Deflator: Merchant Wholesale Trade Industries (SA, 2005=100)*		LogLevel
lRetailExAutosPriceSplice		*Constructed Sales Price Deflator: Retail Trade (SA, 2005=100) ex MVP Dealers*		LogLevel
lMVPRetailPriceSplice		*Sales Price Deflator: Retail Trade: Motor Vehicle & Parts Dlrs (SA, 2005=100)*		LogLevel