Tracking Greenspan: systematic and unsystematic monetary policy revisited

Preliminary Version

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Abstract

This paper proposes a new framework to analyse systematic and unsystematic monetary policy within the same econometric model. As in Bernanke and Boivin, 2001, the model aims at capturing the following facts: monetary authorities use information from a large number of data series to extract a signal on current economic activity which is typically measured with error. Due to strong collinearity between macroeconomic time series, relevant information is obtained by regressing the observables on few aggregates. Collinearity implies that a large panel of time series, which constitutes the information available to policy makers, can be represented as a dynamic factor model *a la* Forni and Reichlin, 1998, Stock and Watson, 1999 and Forni et al., 2000. Here we show how, in this framework, shocks can be identified structurally and the parameters of monetary policy rules, conditional on these shocks, can be estimated. Our results for the US economy between 1982 and 2001 show that: (i) Two shocks capture 80% of the variance of key variables such as output and inflation at all horizons; (ii) The monetary shock mainly affects the term structure of interest rates, but has virtually no effect on output and inflation so that monetary policy affects the economy through its systematic behavior rather than by surprising agents; (iii) Since demand and technology have been the main forces for the dynamics of cyclical output and inflation during the Greenspan era, while supply shocks have been negligible, monetary authorities did not face any tradeoff between inflation and output. By stabilizing inflation conditionally on demand shocks, they also achieved output stabilization; (iv) Conditionally on demand, Greenspan followed the Taylor principle while, conditionally on technology, monetary policy did not respond.

Key words and phrases : Monetary policy, Taylor rules, monetary shocks, signal extraction, dynamic factor models.

1 Introduction

There are two ways in which the literature has modeled the transmission of monetary policy. A large set of studies has analysed the effect of unanticipated monetary policy shocks estimated and identified from small VAR models. Those studies implicitly assume that the agents' information set contains the present and past observations of the variables considered in the VAR and that policy affects the economy by surprising consumers and business. Monetary shocks are typically interpreted as arising from the difficulty of extracting the signal on current economic conditions from noisy data or as reflecting heterogeneity of views on how to implement policy (see, Christiano, Eichenbaum and Evans, 1999). Recently, the focus on policy shocks rather than to the systematic part of monetary policy has been questioned (eg Mc Callum, 1999). The criticism is based on the fact that the percentage of output variance due to monetary policy shocks in VARs is typically very low and that the bulk of variation in the federal fund rate is explained by observable macroeconomic variables rather than exogenous policy action. Another set of studies, on the other hand, has focus on the estimation of structural policy equations (this literature is based on Taylor, 1993) and analysed monetary policy as systematic response to variation in observable variables, typically output gap and inflation (Clarida, Gali and Gertler, 1998). In principle, policy rules reflecting systematic reaction of monetary policy to exogenous shocks could be identified in a structural VAR, however problems of measurement errors and uncertainty on the relevant information set of policy makers, make it difficult to interpret the estimated VAR coefficients (see again Christiano, Eichenbaum and Evans, 1999 for a discussion). This is why the two approaches, VAR and structural rules, have lived separate lives.

Our paper broadly takes the same view on shocks and systematic policy as that underlying the structural VAR approach, but proposes a new framework for empirical analysis which, we will argue, present several advantages with respect to VAR analysis. Our framework differs from the VAR model in three crucial aspects. First, we will explicitely model monetary shocks as those shocks arising from the Fed's missperception of the current value of target variables. Second, we will take into account that monetary authorities use all information available (many time series, possibly in the order of the hundreds) to extract information on current economic activity (on this point, see Bernanke and Boivin, 2001 and Evans, 2001). Third, we will identify the number (as well as the origin) of macroeconomic shocks with respect to which monetary policy react systematically. In our model, although monetary authorities use a large set of variables to assess current economic activity, they condition their behavior on a small number of key shocks driving the observable target variables. Within the same framework, we can identify the money shock and its effect throughout the economy as well as identify the other relevant shocks and the monetary policy reaction to them. We will then be able to evaluate policy, conditionally to the shocks driving the economy and this will allow us to track Greenspan from 1987 to today (and Volcker from 1983 to 1987) to reassess the consensus view on historical performance of the Federal Reserve.

To identify the number of key macroeconomic shocks as well as their economic origin, we follow Forni, Lippi and Reichlin (2002). In our model, each variable is driven by few macroeconomic shocks, common to the whole economy and by idiosyncratic dynamics which is mostly interpreted as measurement error (see Forni, Hallin, Lippi and Reichlin, 2000). To extract information on the common shocks we will use an estimation method based on Forni, Hallin, Lippi and Reichlin (2002) and Stock and Watson (1999). The method provides a parsimonious way to take into account the large information set assumption when estimating shocks and propagation mechanisms. The goal will then be the identification of few shocks from many variables by imposing a minimal set of economically motivated restrictions. Since the shocks to be identified are less numerous than the variables we are conditioning on, with a set of minimal restrictions we easily obtain overidentification which we can then test (testing procedure in this context have been developed by Giannone, 2001). Having identified the shocks, we can estimate the monetary policy rule conditional on those shocks. We will argue that, unlike for unconditional rules, where parameters are functions of both policy action and shocks realization, the estimation of conditional rules allows us to identify policy parameters without ambigouity.

The paper is organised as follows. In Section 2 we briefly review the approach used in the literature to estimate systematic and unsystematic monetary policy. In Section 3 we report some stylized facts that motivate our approach. In Section 4 we outline our methodological strategy. Section 5 reports results on estimates of monetary and non-monetary shocks. Section 6 reports results on the systematic component of monetary policy, conditional on the shocks. Section 7 discusses the advantages of our methodology with respect to the structural VAR approach and standard estimation of policy rules. Section 9 briefly discusses the implications of our results for the evaluation of the Volcker-Greenspan era. Technical issues are discussed in the Appendices.

2 Systematic and unsystematic monetary policy: the SVAR view and the Taylor view

The literature on the empirics of the monetary transmission mechanism is huge and it is not our goal here to summarize it in details. To introduce our methodology, however, it is useful to remind the stylized basic structure of most of the empirical work on the subject.

Let us assume that the Federal Reserve uses the federal funds rate as an instrument of monetary policy. This assumption is typically motivated by institutional considerations (see, for example, Bernanke and Blinder, 1992). Systematic policy can be represented by the following linear rule:

$$r_t = f(\Omega_t) + \eta_t$$

which links the instrument to the variables in the information set of the policy makers Ω_t. The function $f(\Omega_t)$ represents systematic policy while η_t represents the unanticipated monetary shock. There are different views on how η_t is generated. Typically, a justification for the monetary shock η_t is found in changes in the preferences of monetary policy makers, conflicts of views on monetary policy generated by uncertainty on actual economic conditions, measurement errors (for a discussion, see Christiano, Eichenbaum and Evans, 1999).

A VAR specifies the DGP for the elements of Ω_t. Typically, Ω_t will contain present and past values of target variables (τ_t), such as ouput and inflation, for example, and other variables used as leading indicators (z_t), such as, for example the commodity price index. We can partition the vector of the variables of interest as follows:

$$x_t = (z_t,\ \tau_t,\ r_t)$$

and define

$$\Omega_t = \overline{\text{span}}\{x_{t-k},\ \ k \geq 0\}.$$

Following usual notation, a reduced form VAR is :

$$A(L)x_t = v_t$$

with $\mathrm{E}vv' = V$.

Let us partition the structural shocks in the macroeconomy as non-monetary μ_t and monetary η_t so that:

$$\epsilon_t = (\mu_t,\ \eta_t). \tag{2.1}$$

Assuming that the elements of ϵ_t are mutually orthogonal and imposing the normalizing condition $\mathrm{E}\epsilon\epsilon' = I$, identification of the structural parameters of the model requires to impose $n(n-1)/2$ restrictions. This is achieved by chosing an appropriate orthonormal rotation $v_t = Q\epsilon_t$, $QQ' = I$.

Typically, restrictions amount to informational assumptions about policy decisions. For example, in one of the benchmark model discussed in Christiano et al. (1999), it is assumed that policy makers at time t know about current and lagged value of output and inflation, lagged values of the federal fund-rate, non-borrowed reserves, total reserves and the money stock and about current and past value of the commodity price index.

Under the assumption of recursivity (see again, Christiano, Eichenbaum and Evans, 1999), we can obtain just-identification and the money shock η is identified as the shock associated to the row in the VAR corresponding to the federal fund rate. In this case, shocks and coefficients can be estimated by OLS.

At first sight, it would then seem that within the same framework one can identify both shocks and the parameters of the rule. However, there are many problems in interpreting the coefficients of the rules in terms of the behaviour of monetary authorities. First, policy makers observe data with errors (see our discussion below). Second, policy makers may have a larger information set than the econometricians. For example, the assumption that output is observed contemporaneously seems unrealistic since GDP is released quarterly and with a rather long delay. As Christiano, Eichenbaum and Evans (1999) put it:

"the policy rules parameters estimated by the econometrician are a convolution of the parameters of the rule implemented in real time by the policy maker and the parameters of the projection of the missing data onto the econometrician's data set. It is the convolution of these two types of parameters which makes it difficult to assign behavioral interpretations to the econometrician's estimated policy rule parameters." (p. 55)

This is why the systematic component of monetary policy is typically evaluated outside the VAR framework, by structural estimation of an interest rate equation of the form

$$r_t = \phi' \tau_t + \eta_t$$

where the instrument is related to observable variables, rather than exogenous shocks (see, for example, Clarida, Gali and Gertler, 1998).

3 Some stylized facts

- **Fact 1: Comovements**

Let us look at some descriptive features of a panel of quarterly time series for the US economy. To be precise, we will analyze 479 time series. Let us call the $n \times 1$ vector of these variables suitably transformed to obtain stationarity, x_t (see appendix 6 for details on data sources and data transformation).

Although our data set contains variables of different nature: real, nominal, financial and sectoral as well as aggregate data, one fact that emerges from the analysis of the covariance structure is that there is strong collinearity indicating that, indeed, macro time series comove, particularly at business cycle frequencies.

One way to estimate the degree of collinearity between elements of a panel of time series is to look at the eigenvalues of the covariance matrix and see how many we need to capture the bulk of the variance. Table 1 below shows results for our panel. In the first column we have the variance captured by the first $j = 1, ..., 5$ eigenvalues (cumulated) in percentage of the total variance. In column 2 and 3 we have, respectively, the same ratio for frequencies higher than $\theta = \frac{\pi}{2}$, corresponding to cycles longer than 1 years, and $\theta = \frac{\pi}{4}$, corresponding to cycles longer than 2 years. We can see that, overall, the first three eigenvalues capture more than 60% of total variance on average and more than 70% at business cycle frequencies.

Table 1. Variance explained by the first 5 DPCs

no. of DPC	all freq.	> 1 year	> 2 years
1	0.34	0.41	0.45
2	0.51	0.56	0.61
3	0.63	0.67	**0.71**
4	0.72	0.76	0.80
5	0.79	0.82	0.85

Let us define the first 3 dynamic principal components as

$$z_{ht} = p_h(L) x_t, \qquad h = 1, \ldots, 3,$$

where L is the lag operator and $p_h(L)$ is a $(1 \times n)$ row vector of two-sided linear filters[1].

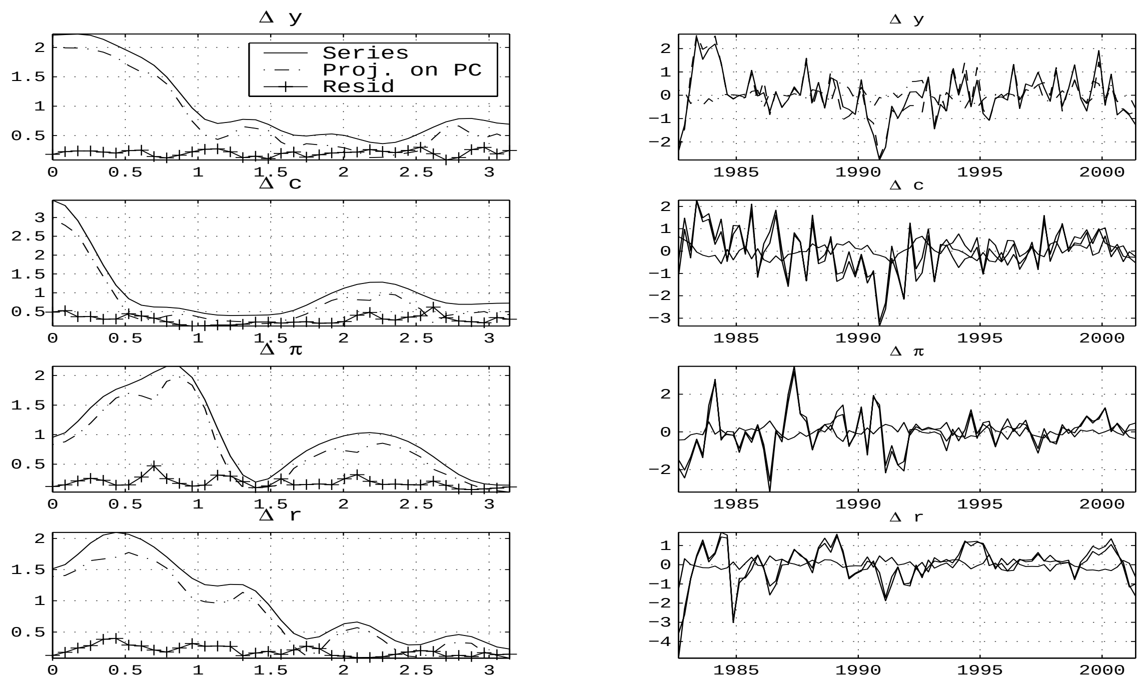
In order to understand how strongly key variables of interest are correlated with the rest of the panel, let us project the latters on the span of the first three principal components. We have:

$$x_{it} = \gamma_{it} + \zeta_{it}$$

where $\gamma_{it} = c_i(L)z_t$ with $z_t = (z_{1t} \ \cdots \ z_{3t})'$ and ζ_{it} is the residual vector.

Figure 1 below shows γ_{it} and ζit plotted over time and their spectral densities over the frequency domain for four variables of interest: the growth rate of GDP (δy), consumption (δc), inflation ($\delta \pi$) and the federal funds rate (δr_t).

Figure 1. Projection on the first 3 dynamic principal components: spectral densities (first column) and time series (second column)



Three features are worth noticing. First, the projection component (the γ's) captures the bulk of the variance in all cases. This suggests that three linear combinations of our large panel capture most of the variance of the variables of interest. Second, in all cases, the residuals have flat spectral shape, indicating that they can be modeled as white noise components, while all interesting dynamics is captured by the projection. This suggests that the residuals can be considered as measurement errors or a component with no temporal or cross-sectional persistence. Table 2 reports the variance

[1] z_{ht} and z_{kt} are mutually orthogonal at any lead and lag for $h \neq k$ and the filters are normalized in such as to guarantee orthogonality $h \neq k$ and unitary variance. For more details, see Brillinger (1981) and Appendix 1.

captured by the first $j = 1, ..., 5$ eigenvalues (cumulated) in percentage of the total variance for selected series and details the results.

Table 2. Variance explained by the first 5 DPCs for selected series

	Δy			Δc			$\Delta \pi$			Δr		
no. of DPC	all	$> 1y$	$> 2y$	all	$> 1y$	$> 2y$	all	$> 1y$	$> 2y$	all	$> 1y$	$> 2y$
1	0.60	0.74	0.78	0.41	0.43	0.49	0.39	0.47	0.50	0.59	0.66	0.68
2	0.72	0.82	0.88	0.60	0.63	0.65	0.75	0.79	0.83	0.73	0.79	0.81
3	0.80	0.86	0.90	0.72	0.74	0.77	0.82	0.84	0.86	0.80	0.85	0.87
4	0.86	0.91	0.93	0.80	0.86	0.89	0.86	0.88	0.90	0.84	0.88	0.90
5	0.90	0.93	0.95	0.85	0.89	0.92	0.88	0.90	0.92	0.87	0.91	0.92

Notice that for all variables, except consumption, the first two dynamic principal components capture around 80% of the variance of the selected variables if cycles longer than one year are considered, while the first three achieve 80% at all frequencies.

•Fact 2: Current economic conditions are known with error

There are two major sources of uncertainty about the current state of real economic activity. First, GDP data and, to a less extent, industrial production and price data, are released with delay. Second, real variables are subject to statistical revisions. The length of publication delay and the size of revision errors vary by country (see Faust et al, 2001 for an interesting cross-country comparison), but they are generally recognized to be substantial. This fact is often misregarded in the literature where it is current practice to fit policy functions assuming that the values of the time series published at time $T + h$ are the same as those known at T. Recently, starting with the work of Orphanides (2001), standard results have been reconsidered using data prior to revisions, i.e. data available at the time of policy decisions. A different literature has dealt with the delay in data publications by suggesting techniques which allow to exploit information on data published with no delay to estimate recent data points in GDP (Altissimo et al., 2001). The two problems, delay and revision errors, are mostly treated separately, but they can be analyzed jointly, just considering that GDP or other variables of interest, are not population quantities, but statistical models. The goal of the econometrician and the policy maker is to extract a signal from noisy data (this way of looking at the problem is, for example, suggested by Evans, 2001). The signal, if successfully measured, will show higher correlation with revised data than to first releases.

Obviously, measurement error is larger in real quantities and price data than in financial data. In particular, the federal fund rate has basically zero measurement error. Moreover, certain variables such as asset prices, survey based indicators on business and consumer expectations are available with minimal delay and are often used formally or informally to assess current economic conditions. Although it is not clear what information policy makers exactly use, it is reasonable to conjecture that their judgement on the state of the economy is based on information coming from a large variety of sources and variable definitions. Below we will model this assumption explicitely.

4 Modeling strategy

Our modeling strategy is based on the stylized facts documented above and rests on three pillars.

• **Pillar 1: The large information set conjecture**

Recent literature (Bernanke and Boivin, 2001, Evans, 2001, Favero and Marcellino, 2001) has suggested that monetary policy makers, when setting the level of the instrument, do not just look at few key variables, but instead exploit knowledge coming from rich data sets containing sectoral as well as aggregate variables, asset prices and key variables used to detect demand and supply conditions (following the notation of Section 2, this implies to assume that Ω_t is large).

• **Pillar 2: Signal extraction**

We assume that most variables in the panel (2.1), especially quantities and prices of goods and services, are measured with error and that they can be decomposed into the sum of two orthogonal components, the signal x^*_{it} and the measurement error e_{it}:

$$x_{it} = x^*_{it} + e_{it}. \tag{4.2}$$

The problem for monetary policy makers is to extract the signal τ^*_t from τ_t, and set r_t according to some policy rule.

Given the large information set conjecture, we assume that the signal from τ_t is extracted using all information potentially available, i.e. by projecting τ_t onto the span of x_t and its past. We have:

$$\tau^*_t = \text{Proj}[\tau_t \mid \overline{\text{span}}(x_{t-k}, k \geq 0)]. \tag{4.3}$$

Notice that $\overline{\text{span}}(x_{t-k}, k \geq 0) = \Omega_t$. Obviously, if the number of elements of x_t is large (in our case $n = 479$), we cannot use a VAR to estimate this projection since the latter has too many parameters. However, the collinearity of the panel can be exploited to extract relevant information from the large cross-section within a parsimonious framework.

Under suitable conditions on the variance-covariance of the x's which, roughly speaking, are satisfied when there is high collinearity (see Forni, Hallin, Lippi and Reichlin, 2000 for precise conditions), we can assume that x_t follows a dynamic factor model:

$$x_{it} = \chi_{it} + \xi_{it} \tag{4.4}$$

where

$$\chi_{it} = b_i(L)u_t = \sum_{h=1}^{q} b_{ih}(L)u_{ht}$$

is the common component, $u_t = (u_{1t}, \ldots, u_{qt})'$ is the q-dimensional vector of the common shocks, which are unit variance white noises mutually orthogonal at all leads and lags, $b_i(L) = b_{i1}(L), \ldots, b_{iq}(L)$ is a row vector of polynomials in the lag operator of possibly infinite order and the idiosyncratic component ξ_{it} is orthogonal to u_{t-k} for any k and i.

The common component, which is identified under the conditions given in Forni et al. (2000), captures that part of the series which is correlated with the rest of the panel while the idiosyncratic component contains measurement error and locally cross-correlated components.

Abstracting for the moment from estimation issues, we assume that by extracting the common components from target variables, we clean them from measurement error. We have:

$$\tau_t^* = \chi_{\tau,t}$$

Under these assumptions, τ_t^* can be recovered by projecting on the span of the common components of x_t (or, which is the same, on the span of the common factors u_{th}) rather than x_t itself. Since the latter is of reduced rank q, this projection is feasible. Under our assumptions, τ^* is equal to its common component $\chi_{\tau t}$. We have:

$$\tau_t^* = \chi_{\tau t} = \text{Proj}[\tau_t \mid \overline{\text{span}}(u_{t-k}, k \geq 0)] \tag{4.5}$$

- **Pillar 3: Policy function**

In Section 2, we expressed the policy rule as a function relating the instrument r_t and the information set Ω_t:

$$r_t = f(\Omega_t) + \eta_t.$$

Given, the argument above, we can be more specific and say:

$$f(\Omega_t) = \phi(L)\tau_t^* = g(u_t)$$

where τ_t^* is not known and has to be estimated on the basis of information in Ω_t, i.e. the span of the present and past x's, where x is potentially very large. The estimate is obtained from (4.5) as $\chi_{\tau t}$. The unfeasible problem of estimating a large VAR on x has then be transformed in a reduced rank regression problem of regressing the x's on a few number of common shocks.

The policy function can then be written in three alternative forms:

$$r_t = \phi(L)\tau_t^* + \eta_t = \phi(L)\chi_{\tau t} + \eta_t = \phi(L)b_\tau(L)u_t + \eta_t. \tag{4.6}$$

In the first two forms the federal fund rate is expressed as a function of the signal extracted from observable target variables while, in the third, we obtain it as a function of unobservable exogenous macroeconomic shocks.

Notice that the number of shocks is not necessarily the same as the number of target variables and, clearly, if the targets are more numerous than the shocks, coefficients cannot be identified. We will comment on this point later on. Let us here say that the number of common shocks can be inferred from the behavior of the eigenvalues of the covariances of the x's (see, Forni et al., 2000 on this point).

Once the number of shocks is selected, we must identify the shocks structurally and label them as technology, demand, etc.. Had the money shock affected the whole economy, one element of u_t should certainly be identified as "money" and distinguished from other shocks. The policy function can be expressed in its conditional form as a function of the money shock u_t^m and the vector of the non-money shocks u_t^{nm}. We have:

$$r_t = \phi^{nm} b_\tau^{nm}(L) u_t^{nm} + \phi^m b_\tau^m(L) u_t^m + \eta_t. \tag{4.7}$$

Notice that, since the monetary shock η_t, beside having a pervasive impact, may also have a local impact (affecting, for example, only nominal variables), we can split it in its "common" and "idiosyncratic" component:

$$\eta_t = u_t^m + \xi_{rt}.$$

It is easily seen that η_t in (4.6) and (4.7) is not orthogonal to the regressors. While this would be a problem in a standard estimation of the rule (even in the absence of forward looking behaviour), it is not a problem in our framework since the coefficients of the rules and the exogenous shocks can be identified and estimated from:

$$r_t = b_r^{nm}(L) u_t^{nm} + b_r(L) u_t^m + \xi_{r,t} \tag{4.8}$$

where $b_r^{nm}(L)$ provide information on the systematic reaction of monetary policy to unanticipated shocks and $b_r(L)u_t^m$ represents the feedbacks. Of course, the money shock may turn out not to propagate throughout the whole economy and to have only a local effect, as for example, to nominal variables. In that case the money shock will be idiosyncratic, i.e. poorly cross-sectionally correlated in the sense defined by Forni et al. (2000). We will investigate this possibility later on.

Let us here stress two points and make two remarks.

Point 1. In order to identify policy behavior, it is important to define rules conditionally on shocks rather than estimating them in terms of the variables themselves. This point can be best illustrated by the following example.

Example: Inflation targeting.

Assume that there are two shocks in the economy, demand and technology, so that inflation and the federal fund rate can be expressed as the sum of a component conditional on demand and a component conditional on technology. With obvious notation we have;

$$\pi_t = \pi_t^d + \pi_t^{tek}$$

$$r_t = r_t^d + r_t^{tek}$$

where $r_t^d = \phi_\pi^d \pi_t^d$ and $r_t^{tek} = \phi_\pi^{tek} \pi_t^{tek}$.

The coefficients of the conditional rule are:

$$\phi_\pi^d = \frac{\mathrm{cov}(\pi_t^d, r_t^d)}{\mathrm{var}(\pi_t^d)}$$

$$\phi_\pi^{tek} = \frac{\mathrm{cov}(\pi_t^{tek}, r_t^{tek})}{\mathrm{var}(\pi_t^{tek})}.$$

The corresponding unconditional rule is:

$$r_t = \tilde{\phi}_\pi (\pi_t^d + \pi_t^{tek})$$

and the estimated coefficient is derived as:

$$\tilde{\phi}_\pi = \frac{\mathrm{cov}(\pi_t^{tek} + \pi_t^d, r_t^{tek} + r_t^d)}{\mathrm{var}(\pi_t^{tek} + \pi_t^d)}.$$

Under the assumption that $\mathrm{cov}(\pi_t^{tek}, r_t^{tek}) = 0$, the expression above simplifies to:

$$\tilde{\phi}_\pi = \phi_\pi^d \frac{\mathrm{var}(\pi_t^d)}{\mathrm{var}(\pi_t^{tek} + \pi_t^d)}$$

Clearly the coefficient of the unconditional rule depends on the relative weight of the variance of inflation explained by demand and that explained by supply. Assume that the Central Bank does not react to the technology shocks so that $\phi_\pi^{tek} = 0$. If the Central Bank follows the Taylor principle conditionally on demand, so that ϕ_π^d is larger than one, we may observe an unconditional parameter larger or smaller than one depending on the ratio between the variance of inflation explained by demand and the variance of inflation explained by technology. If this ratio decreases, causing, other things being equal, a drop of $\tilde{\phi}$ to a value less than one, we may wrongly conclude that the Central Bank has not followed a stabilizing rule.

Notice that, although the importance of conditional estimates is aknowledged in the theoretical literature (eg. Woodford, 2002 and Clarida, Gali and Gertler, 1999), the empirical literature generally takes an unconditional approach where r_t is expressed as a function of observable variables rather than in terms of exogenous shocks.[2]

Point 2. The second point is that the fact that our model has many variables driven by the same few shocks, has important consequences on the identification of policy parameters inthe Taylor rule. If the number of target variables m is smaller or equal than the number of shocks q, the parameters of the rule are identified by the relation

[2]Exception is Gali, López-Salido, Vallés (2000) who, however, only conditions with respect to the technology shock.

between (4.8) and (4.6). It is easily seen that equation (4.8) implies the following restrictions:

$$\phi^m(L) = [b_r^m(L) - 1]b_\tau^m(L)^{-1}$$

and

$$\phi^{nm}(L) = b_r^{nm}(L)b_\tau^{nm}(L)^{-1}.$$

The identification of the parameters of the rule conditional on the shock, on the other hand, will not be identified in this case. For q shocks and m target variables, we need to identify $q \times m$ parameters from q equations. We will return to this point in Session 6.

Remark 1. $\chi_{\tau t}$ has to be estimated. A consistent estimate can be obtained by projecting x_{it} on the appropriate number of static principal components as in Stock and Watson, 1999 or as the projection on the appropriate number of dynamic principal components as in Forni, Hallin, Lippi and Reichlin, 2000. If $q = 3$ the estimated common component (the signal) of the target variables GDP and inflation is exactly what we have illustrated in Figure 1 in Section 2. Recall that, for both output and inflation, the measurement error captured by the residual idiosyncratic component exhibits a flat spectrum while the business cycle dynamics is entirely captured by the estimated common component. This should persuade the reader that by extracting the common component we are indeed extracting the signal.

Remark 2. The task of the structural identification of the u's requires to impose identification restrictions as it is usually done in the VAR literature. We turn to this point in the next Section.

5 Shocks

Before identifying the common shocks, we have to determine their number q on the basis of some statistical criterion. Although a number of criteria have been suggested by the literature (Forni et al, 2000 and Liska, 2002), no formal test is available. The suggested criteria are based on the values of the dynamic eigenvalues of the observations. Table 1 in Section 2 reported the percentage of the total variance explained by the first five dynamic principal components. We can see that three eigenvalues capture over 60% of the variance when all frequencies are considered and over 70% at business cycle frequencies. Just the first two eigenvalues capture more than 50% of the total variance. From Figure 1, we have also seen that these numbers are even larger when one considers explained variance of key variables such as output, consumption and inflation. We will then try two alternative choices, $q = 2$ and $q = 3$.

We will start analysing the case $q = 3$ and procede to identify three shocks. Identification requires two steps. First, we need to obtain a representation of the u's on the past of the χ's. This allows us to recover the common shocks from a reduced rank regression on the common components. Second, we need to impose restrictions to reach identification. Notice that in the factor model framework, we need to identify q shocks from n observable time series unlike in VARs where the number of shocks is the same as the number of series. The consequence, as it has been pointed out by Forni, Lippi and Reichlin (2001), is that we can easily obtained over-identifying restrictions which can then be tested using the framework developed by Giannone (2001).

Let us discuss the first point first. We will assume a restricted version of (4.4) which is in line with Stock and Watson (1999) and Forni et al. (2001):

$$x_{it} = c_i(L)f_t + \xi_{it} \tag{5.9}$$

and

$$f_t - a_1 f_{t-1} - ... - a_p f_{t-p} = a(L)f_t = Bu_t \tag{5.10}$$

We assume that $c_i(L)$ is of finite order s and that the $q \times 1$ vector of the factors has an autoregressive structure of order p. We will then have:

$$b_i(L) = c_i(L)a(L)^{-1}B$$

Under the assumptions above, the model can be written in its stacked form and estimated by static principal components. Details are spelled out in Appendices 3 and 4. Let us here say that the identification problem consists in recovering a vector of structural shocks of dimension q. If the loadings have finite lag structure of order s, the model can be written is stacked form where each observable is a linear function of the first $r = q(s+1)$ static principal components of the x's. In this case, recovering the span of the q dimensional shocks u_t is the same as recovering the span of the r dimensional vector of the u's and their s lags. Identification is then achieved in two steps. In the first, we recover a linear combination of r shocks and we compute their first q static principal components: this gives us a linear combination of the q shocks of interest. In the second step, we fix a q-dimensional rotation of the principal components.

Let us define the stacked r-dimensional common shocks as $v_t = Du_t$ with variance-covariance matrix $\Sigma = DD' = PMP'$ where the last term of the equality expresses it in terms of the matrix P of its eigenvectors and the matrix M of its eigenvalues. The q-vector of orthogonal common shocks can be estimated as the q normalized non-zero static principal components of the v residuals, i.e. as:

$$\omega_t = M^{-1/2}P'v_t.$$

The latter obviously spans the same space spanned by the u_t. We have $u_t = R'\omega_t$ where R is an orthonormal matrix which rotates ω_t. In the case $q = 3$, R can be parameterized as:

$$R = \begin{pmatrix} \cos(a) & \sin(a) & 0 \\ -\sin(a) & \cos(a) & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \cos(b) & 0 & \sin(b) \\ 0 & 1 & 0 \\ -\sin(b) & 0 & \cos(b) \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos(c) & \sin(c) \\ 0 & -\sin(c) & \cos(c) \end{pmatrix} \tag{5.11}$$

with $(a, b, c) \in [0, 2\pi]$.

Since the rotation matrix is of dimension $q \times q$ and the u's are orthonormal, just-identification is obtained with q restrictions.

The impulse response functions of x_{it}, associated with the common shocks ω's are given by $b_i(L)R$.

Structural identification consists in the selection of a particular matrix R. Given the orthonormality of the u's this implies that we have to choose three parameters in order to reach just-identification. In our model, where $n >> q$, by adopting a minimal set of "consensus" restrictions, we easily reach over-identification.

We have in mind four types of potentially relevant shocks: technology, demand, supply and money.

A broad class of theoretical models suggests that the identified shocks should satisfy the following restrictions on long-run multipliers (LR) (see Francis and Ramey, 2001 for a review) and conditional correlations (CC)

LR.1) demand, supply and monetary shocks do not have permanent effects on productivity and real wages;

LR.2) technology shocks do not permanently affect labor supply;

LR.3) monetary shocks do not have permanent effects on real variables such as consumption, investment, output, labor supply;

CC.1) supply shocks have opposite effects on prices and output;

CC.2) demand and money shocks affect prices and output in the same direction;

Notice that long-run restrictions do not allow to discriminate between demand and supply shocks.

Restrictions LR1-3 and CC1-3 are summarized in the table below where columns LR show the zero restrictions on the long-run multipliers and columns CC show the sign of the conditional response:

	tek		demand		supply		money	
	LR	CC	LR	CC	LR	CC	LR	CC
y/l	$\times$	$\times$	0	$\times$	0	$\times$	0	$\times$
w	$\times$	$\times$	0	$\times$	0	$\times$	0	$\times$
l	0	$\times$	$\times$	$\times$	$\times$	$\times$	0	$\times$
y	$\times$	$\times$	$\times$	$+$	$\times$	$+$	0	$+$
c	$\times$	$\times$	$\times$	$\times$	$\times$	$\times$	0	$\times$
i	$\times$	$\times$	$\times$	$\times$	$\times$	$\times$	0	$\times$
π	$\times$	$\times$	$\times$	$+$	$\times$	$-$	$\times$	$+$

Long-run overidentifying restrictions can be tested as follows. Denote by ΔG_t a vector process consisting of the first differences of labor productivity, real wage, hours per capita, GDP, consumption and investment. Let us define $B(1) = [b_1(1)' \cdots b_n(1)']'$ and call $B_{\Delta G}(1)$ the $6 \times q$ matrix of the long run structural multipliers of the three common shocks to the variables in vector G. Over-identifying constraints on the long run multipliers can be expressed as $\Omega \mathrm{vec}(\mathrm{B}_{\Delta \mathrm{G}}(1)) = 0$ where Ω has been chosen appropriately. The null hypothesis has the following form:

$$H_0 : \Omega \mathrm{vec}(\mathrm{B}_{\Delta \mathrm{G}}(1)) = 0 \tag{5.12}$$

The test for the overidentifying restrictions is based on the minimal distance of the estimated $\Omega \mathrm{vec}(\mathrm{B}_{\Delta \mathrm{G}}(1))$ from the null (see appendix 4 for details). The test statistics is similar to the Hansen J-statistics and is distributed as a chi-squared with degrees of freedom equal to the number of overidentifying restrictions.

We first test for the existence of two shocks long-run neutral neutral on labor-productivity and output. The zero restrictions imposed on the long-run multipliers are:

	tek	2nd shock	3rd shock
y/l	$\times$	0	0
y	$\times$	0	0

We have one overidentifying restriction (four total restrictions minus three restrictions needed for just-identification), and the test statistics is 4.88 with a p-value of 0.03. The null is hence rejected at 5% level. This result rules out the possibility that there are two non-technolgy shocks long-run neutral on output.

We then test for the existence of a shock that is long-run neutral on the selected real variables. The zero restrictions imposed on the long-run multipliers are:

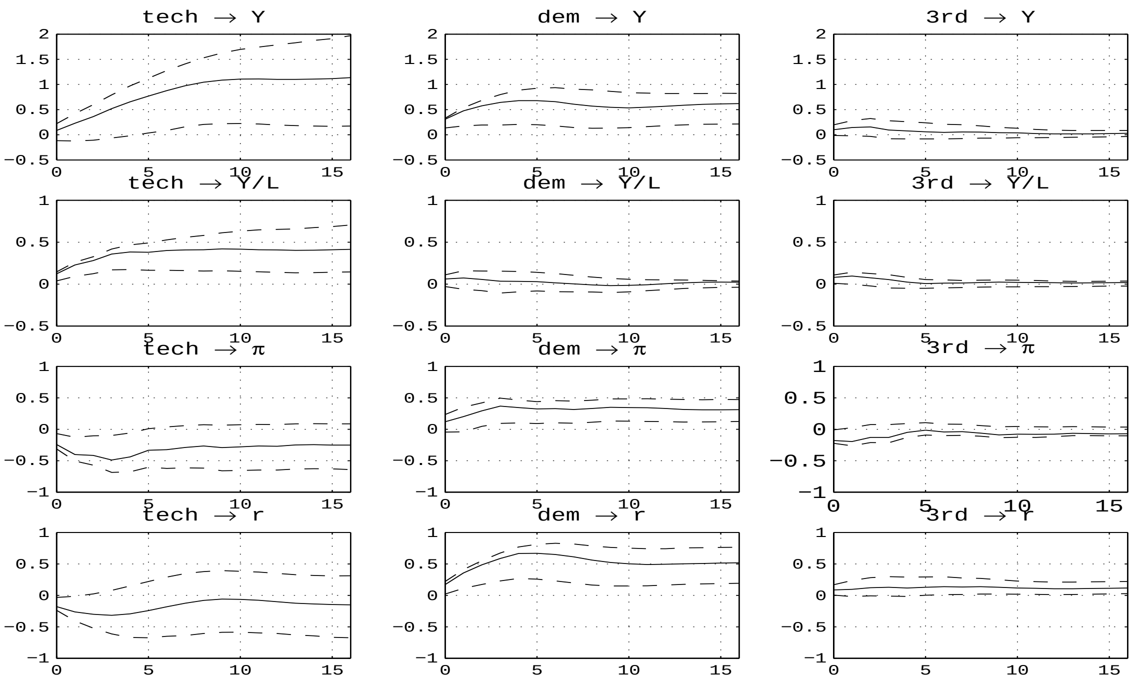
	tek	demand	money
y/l	$\times$	0	0
w	$\times$	0	0
l	0	$\times$	0
y	$\times$	$\times$	0
c	$\times$	$\times$	0
i	$\times$	$\times$	0

We have 6 overidentifying restrictions and the test statistics is equal to 4.72, with a p-value of 0.58. These results are thus compatible with the existence of two shocks long-run neutral on productivity and only one shock long-run neutral on real variables. Long-run restrictions, however, are not sufficient to disentangle the following cases:

a)	Tek	Dem	Money
b)	Tek	Dem	Supply
c)	Tek	Money	Supply

To select one of these cases, we perform two types of exercises. In exercise 1, we impose the identification restriction for the technology shock that we have tested above. This implies to fix a and b in (5.11). We identify c by imposing the other condition tested, namely that only one shock is long-run neutral on output. Figure 2 illustrates results on the impulse response functions of GDP, labor productivity, inflation and the federal fund rate to the identified shocks. Notice that the results correspond to those just-identified restrictions which are a sub-set of the overidentified restrictions which we have tested. These are: technology shock is the only one with permanent effects on labor productivity and there is only one shock which is long-run neutral on output.[3]

Figure 2. Impulse response functions of key variables to the common shocks



The first column displays the effects of a technology shock. The second shock has been labeled demand, because it has significantly positive conditional correlations between output and prices. In addition, it is non-neutral in the long-run on output and thus cannot be confused with a monetary shock. Concerning the last shock, we are not able to discriminate between money and supply. The third shock displays long-run neutrality on output as required for a money shock, but conditional correlation between output and prices is negative (though not significant), as required for a supply shock. In conclusion, we can safely rule out case c, but we still remain uncertain between cases a and b since, the conditional correlations are not statistically significnt.

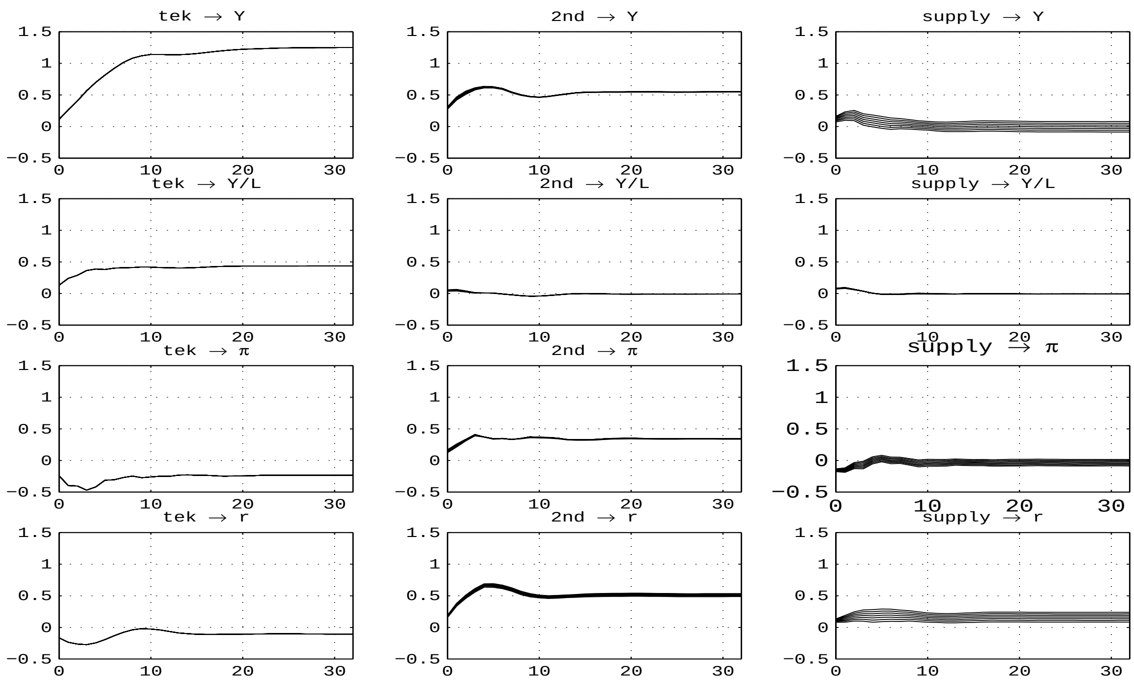
In order to check for the robustness of our conclusions, we performed a second exercise. In exercise 2, we fix a and b as above and examine rotations corresponding to those values of $c \in (0, \pi)$ such that the third shock has opposite effects on prices

[3] An alternative natural choice would have been to chose that rotation that minimizes the distance with the restrictions which we have tested. Notice, however, that, if the restrictions hold, it is sufficient to impose a subset of just-identifying restrictions to have a consistent estimator of the structural model. The strategy we have chosen is motivated by simplicity. The difficulty of estimating the "minimum distance" matrix is that Giannone's test is developed in the frequency domain and the translation in the time domain is not straightforward.

and output in the first year after a shock. These are the rotations compatible with the existence of a supply shock.

Figure 3 below illustrates the impulse response functions corresponding to those values of c (with a grid 0.01). The similarity of the responses with the one obtained in the previous just-identified exercise is striking. In particular, the demand shock has the same impulses and the long-run effect of the supply shock on output appears to be negligible. In addition, qualitative results are quite robust as the responses are not much affected by the choice of a particular rotation.

Figure 3. Impulse response functions of key variables to the common shocks



Notice that the long-run neutral shock on output, which can possibly be identified as money, does not satify the traditional sign restrictions suggested by theoretical models because it has an opposite effect on prices and output.

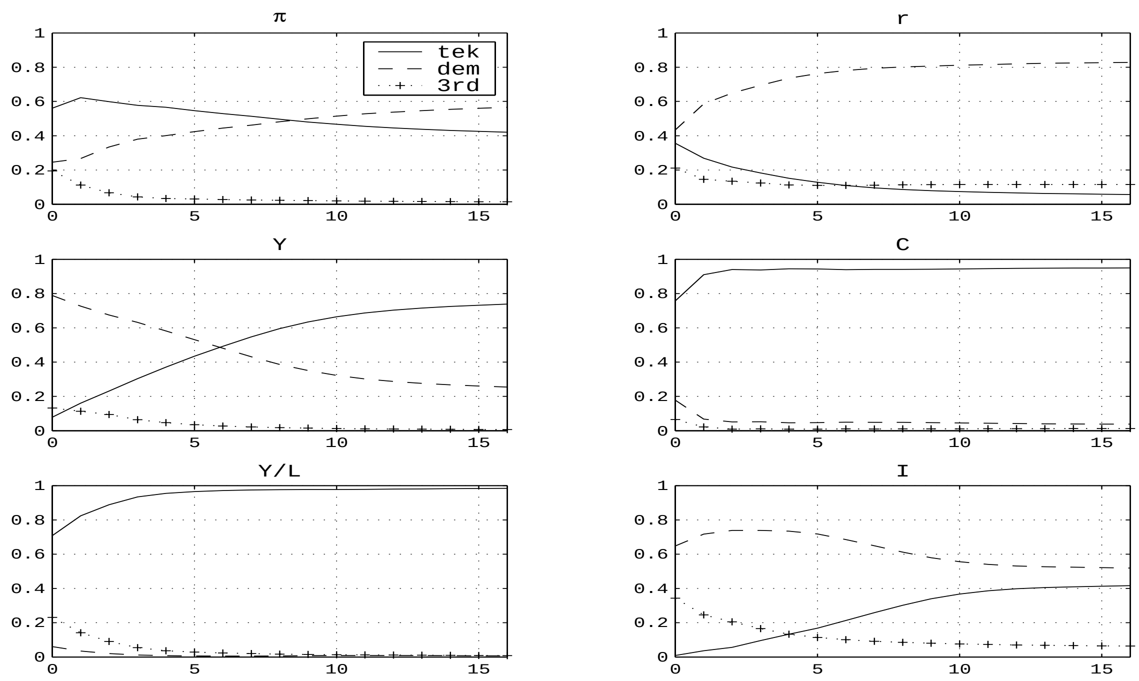
We conclude that the there are two major macroeconomic shocks in the economy, technology and demand. The third shock is small and can be labeled supply. We will keep this interpretation fron now on.

One feature is immediately evident. The supply shock, in the Greenspan's regime, has been very small, suggesting that it might have been irrelevant for policy.

As for the other shocks, we can see that, in the short-run, the main effect on output is caused by the demand shock, while, in the long-run, technology prevails.

Figure 4 reports the variance decompositions for the same variables as in Figure 2 and also complements the analysis by illustrating results for two other variables of interest: consumption and investment. Notice that the technology shock explains almost all the variance of consumption at all horizons, suggesting that only permanent shocks affect consumption while demand explains the bulk of investment variance with technology catching up in the long-run. The Figure on investment helps us intepreting the nature of our non-monetary demand shock and suggest that this is the type of investment shock suggested by Rotemberg and Woodford, 1992. In a separate paper (Giannone, Reichlin and Sala, 2002) we exploit the (rich) cross-sectional information to interpret it more precisely. We skip the discussion here since this is not the focus of the paper.

Figure 4. Variance decompositions



Given the small or insignificant effect of the supply shock, a reasonable characterization of the macroeconomy corresponds to the choice $q = 2$ with only two pervasive and sizeable shock, and supply, at least in this sample, not being one of them. To check for the robustness of our results on the impulses of demand technology, we have derived results for the choice $q = 2$. From Figures 5 and 6 it is easily seen that results are basically unchanged from those based on $q = 3$. From now on we will conduct the analysis under alternative specifications, $q = 2$ and $q = 3$.

Figure 5. Impulse response functions of key variables to the common shocks (q=2)

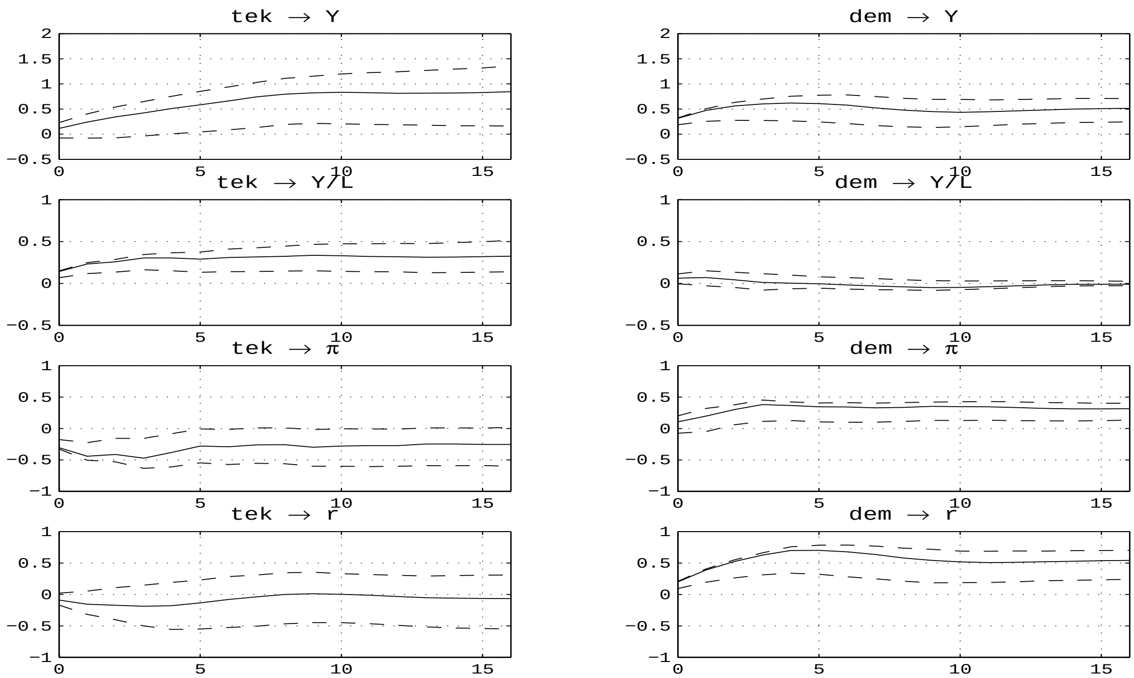
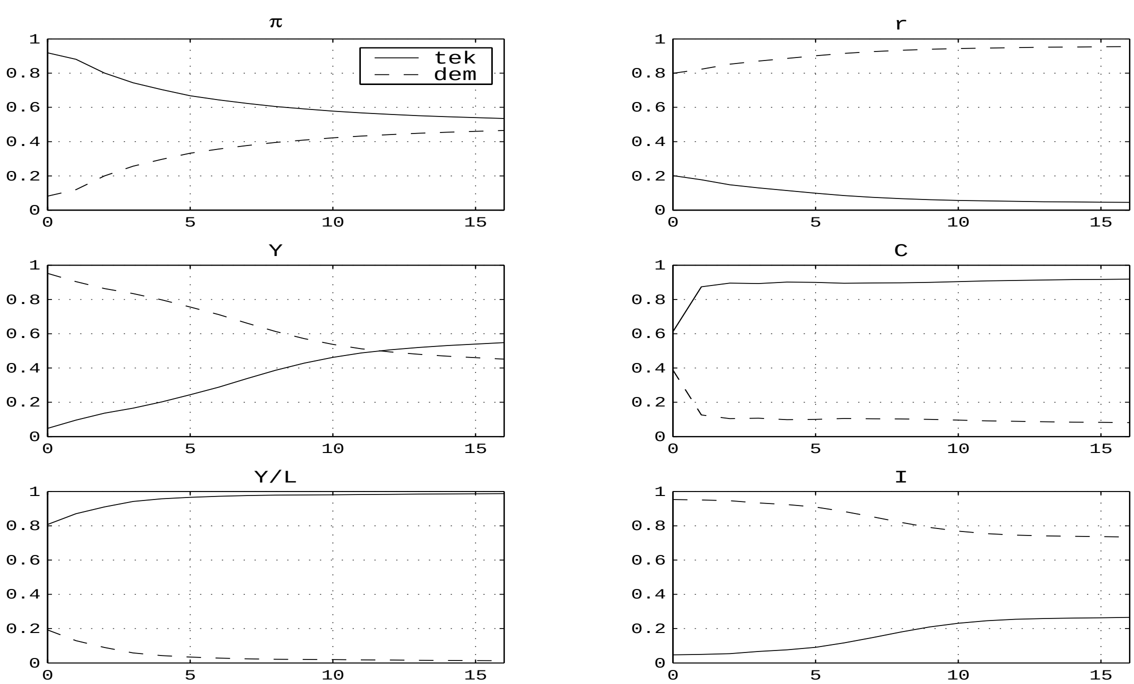


Figure 6. Variance decompositions (q=2)



Since the money shock is found not to be common to all blocks of variables in the system, while the idiosyncratic shock account for 27% ($q = 2$) or 20% ($q = 3$) of the federal fund rate, it is natural to ask whether the correlation structure of the idiosyncratic variance matrix reveals any interesting feature of the money shock. Table 3 below reports correlation coefficients between the idiosyncratic components of the federal fund rate and those of selected series.

Table 3. Correlation between idio components of selected series and r_t

	Δy	$\Delta\pi$	Δr^{1yrs}	Δr^{3yrs}	Δr^{5yrs}	Δr^{10yrs}
2 shocks	0.22	-0.21	0.50	0.40	0.31	0.26
3 shocks	0.15	-0.01	0.43	0.35	0.26	0.05

The correlation is estimated to be rather strong with respect to other interest rates and declining with maturity (1 year, 3 years, 5 years and 10 years). This simply reflects local correlations due to the term structure. Notice also that the correlation with output and inflation have the correct sign.

Our finding of a negligible effect of the monetary shock on output confirms the result of most of the literature (see Faust, 1998 for an analysis of the robustness of this conclusion). As showed in Faust the larger the dimension of the model, the smaller the percentage of the variance of GDP explained by the monetary shock and it is not surprising, therefore, that, by conditioning on a large information set, we obtain a small effect of monetary shocks on output.

If monetary shocks has no pervasive effect, the interesting part of the story is in the analysis of the systematic component of policy. This is where we now turn.

6 Conditional Monetary rules

An optimal monetary policy, designed to fully stabilize prices, should call for a differentiated response of the policy instrument conditional to the origin of the shock (Woodford, 2002, Clarida, Gali and Gertler, 1999). Our framework allows to estimate conditional rules. Therefore, our estimates will provide richer results than in the classical Taylor rule case since the systematic response to, say, inflation, will be split between the response to the component of inflation generated by a technological shock, the component of inflation generated by a demand shock, and so on.

The three shocks we have identified are demand, technology and supply so that, with obvious notation, we have:

$$u_t = (u_t^d,\ u_t^{tek},\ u_t^s)'.$$

- *Unrestricted conditional policy rule*

Given results of the previous Section, the conditional unrestricted rules estimated from the factor model can be written as:

$$\tilde{r}_t = b_r^d(L)u_t^d + b_r^s(L)u_t^s + b_r^{tek}(L)u_t^{tek}. \tag{6.13}$$

Let us here recall some features of the impulse response functions that we can exploit in the analysis of monetary poicy rule.

1. The federal fund rate responds mainly to the demand shock while the response to the technology and supply shocks is very small.

2. The effect of the demand shock is larger on the interest rate than on inflation indicating that it affects the real interest rate positively (Taylor principle).

3. The technology shock has a negative effect on inflation in the short-run and a neutral effect at one year horizon or longer.

4. In response to a positive demand shock, both output and inflation increase; in response to a technology shock, inflation at one year horizon or longer does not move while the output response is large and significant only at horizons longer than one year and a half; in response to a supply shock, we have both a decrease in ouput and an increase in inflation.

Without imposing any restriction on the particular policy rule, we can already draw some conclusions on policy by analysing the impulse response functions to different variables in the system. In particular, the fourth feature higlighted above tells us that the supply shock is the only one amongst the three that calls for a response of monetary policy that implies a tradeoff between inflation and output. Only in that case, an increase of the federal fund rate targeted at inflation would have a cost in terms of cyclical output. Since, in the Greenspan era, the importance of supply shocks seems to have been negligible and technology shocks have been favorable, we may infer that the usual Phillips curve tradeoff has not burdened monetary policy in this particular sample period.

• *Conditional restricted policy rule*

Let us assume that policy targets inflation (or inflationary expectations). The policy coefficient (or better the filter) is implicit in our estimates of the impulse response functions. We have:

$$r_r = \phi_\pi(L)\pi_t = \phi_\pi^d(L)b_\pi^d(L)u_t^d + \phi_\pi^s(L)b_\pi^s(L)u_t^d + \phi_\pi^{tek}(L)b_\pi^d(L)u_{tek}^d \tag{6.14}$$

and the filters are identified from (6.13) and (6.14) as the following ratios:

$$\phi_\pi^j(L) = b_r^j(L)[b_\pi^j(L)]^{-1}$$

with $j = d, tek, s$.

Table 4 reports two summary statistics describing the filter: $\phi^j_\pi(1) = \sum_h \phi^j_{\pi,h}$, which provides information on the long-run relation between the two variables and the mean lag $\mathrm{ML}^j = -\sum_h \phi^j_{\pi,h} h / \sum_j \phi^j_{\pi,h}$[4].

Table 4. Summary of the filter
equation: $\Delta r^j_t = \phi^j_\pi(L)\Delta\pi^j_t$

	Tek	Dem	Supply
$\phi^j_\pi(1)$	0.58	1.59**	-1.55
ML^j	-1.22	0.50	-2.40

**: different from zero at 5% level

Monetary policy responds to inflation with a coefficient significantly larger than one, conditionally on demand shocks, confirming what appeared to be the case from visual inspections of the impulse response functions. The response to the technology shock, on the other hand, is not significantly different from zero and neither is the response to the supply shock, although a value less than one is within the boostrapped confidence intervals. It should be pointed out that the bootstrap confidence intervals are very small for the coefficients of the filter conditional on demand while rather large for those conditional on technology and supply. The result on the response of the federal fund rate to inflation, conditional on demand does not only gives us a point estimate larger than one but tells us that a coefficient smaller than one is rejected at the 5% significance level. This is indeed a very strong evidence on the Taylor principle, conditionally on demand.

The estimates on the mean lag are not very reliable, not significant and not robust. If we believe the point estimates, we would conclude that the Federal Funds Rate leads inflation by half a quarter indicating a slightly forward-looking behaviour.

Notice that since the "clean" variables are collinear, it makes no sense to include an extra variables amongst the Central Bank target: the output gap is collinear with inflation, no matter what is the definition we want to give to it. However, to shed some light on the relative weight of output and inflation in the policy function, we can express inflation in terms of output and find the corresponding filter. We have:

$$\Delta\pi^j_t = \gamma^j(L)\Delta x^j_t$$

and $\Delta r_t = \phi^j_\pi(L)\gamma^j(L)b^j_x(L)u^j_t$

Table 5 reports results on $\gamma^j(1)$ and the mean lag.

Table 5. Summary of the filter
$\Delta\pi_t = \gamma^j(L)b^j_x(L)u^j_t$

[4]Since variables are non-stationary, they are all expressed in first differences.

	Tek	Dem	Supply
$\gamma^j(1)$	-4.85	1.93**	-0.25
ML^j	-9.88	0.87	35.43

**: different from zero at 5% level

Table 5 shows two results. First, the long run coefficient linking inflation and output conditionally on demand is larger than that linking the federal fund rate and inflation, suggesting that the long-run relation between the federal fund rate and output, conditionally on demand, is about 3. Since ouput conditional on demand seems to lead inflation, this may simply mean that the federal fund rate is set so as to target future inflation, but, of course, we cannot really identify the two coefficients separately. Notice, that the sign of the long-run relations tell us that the long-run Phillips curve is positively sloped if conditional on demand, but negativey sloped if conditional on supply and technology. Finally, let us remark that since there is no consensus on what is the correct measure of the output gap, this result should be interpreted with caution and it can be related to results on the role of the output gap in policy functions found in the literature only if we are ready to accept the notion that the output gap is that part of output generated by the demand shock. A measure such as the Hodrick-Prescott filter on output, however, would give us an estimate just slighy lower than one, therefore not changing our qualitative result.

7 Structural VAR, rules and structural factor models

Let us go back to Section 2 and to the problems outlined there about the difficulties in interpreting the parameters of the rule within a structural VAR framework. What are the advantages of structural factor models such as the one used here over the structural VAR framework for understanding monetary rules and monetary shocks?

It is clear that structural factor models belong to the same family of structural VARs as far as view of modelization of policy. Factor models, however, present few advantages. Let us suggest the following list:

1. *Information set* Ω_t. Since in our approach to the estimation of the factors we are not constrained by the dimension of the panel, Ω_t can be "as large as we want". In other words, we can have an encompassing informational assumption where *apriori* both the econometrician and the policy makers use all information available and then they estimate the approximate rank of the covariance matrix at hand to use a statistically based reduction criterion.

2. *Measurement error*. The problem of interpretation caused by measurement error present in the SVAR modelization, is addressed explicitely in the factor methodology where we model the signal extraction problem solved by monetary authorities.

3. *Identification* In a factor model we can use information on n variables to identify q shocks and $n >> q$. This implies that even a small set of consensus restrictions

generate testable over-identified restrictions. In general, the indeterminacy problem of structural VAR is the same in structural factor models, but while in VAR the indeterminacy is generated by a n-dimensional rotation, in structural factor models the rotation is only of dimension q.

4. *Systematic policy.* As in SVARs, information on systematic policy is obtained from the row corresponding to the federal funds rate, but the coeffcients estimates are free from those interpretation problems due to measurement error and heterogeneity of information outlined in Section 2.

As for the estimation of rules, the advantage of our framework is that we obtain an expression of the federal fund rate in terms of exogenous shocks and policy can therefore be evaluated conditionally on the particular shock hitting the economy. We have seen that, when the rule is expressed in terms of observable variables rather than shocks the policy parameters have an ambiguous interpretation. It is also important to remark, that our results indicate that the relevant stochastic rank of the economy is between two and three which implies that macrovariables are collinear and that it is more transparent to write the rule in terms of one variable only, conditional on different shocks rather than in terms of different unconditional variables.

8 What about Greenspan?

As it has been widely commented on, the Greenspan era has been an era of remarkable output and inflation stability. Is this a result of luck or wisdom? We have shown that policy has been wise in two dimensions. First, the Central Bank has distinguished between sources of change, technology versus demand, and has reacted exploiting information on the different dynamic effects of these sources. Conditionally on technology, the federal fund rate was not adjusted while, conditionally on demand, it has followed the Taylor principle, which is stabilizing. But could have Greenspan done worse? The shock that poses a dilemma for policy, since it affects output downward and inflation upward, is the supply shock and we have shown that, during the Greenspan era, supply shocks have been negligible. Therefore Greenspan did not face any tradeoff and, as a consequence, the stabilization performance of his regime is largely due to luck. In the previous regime, where supply shocks have been larger, was the Central Bank policy different? This question goes beyond the scope of this work and it is one we are analysing in a separate paper.

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Appendix 1: Dynamic eigenvalues

We start by estimating the spectral-density matrix of $X_t = \begin{pmatrix} x_{1t} & \cdots & x_{nt} \end{pmatrix}'$. Let us denote the theoretical matrix by $\mathbf{\Sigma}(\theta)$ and its estimate by $\hat{\mathbf{\Sigma}}(\theta)$. The estimation is accomplished by using a Bartlett lag-window of size $M = 12$, i.e. by computing the sample auto-covariance matrices $\hat{\mathbf{\Gamma}}_k$, multiplying them by the weights $w_k = 1 - \frac{|k|}{m+1}$ and applying the discrete Fourier transform:

$$\hat{\mathbf{\Sigma}}_x(\theta) = \frac{1}{2\pi} \sum_{k=-m}^{m} w_k \cdot \hat{\mathbf{\Gamma}}_k \cdot e^{-i\theta k}.$$

The spectra were evaluated at 101 equally spaced frequencies in the interval $[-\pi, \pi]$, i.e. at the frequencies $\theta_h = \frac{2\pi h}{100}$, $h = -50, \ldots, 50$.
Then we performed the dynamic principal component decomposition (see Brillinger, 1981). For each frequency of the grid, we computed the eigenvalues and eigenvectors of $\hat{\mathbf{\Sigma}}(\theta)$. By ordering the eigenvalues in descending order for each frequency and collecting values corresponding to different frequencies, the eigenvalue and eigenvector functions $\hat{\lambda}_j(\theta)$ and $\hat{U}_j(\theta)$, $j = 1, \ldots, n$, are obtained. The function $\hat{\lambda}_j(\theta)$ can be interpreted as the (sample) spectral density of the j-th principal component series and, in analogy with the standard static principal component analysis, the ratio

$$p_j = \int_{-\pi}^{\pi} \lambda_j(\theta) d\theta / \sum_{h=1}^{n} \int_{-\pi}^{\pi} \lambda_h(\theta) d\theta$$

represents the contribution of the j-th principal component series to the total variance in the system.

Appendix 2: Link between the static factor representation and the dynamic representation

Given that the filters $c_i(L)$ are assumed to be of finite order, (4.4) can be rewritten as:

$$x_{it} = C_i' F_t + \xi_{it}$$

where x_{it} is of dimension $n \times 1$, C_i of dimension $r \times n$, where $r = q(s+1)$ and F_t :

$$F_t = [f_t' \;\; f_{t-1}' \;\; \cdots f_{t-s}']'$$

of dimension $r \times 1$.

Written in this form, F_t can be estimated consistently using the first r static principal components of the x_{it}'s (Stock and Watson, 1999).

Having obtained the F_t's, the q common shocks can be derived from a VAR on the F_t's of the form $A(L)F_t = Du_t$. Identification can be obtained by fixing a static rotation of these shocks.

Let us explore this point further. If the length of the filter $a(L)$ is $p \leq s+1$, we can write F_t in VAR(1) form.

We have:

$$F_t = AF_{t-1} + Du_t$$

where:

$$A = \begin{pmatrix} a_1 & a_2 & \cdots & a_p & 0 & \cdots & & 0 \\ I & 0 & \cdots & 0 & 0 & \cdots & & 0 \\ & & \ddots & & & & & \\ & & & & & \ddots & & \\ 0 & 0 & \cdots & 0 & 0 & \cdots & I & 0 \end{pmatrix}$$

and:

$$D = \begin{pmatrix} B \\ 0 \\ \vdots \\ 0 \end{pmatrix}$$

If the length of the filter $a(L)$ is $p > s+1$, we can follow the same procedure as above, but we need to impose a larger number of lags of F_t in order to span the space of the u_t's. In this case, F_t has a VAR$(p-s)$ representation:

$$F_t = A_1 F_{t-1} + ... + A_{p-s} F_{t-p+s} + Du_t$$

where the matrices $A_1 ... A_{p-s}$ have dimension $q(s+1) \times q(s+1)$. As an extreme, consider the case $s = 0$. In this case $F_t = f_t$ and the VAR(p) will simply be equation (5.10) :

$$f_t = a_1 f_{t-1} + ... + a_p f_{t-p} + Bu_t$$

Once the VAR form for F_t is obtained, we can obtain the residual $v_t = Du_t$. Notice that the dimension of F_t, r and the dimension of u_t, q, are unknown. Once r is specified, however, q can be identified from the rank of the variance-covariance matrix of v_t, $\Sigma = DD'$. In the empirical application we specified r following the information criterion proposed by Bai and Ng (2001) and found $r = 4$.

Write N for a version of $\Sigma^{1/2}$, i.e. $N = DQ$ with Q a $q \times q$ orthonormal matrix, and N^+ for its generalized inverse [5].

The q-vector of orthogonal common shocks can be expressed as:

$$\omega_t = N^+ v_t.$$

The latter obviously spans the same space spanned by the u_t.

[5] A particular choice is $N = PM^{1/2}$ and $N^+ = M^{-1/2}P'$ where M is the $q \times q$ diagonal matrix of the non zero eigenvalues of Σ and P is the $r \times q$ matrix of the corresponding eigenvectors

We also have $\chi_t = CF_t$ which implies

$$\chi_t = K\chi_{t-1} + CDu_t$$

where $K = CAC'$.

We are now ready for the second step. Just-identification of the u's consists in identifying an orthonormal matrix R which rotates ω_t. Since the rotation matrix is of dimension $q \times q$ and the u's are orthonormal, just-identification is obtained with $q(q-1)/2$ restrictions.

The impulse response function of x_{it} associated with the common shocks u's are given by:

$$C_i\Theta(L)u_t$$

where $u_t = R'\omega_t$, $\Theta(L) = A(L)^{-1}NR$.

Appendix 3: Estimation

We estimate the static factors f_t as linear combinations of (the present of) the observable variables x_{it}, $i = 1, \dots, n$. We need only a set of $r = q(s+1)$ variables forming a basis for the linear space spanned by the u_{ht}'s and their lags. We can then obtain $\hat{\chi}_{jt}$ by projecting χ_{jt} on such factors. Two strategies have been used in the literature, Stock and Watson, 1999 and Forni et al., 2001. Forni et al., 2000 propose a method based on frequency domain which is what we used in Section 2.

Otherwise we have followed Stock and Watson and estimated F_t as the first r static principal components of the x's:

$$\hat{F}_t = \Lambda^{-1/2}V'X_t$$

where Λ is the $r \times r$ diagonal matrix of the first r eigenvalues of the sample covariance matrix of the X's, V is the $(n \times r)$ matrix of the corresponding eigenvectors and

$$X_t = [x'_{1t} \;\; x'_{2t} \;\; \cdots x'_{nt}]'.$$

Stock and Watson (1998) show that the static projection $\hat{\chi}_{it} = \hat{C}_i'\hat{F}_t$ converges to χ_{it} as both the number of series (n) and the sample size (T) tend to infinity, where

$$\hat{C}_i = \left(\frac{1}{T}\sum_{t=1}^{T}\hat{F}_t\hat{F}_t'\right)^{-1}\left(\frac{1}{T}\sum_{t=1}^{T}\hat{F}_t x_{it}\right) = V_i\Lambda^{1/2}$$

and V_i denote the i-th row of V.

Consider now the OLS estimator of a VAR on the estimated factors [6]:

$$\hat{A}(L)\hat{F}_t = \hat{v}_t, \;\; \hat{\Sigma} = \frac{1}{T-p+1}\sum_{t=t+1}^{T}\hat{v}_t\hat{v}_t'$$

[6] In the case in which the order of the VAR is larger than one, we cannot use OLS estimation because of collinearity and we perform a reduced rank regression, i.e. we regress F_t on the first $r + (p-1)$ principal components of the variance matrix of the stacked vector of the lagged F's.

and write $\hat{N} = \hat{P}\hat{M}^{1/2}$, where $\hat{M}$ is the $q \times q$ diagonal matrix of the first q eigenvalues of the $\hat{\Sigma}$ and $\hat{M}$ is the $(r \times q)$ matrix of the corresponding eigenvectors.

We will show that $\hat{C}_i\hat{A}(L)^{-1}\hat{N}$ is a consistent estimator of the population impulse response functions $C_iA(L)^{-1}N$. This result is an immediate consequence of the following lemma.

Lemma. Under assumptions A-E given in Bai (2001), there exists an invertible matrix H (whose dependence on T and n is dropped for notational simplicity) such that:

(i) $\frac{1}{T}\sum_{t=1}^{T}\|\hat{F}_t - H'F_t\|^2 = O_p(\min\{T^{-1}, n^{-1}\})$

(ii) $\left(\hat{C}_i - H^{-1}C_i\right) = O_p(\min\{T^{-1/2}, n^{-1}\})$

(iii) $\|\hat{\Gamma}_h - H'\Gamma_h\mathrm{H}\| = \|\frac{1}{\mathrm{T-h}}\sum_{\mathrm{t=h+1}}^{\mathrm{T}}\hat{\mathrm{F}}_\mathrm{t}\hat{\mathrm{F}}'_\mathrm{t-h} - \mathrm{H'E}\left[\mathrm{F_tF'_{t-h}}\right]\mathrm{H}\| = \mathrm{o_p}(1)$

as $\min\{T, n\} \to \infty$.

Proof. For (i) and (ii) see Bai(2001) Lemma A.1 and Theorem 2, respectively.

To prove part (iii), notice that from Holder's inequality and from the triangular inequality, it follows:

$$
\begin{aligned}
&\|\frac{1}{T-h}\sum_{t=h+1}^{T}\hat{F}_t\hat{F}'_{t-h} - H\mathrm{E}\left[\mathrm{F_tF'_{t-h}}\right]\mathrm{H'}\| \\
=&\|\frac{1}{T-h}\sum_{t=h+1}^{T}\hat{F}_t(\hat{F}_{t-h} - H'F_{t-h})' + \frac{1}{T-h}\sum_{t=h+1}^{T}(\hat{F}_t - H'F_t)F'_{t-h}H \\
&+ \frac{1}{T-h}\sum_{t=h+1}^{T}HF_tF'_{t-h}H' - H\mathrm{E}\left[\mathrm{F_tF'_{t-h}}\right]\mathrm{H'}\| \\
\leq&\sqrt{\frac{1}{T-h}\sum_{t=h+1}^{T}\|\hat{F}_t\|^2}\sqrt{\frac{1}{T-h}\sum_{t=h+1}^{T}\|\hat{F}_{t-h} - H'F_{t-h}\|^2} \\
&+ \sqrt{\frac{1}{T-h}\sum_{t=h+1}^{T}\|\hat{F}_t - H'F_t\|^2}\sqrt{\sum_{t=h+1}^{T}\|H'F_{t-h}\|^2} \\
&+ \|\frac{1}{T-h}\sum_{t=h+1}^{T}HF_tF'_{t-h}H' - H\mathrm{E}\left[\mathrm{F_tF'_{t-h}}\right]\mathrm{H'}\|
\end{aligned}
$$

The last term is $o_p(1)$ as $T \to \infty$. The first and second terms are $o_p(1)$ from (i) and because both $\frac{1}{T-h}\sum_{t=h+1}^{T}\|F_t\|^2$ and $\frac{1}{T-h}\sum_{t=h+1}^{T}\|\hat{F}_t\|^2$ are $O_p(1)$ as $\min\{T, n\} \to \infty$ (cfr. Bai 2001).

Proposition. For each i,

$$\hat{C}_i\hat{A}(L)^{-1}\hat{N} \xrightarrow{p} C_iA(L)^{-1}N \quad \text{as } \min\{T, n\} \to \infty$$

Proof. $\hat{A}(L)$, $\hat{M}$ and $\hat{P}$ are continuous functions of the sample covariance matrices $\hat{\Gamma}_h$, so from result (iii) of the previous lemma and the continuous mapping theorem:

(iv) $\|\hat{A}(L) - HA(L)H'^{-1}\| = o_p(1)$

(v) $\|\hat{P}\hat{M}^{1/2} - H'N\| = o_p(1)$

as $\min\{T, n\} \to \infty$, where N is a version of $\Sigma^{1/2}$

Putting togheter (ii), (iv) and (v), the result follows.

Appendix 4: Testing

Consider a vector process G_t consisting a set of difference stationary series, subset of x_t and write $B_G(1)$ for the relative long run multiplier. We consider the following hypothesis testing problem:

$$H_0 : \Omega\mathrm{vec}(\mathrm{B_G}(1)) = 0$$

Denote by $\hat{B}(1) = \hat{U}_q(\hat{\Lambda}_q)^{1/2}$, where $\hat{\Lambda}_q = \mathrm{diag}(\hat{\lambda}_1(1), \dots \hat{\lambda}_\mathrm{q}(1))$ and $\hat{V}_q = (\hat{U}_1, \dots, \hat{U}_1)$. It can be shown that there exist a unitary $(q \times q)$ matrix, Q, such that

$$\sqrt{\frac{3T}{2m}}\left[\mathrm{vec}\left(\hat{\mathrm{B}}(1)\mathrm{Q} - \mathrm{B}(1)\right)\right] \xrightarrow{d} \mathrm{N}(0, \boldsymbol{\Theta}(\mathrm{Q}))$$

as both the cross-sectional and the time dimensions tend to infinity at appropriate rate.

Write $\hat{B}_G(1)$ the matrix formed by taking the rows of $\hat{B}(1)$ relative to the variable in G. Then it can be shown that if H_0 holds then:

$$\hat{J} = \frac{3T}{2m}\left(\min_{Q|QQ'=I_q}\{\Omega\mathrm{vec}(\hat{\mathrm{B}}_\mathrm{G}(1)\mathrm{Q}))'(\boldsymbol{\Theta}(\mathrm{Q}))^{-1}(\Omega\mathrm{vec}(\hat{\mathrm{B}}_\mathrm{G}(1)\mathrm{Q})\}\right) \xrightarrow{d} \chi^2_{(v)}$$

where v is equal to the number of overidentifying restriction. Define

$$Q^* =: \mathrm{argmin}_{\mathrm{Q|QQ'=I_q}}\Omega\mathrm{vec}(\hat{\mathrm{B}}_\mathrm{G}(1)\mathrm{Q}))'(\boldsymbol{\Theta}(\mathrm{Q}))^{-1}(\Omega\mathrm{vec}(\hat{\mathrm{B}}_\mathrm{G}(1)\mathrm{Q})$$

$\hat{B}_G(1)Q^*$ is a natural estimator for the structural long-run multiplier $B_G(1)$ under H_0.

Appendix 5: Asymptotic distribution and Monte Carlo bands for the impulse response functions

Under suitable assumptions on the asymptotic behavior of n and T ($T << n$), the error in the estimation of the factors can be ignored (notes available from the authors). This implies that, in the construction of the confidence bands, we can treat the factors as known.

In addition, uncertainty regarding the matrix of eigenvectors V becomes asymptotically negligible. The only source of uncertainty to be taken into account in computing confidence intervals is the one regarding the estimation of the VAR for F_t.

After having estimated the model and computed the impulse response functions as explained in the text, we compute 500 new series for the factors F_t and we re-estimate and re-identify the whole model.

Each new sample j is generated as follows. We first extract with replacement from the series of structural shocks: $\{\hat{u}_i\}_{i=p+1}^{T}$ and generate a new series of shocks $\{\hat{u}_i^{(j)}\}_{i=p+1}^{T}$.

Second, we use the new series of shocks, the estimated $\hat{A}, \hat{P}$ and $\hat{M}$ matrices to compute the new $F_t^{(j)}$.

After having obtained a new $F_t^{(j)}$ vector, we perform the whole estimation and identification procedure to get new impulse response functions. We sort the 500 responses to obtain the empirical distribution and finally we select the $\frac{\alpha}{2}$-th and the $(1 - \frac{\alpha}{2})$-th percentile to obtain the α probability level confidence intervals. In the Figures, we report 95% confidence intervals.

Appendix 6: Data and data treatment

0: no transformation
1: first difference
2: logarithm
3: first difference of logarithm
4: fourth difference of first difference of logarithm

	Description:	Source:	Native Frequency:	
1	NIPA: Personal consumption expenditures, (Bil. Chained$, SAAR)	BEA: Table 1.2 Line 2	QUARTERLY	3
2	NIPA: Durable goods, (Bil. Chained$, SAAR)	BEA: Table 1.2 Line 3	QUARTERLY	3
3	NIPA: Motor vehicles and parts, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 3	QUARTERLY	3
4	NIPA: Furniture and household equipment, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 4	QUARTERLY	3
5	NIPA: Other, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 5	QUARTERLY	3
6	NIPA: Nondurable goods, (Bil. Chained$, SAAR)	BEA: Table 1.2 Line 4	QUARTERLY	3
7	NIPA: Food, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 7	QUARTERLY	3
8	NIPA: Clothing and shoes, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 8	QUARTERLY	3
9	NIPA: Gasoline and oil, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 10	QUARTERLY	3
10	NIPA: Fuel oil and coal, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 11	QUARTERLY	3
11	NIPA: Other, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 12	QUARTERLY	3
12	NIPA: Housing, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 14	QUARTERLY	3
13	NIPA: Household operation, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 15	QUARTERLY	3
14	NIPA: Electricity and gas, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 16	QUARTERLY	3
15	NIPA: Other household operation, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 17	QUARTERLY	3
16	NIPA: Transportation, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 18	QUARTERLY	3
17	NIPA: Medical care, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 19	QUARTERLY	3
18	NIPA: Other, (Bil. Chained$, SAAR)	BEA: Table 2.3 Line 21	QUARTERLY	3
19	NIPA: Gross domestic product, (Bil. Chained$, SAAR)	BEA: Table 1.10 Line 1	QUARTERLY	3
20	NIPA: Personal consumption expenditures, (Bil. Chained$, SAAR)	BEA: Table 1.2 Line 2	QUARTERLY	3
21	NIPA: Gross private domestic investment, (Bil. Chained$, SAAR)	BEA: Table 1.2 Line 6	QUARTERLY	3
22	NIPA: Less: Exports of goods and services, (Bil. Chained$, SAAR)	BEA: Table 1.6 Line 2	QUARTERLY	3
23	NIPA: Plus: Imports of goods and services, (Bil. Chained$, SAAR)	BEA: Table 1.6 Line 3	QUARTERLY	3
24	NIPA: Government consumption expenditures and gross investment, (Bil. Chained$, SAAR)	BEA: Table 1.2 Line 20	QUARTERLY	3
25	NIPA: Structures, (Bil. Chained$, SAAR)	BEA: Table 1.2 Line 9	QUARTERLY	3
26	NIPA: Nonresidential buildings including farm, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 4	QUARTERLY	3
27	NIPA: Utilities, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 5	QUARTERLY	3
28	NIPA: Mining exploration shafts and wells, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 6	QUARTERLY	3
29	NIPA: Other structures, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 7	QUARTERLY	3
30	NIPA: Equipment and software, (Bil. Chained$, SAAR)	BEA: Table 1.2 Line 10	QUARTERLY	3
31	NIPA: Information processing equipment and software, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 9	QUARTERLY	3
32	NIPA: Computers and peripheral equipment, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 10	QUARTERLY	3
33	NIPA: Software, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 11	QUARTERLY	3
34	NIPA: Industrial equipment, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 13	QUARTERLY	3
35	NIPA: Transportation equipment, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 14	QUARTERLY	3
36	NIPA: Structures, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 17	QUARTERLY	3
37	NIPA: Single family, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 18	QUARTERLY	3
38	NIPA: Multifamily, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 19	QUARTERLY	3
39	NIPA: Other structures, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 20	QUARTERLY	3
40	NIPA: Equipment, (Bil. Chained$, SAAR)	BEA: Table 5.5 Line 21	QUARTERLY	3
41	NIPA: National income without capital consumption adjustment, (Bil. $, SAAR)	BEA: Table 6.1C Line 1	QUARTERLY	3
42	NIPA: Domestic industries, (Bil. $, SAAR)	BEA: Table 6.1C Line 2	QUARTERLY	3
43	NIPA: Private industries, (Bil. $, SAAR)	BEA: Table 6.1C Line 3	QUARTERLY	3
44	NIPA: Agriculture forestry and fishing, (Bil. $, SAAR)	BEA: Table 6.1C Line 4	QUARTERLY	3
45	NIPA: Mining, (Bil. $, SAAR)	BEA: Table 6.1C Line 5	QUARTERLY	3
46	NIPA: Construction, (Bil. $, SAAR)	BEA: Table 6.1C Line 6	QUARTERLY	3
47	NIPA: Manufacturing, (Bil. $, SAAR)	BEA: Table 6.1C Line 7	QUARTERLY	3
48	NIPA: Durable goods, (Bil. $, SAAR)	BEA: Table 6.1C Line 8	QUARTERLY	3
49	NIPA: Nondurable goods, (Bil. $, SAAR)	BEA: Table 6.1C Line 9	QUARTERLY	3
50	NIPA: Transportation and public utilities, (Bil. $, SAAR)	BEA: Table 6.1C Line 10	QUARTERLY	3
51	NIPA: Transportation, (Bil. $, SAAR)	BEA: Table 6.1C Line 11	QUARTERLY	3
52	NIPA: Communications, (Bil. $, SAAR)	BEA: Table 6.1C Line 12	QUARTERLY	3
53	NIPA: Electric gas and sanitary services, (Bil. $, SAAR)	BEA: Table 6.1C Line 13	QUARTERLY	3
54	NIPA: Wholesale trade, (Bil. $, SAAR)	BEA: Table 6.1C Line 14	QUARTERLY	3
55	NIPA: Retail trade, (Bil. $, SAAR)	BEA: Table 6.1C Line 15	QUARTERLY	3
56	NIPA: Finance insurance and real estate, (Bil. $, SAAR)	BEA: Table 6.1C Line 16	QUARTERLY	3
57	NIPA: Services, (Bil. $, SAAR)	BEA: Table 6.1C Line 17	QUARTERLY	3
58	NIPA: Government, (Bil. $, SAAR)	BEA: Table 6.1C Line 18	QUARTERLY	3
59	NIPA: Change in private inventories, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 1	QUARTERLY	3
60	NIPA: Farm, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 2	QUARTERLY	3
61	NIPA: Durable goods, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 14	QUARTERLY	3
62	NIPA: Nondurable goods, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 15	QUARTERLY	3
63	NIPA: Durable goods, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 17	QUARTERLY	3
64	NIPA: Other, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 19	QUARTERLY	3
65	NIPA: Nondurable goods, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 20	QUARTERLY	3
66	NIPA: Durable goods, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 22	QUARTERLY	3
67	NIPA: Nondurable goods, (Bil. Chained$, SAAR)	BEA: Table 5.11 Line 23	QUARTERLY	3
68	NIPA: Gross saving, (Bil. $, SAAR)	BEA: Table 5.1 Line 1	QUARTERLY	3
69	NIPA: Gross private saving, (Bil. $, SAAR)	BEA: Table 5.1 Line 2	QUARTERLY	3
70	NIPA: Personal saving, (Bil. $, SAAR)	BEA: Table 5.1 Line 3	QUARTERLY	3
71	NIPA: Undistributed corporate profits with inventory valuation and capital consumption adjustments, (Bil. $, SAAR)	BEA: Table 5.1 Line 4	QUARTERLY	3
72	NIPA: Undistributed profits, (Bil. $, SAAR)	BEA: Table 5.1 Line 5	QUARTERLY	3
73	NIPA: Corporate consumption of fixed capital, (Bil. $, SAAR)	BEA: Table 5.1 Line 8	QUARTERLY	3
74	NIPA: Noncorporate consumption of fixed capital, (Bil. $, SAAR)	BEA: Table 5.1 Line 9	QUARTERLY	3
75	NIPA: Consumption of fixed capital, (Bil. $, SAAR)	BEA: Table 5.1 Line 13	QUARTERLY	3
76	NIPA: State and local, (Bil. $, SAAR)	BEA: Table 5.1 Line 15	QUARTERLY	3
77	NIPA: Consumption of fixed capital, (Bil. $, SAAR)	BEA: Table 5.1 Line 16	QUARTERLY	3
78	NIPA: Gross investment, (Bil. $, SAAR)	BEA: Table 5.1 Line 18	QUARTERLY	3
79	NIPA: Gross private domestic investment, (Bil. $, SAAR)	BEA: Table 5.1 Line 19	QUARTERLY	3
80	NIPA: Gross government investment, (Bil. $, SAAR)	BEA: Table 5.1 Line 20	QUARTERLY	3
81	Productivity & Costs: Nonfarm Business - Output Per Hour All persons, (Index 1992 = 100)	BLS: Productivity & Costs	QUARTERLY	3
82	Productivity & Costs: Nonfarm Business - Output Per Person All persons, (Index 1992 = 100)	BLS: Productivity & Costs	QUARTERLY	3
83	Productivity & Costs: Nonfarm Business - Hours All persons, (Index 1992 = 100)	BLS: Productivity & Costs	QUARTERLY	3
84	Productivity & Costs: Nonfarm Business - Output All persons, (Index 1992 = 100)	BLS: Productivity & Costs	QUARTERLY	3
85	Capacity Utilization: Total Index, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
86	Capacity Utilitzation: Manufacturing, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
87	Capacity Utilitzation: Primary Processing, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
88	Capacity Utilitzation: Advanced Processing, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
89	Capacity Utilitzation: Durable Manufacturing, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
90	Capacity Utilitzation: Lumber And Products SIC=24, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
91	Capacity Utilitzation: Furniture And Fixtures SIC=25, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
92	Capacity Utilitzation: Stone Clay And Glass Products SIC=32, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
93	Capacity Utilitzation: Primary Metals SIC=33, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
94	Capacity Utilitzation: Iron And Steel SIC=3312, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
95	Capacity Utilitzation: Raw Steel SIC=331PT, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
96	Capacity Utilitzation: Nonferrous Metals SIC=333-69, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
97	Capacity Utilization: Copper SIC=3331, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
98	Capacity Utilitzation: Aluminum SIC=3334, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
99	Capacity Utilitzation: Fabricated Metal Products SIC=34, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
100	Capacity Utilitzation: Industrial Machinery And Equipment SIC=35, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
101	Capacity Utilitzation: Computer And Office Equipment SIC=357, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
102	Capacity Utilitzation: Electrical Machinery SIC=36, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
103	Capacity Utilitzation: Transportation Equipment SIC=37, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
104	Capacity Utilitzation: Motor Vehicles And Parts SIC=371, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
105	Capacity Utilitzation: Aerospace And Misc. Transp. Equipment SIC=372-69, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
106	Capacity Utilitzation: Instruments SIC=38, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
107	Capacity Utilitzation: Miscellaneous Manufactures SIC=39, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
108	Capacity Utilitzation: Nondurable Manufacturing, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
109	Capacity Utilitzation: Foods SIC=20, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
110	Capacity Utilitzation: Textile Mill Products SIC=22, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
111	Capacity Utilitzation: Apparel Products SIC=23, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
112	Capacity Utilitzation: Paper And Products SIC=26, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
113	Capacity Utilitzation: Pulp And Paper SIC=261-3, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
114	Capacity Utilitzation: Printing And Publishing SIC=27, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1

115	Capacity Utilitzation: Chemicals And Products SIC=28, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
116	Capacity Utilitzation: Plastics Materials SIC=2821, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
117	Capacity Utilitzation: Synthetic Fibers SIC=28234, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
118	Capacity Utilitzation: Petroleum Products SIC=29, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
119	Capacity Utilitzation: Rubber And Plastics Products SIC=30, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
120	Capacity Utilitzation: Leather And Products SIC=31, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
121	Capacity Utilitzation: Mining, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
122	Capacity Utilitzation: Metal Mining SIC=10, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
123	Capacity Utilitzation: Coal Mining SIC=12, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
124	Capacity Utilitzation: Oil And Gas Extraction SIC=13, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
125	Capacity Utilitzation: Oil And Gas Well Drilling SIC=138, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
126	Capacity Utilitzation: Stone And Earth Minerals SIC=14, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
127	Capacity Utilitzation: Utilities, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
128	Capacity Utilitzation: Electric Utilities SIC=491493PT, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
129	Capacity Utilitzation: Gas Utilities SIC=492493PT, (% Capacity, SA)	Federal Reserve Board, G.17	MONTHLY	1
130	Consumer Installment Credit: Total Outstanding, (Bil. $, SA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
131	Consumer Installment Credit: Nonrevolving, (Bil. $, SA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
132	Consumer Installment Credit: Total, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
133	Consumer Installment Credit: CommercialBanks, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
134	Consumer Installment Credit: Finance Companies, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
135	Consumer Installment Credit: Credit Unions, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
136	Consumer Installment Credit: Savings Institutions, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
137	Consumer Installment Credit: Nonfinancial Business, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
138	Consumer Installment Credit: Nonrevolving, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
139	Nonrevolving Credit: Commercial Banks, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
140	Nonrevolving Credit: Finance Companies, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
141	Nonrevolving Credit: Credit Unions, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
142	Nonrevolving Credit: Savings Institutions, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
143	Nonrevolving Credit: Nonfinancial Business, (Bil. $, NSA)	Federal Reserve Board: Consumer Installment Credit	MONTHLY	3
144	CPI: Urban Consumer - All items, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
145	CPI: Urban Consumer - Food and beverages, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
146	CPI: Urban Consumer - Food, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
147	CPI: Urban Consumer - Food at home, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
148	CPI: Urban Consumer - Meats, poultry, fish, and eggs, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
149	CPI: Urban Consumer - Fruits and vegetables, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
150	CPI: Urban Consumer - Nonalcoholic beverages and beverage materials, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
151	CPI: Urban Consumer - Other food at home, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
152	CPI: Urban Consumer - Food away from home, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
153	CPI: Urban Consumer - Alcoholic beverages, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
154	CPI: Urban Consumer - Housing, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
155	CPI: Urban Consumer - Shelter, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
156	CPI: Urban Consumer - Fuels and utilities, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
157	CPI: Urban Consumer - Fuels, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
158	CPI: Urban Consumer - Fuel oil and other fuels, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
159	CPI: Urban Consumer - Gas (piped) and electricity, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
160	CPI: Urban Consumer - Household furnishings and operations, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
161	CPI: Urban Consumer - Apparel, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
162	CPI: Urban Consumer - Men's and boys' apparel, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
163	CPI: Urban Consumer - Women's and girls' apparel, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
164	CPI: Urban Consumer - Footwear, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
165	CPI: Urban Consumer - Transportation, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
166	CPI: Urban Consumer - Private transportation, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
167	CPI: Urban Consumer - New vehicles, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
168	CPI: Urban Consumer - Used cars and trucks, (1982-84=100, SA)	BLS: CPI; Data from 1993 to present is NSA	MONTHLY	4
169	CPI: Urban Consumer - Motor fuel, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
170	CPI: Urban Consumer - Gasoline (all types), (1982-84=100, SA)	BLS: CPI	MONTHLY	4
171	CPI: Urban Consumer - Motor vehicle maintenance and repair, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
172	CPI: Urban Consumer - Medical care, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
173	CPI: Urban Consumer - Medical care commodities, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
174	CPI: Urban Consumer - Medical care services, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
175	CPI: Urban Consumer - Educational books and supplies, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
176	CPI: Urban Consumer - Other goods and services, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
177	CPI: Urban Consumer - Food and beverages, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
178	CPI: Urban Consumer - Commodities less food and beverages, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
179	CPI: Urban Consumer - Apparel, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
180	CPI: Urban Consumer - Durables, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
181	CPI: Urban Consumer - Commodities, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
182	CPI: Urban Consumer - Services, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
183	CPI: Urban Consumer - Gas (piped) and electricity, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
184	CPI: Urban Consumer - Transportation services, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
185	CPI: Urban Consumer - Medical care services, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
186	CPI: Urban Consumer - Other services, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
187	CPI: Urban Consumer - All items less food, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
188	CPI: Urban Consumer - All items less shelter, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
189	CPI: Urban Consumer - All items less medical care, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
190	CPI: Urban Consumer - Commodities less food, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
191	CPI: Urban Consumer - Nondurables, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
192	CPI: Urban Consumer - Energy, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
193	CPI: Urban Consumer - All items less energy, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
194	CPI: Urban Consumer - All items less food and energy, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
195	CPI: Urban Consumer - Commodities less food and energy commodities, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
196	CPI: Urban Consumer - Energy commodities, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
197	CPI: Urban Consumer - Services less energy services, (1982-84=100, SA)	BLS: CPI	MONTHLY	4
198	Employment: Total Non-Agricultural, (Ths., SA)	BLS: Form 790	MONTHLY	3
199	Employment: Total private, (Ths., SA)	BLS: Form 790	MONTHLY	3
200	Employment: Goods-producing, (Ths., SA)	BLS: Form 790	MONTHLY	3
201	Employment: Mining, (Ths., SA)	BLS: Form 790	MONTHLY	3
202	Employment: Metal mining, (Ths., SA)	BLS: Form 790	MONTHLY	3
203	Employment: Coal mining, (Ths., SA)	BLS: Form 790	MONTHLY	3
204	Employment: Nonmetallic minerals except fuels, (Ths., SA)	BLS: Form 790	MONTHLY	3
205	Employment: Construction, (Ths., SA)	BLS: Form 790	MONTHLY	3
206	Employment: General building contractors, (Ths., SA)	BLS: Form 790	MONTHLY	3
207	Employment: Manufacturing, (Ths., SA)	BLS: Form 790	MONTHLY	3
208	Employment: Durable goods, (Ths., SA)	BLS: Form 790	MONTHLY	3
209	Employment: Food and kindred products, (Ths., SA)	BLS: Form 790	MONTHLY	3
210	Employment: Tobacco products, (Ths., SA)	BLS: Form 790	MONTHLY	3
211	Employment: Textile mill products, (Ths., SA)	BLS: Form 790	MONTHLY	3
212	Employment: Apparel and other textile products, (Ths., SA)	BLS: Form 790	MONTHLY	3
213	Employment: Lumber and wood products, (Ths., SA)	BLS: Form 790	MONTHLY	3
214	Employment: Furniture and fixtures, (Ths., SA)	BLS: Form 790	MONTHLY	3
215	Employment: Paper and allied products, (Ths., SA)	BLS: Form 790	MONTHLY	3
216	Employment: Petroleum and coal products, (Ths., SA)	BLS: Form 790	MONTHLY	3
217	Employment: Printing and publishing, (Ths., SA)	BLS: Form 790	MONTHLY	3
218	Employment: Chemicals and allied products, (Ths., SA)	BLS: Form 790	MONTHLY	3
219	Employment: Rubber and miscellaneous plastics products, (Ths., SA)	BLS: Form 790	MONTHLY	3
220	Employment: Leather and leather products, (Ths., SA)	BLS: Form 790	MONTHLY	3
221	Employment: Stone clay and glass products, (Ths., SA)	BLS: Form 790	MONTHLY	3
222	Employment: Primary metal industries, (Ths., SA)	BLS: Form 790	MONTHLY	3
223	Employment: Fabricated metal products, (Ths., SA)	BLS: Form 790	MONTHLY	3
224	Employment: Industrial machinery and equipment, (Ths., SA)	BLS: Form 790	MONTHLY	3
225	Employment: Computer and office equipment, (Ths., SA)	BLS: Form 790	MONTHLY	3
226	Employment: Electronic and other electrical equipment, (Ths., SA)	BLS: Form 790	MONTHLY	3
227	Employment: Electronic components and accessories, (Ths., SA)	BLS: Form 790	MONTHLY	3
228	Employment: Transportation equipment, (Ths., SA)	BLS: Form 790	MONTHLY	3
229	Employment: Motor vehicles and equipment, (Ths., SA)	BLS: Form 790	MONTHLY	3
230	Employment: Aircraft and parts, (Ths., SA)	BLS: Form 790	MONTHLY	3
231	Employment: Instruments and related products, (Ths., SA)	BLS: Form 790	MONTHLY	3
232	Employment: Miscellaneous manufacturing industries, (Ths., SA)	BLS: Form 790	MONTHLY	3
233	Employment: Transportation and public utilities, (Ths., SA)	BLS: Form 790	MONTHLY	3
234	Employment: Transportation, (Ths., SA)	BLS: Form 790	MONTHLY	3
235	Employment: Railroad transportation, (Ths., SA)	BLS: Form 790	MONTHLY	3
236	Employment: Local and interurban passenger transit, (Ths., SA)	BLS: Form 790	MONTHLY	3
237	Employment: Communications, (Ths., SA)	BLS: Form 790	MONTHLY	3
238	Employment: Electric gas and sanitary services, (Ths., SA)	BLS: Form 790	MONTHLY	3
239	Employment: Wholesale and retail trade, (Ths., SA)	BLS: Form 790	MONTHLY	3
240	Employment: Wholesale trade, (Ths., SA)	BLS: Form 790	MONTHLY	3
241	Employment: Retail trade, (Ths., SA)	BLS: Form 790	MONTHLY	3
242	Employment: Department stores, (Ths., SA)	BLS: Form 790	MONTHLY	3
243	Employment: Food stores, (Ths., SA)	BLS: Form 790	MONTHLY	3
244	Employment: Automotive dealers and service stations, (Ths., SA)	BLS: Form 790	MONTHLY	3
245	Employment: Apparel and accessory stores, (Ths., SA)	BLS: Form 790	MONTHLY	3
246	Employment: Furniture and home furnishings stores, (Ths., SA)	BLS: Form 790	MONTHLY	3
247	Employment: Eating and drinking places, (Ths., SA)	BLS: Form 790	MONTHLY	3
248	Employment: Finance insurance and real estate, (Ths., SA)	BLS: Form 790	MONTHLY	3
249	Employment: Security and commodity brokers, (Ths., SA)	BLS: Form 790	MONTHLY	3
250	Employment: Insurance carriers, (Ths., SA)	BLS: Form 790	MONTHLY	3
251	Employment: Services, (Ths., SA)	BLS: Form 790	MONTHLY	3
252	Employment: Personal services, (Ths., SA)	BLS: Form 790	MONTHLY	3
253	Employment: Business services, (Ths., SA)	BLS: Form 790	MONTHLY	3
254	Employment: Services to buildings, (Ths., SA)	BLS: Form 790	MONTHLY	3
255	Employment: Miscellaneous repair services, (Ths., SA)	BLS: Form 790	MONTHLY	3

256 Employment: Health services, (Ths., SA)	BLS: Form 790	MONTHLY	3
257 Employment: Hospitals, (Ths., SA)	BLS: Form 790	MONTHLY	3
258 Employment: Educational services, (Ths., SA)	BLS: Form 790	MONTHLY	3
259 Employment: Engineering and architectural services, (Ths., SA)	BLS: Form 790	MONTHLY	3
260 Employment: Government, (Ths., SA)	BLS: Form 790	MONTHLY	3
261 Foreign Exchange Rate: Germany, (Deutsche Mark Per U.S.$)	FRB: Exchange Rates G.5 (405)	MONTHLY	3
262 Foreign Exchange Rate: Japan, (Yen Per U.S.$)	FRB: Exchange Rates G.5 (405)	MONTHLY	3
263 Avg. Hrly Earnings: Total private, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
264 Avg. Hrly Earnings: Goods-producing, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
265 Avg. Hrly Earnings: Mining, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
266 Avg. Hrly Earnings: Construction, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
267 Avg. Hrly Earnings: Manufacturing, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
268 Avg. Hrly Earnings X-Overtime: Manufacturing, (Index, SA)	BLS: Form 790	MONTHLY	3
269 Avg. Hrly Earnings: Private service-producing, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
270 Avg. Hrly Earnings: Transportation and public utilities, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
271 Avg. Hrly Earnings: Wholesale and retail trade, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
272 Avg. Hrly Earnings: Wholesale trade, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
273 Avg. Hrly Earnings: Retail trade, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
274 Avg. Hrly Earnings: Finance insurance and real estate, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
275 Avg. Hrly Earnings: Services, ($ Per Hrs., SA)	BLS: Form 790	MONTHLY	3
276 Housing Starts: Total privately owned, (Ths., SAAR)	Bureau of Census: Housing Starts and Building Permits C20	MONTHLY	1
277 Total Authorized Building Permits, (SAAR, Ths.)	Bureau of Census: Housing Starts C20	MONTHLY	1
278 New Home Sales: New single-family houses sold, (Ths., SAAR)	Bureau of Census: New Houses Sold C25	MONTHLY	1
279 New Home Sales: Single-Family Houses for Sale, (Ths., SA)	Bureau of Census: New Houses Sold C25	MONTHLY	1
280 Construction put in place: Total, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
281 Construction put in place: Private - Total, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
282 Construction put in place: Private residential - Total, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
283 Construction put in place: Private residential - New housing units, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
284 Construction put in place: Private residential - New housing 1 unit, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
285 Construction put in place: Private residential - New housing 2 units or more, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
286 Construction put in place: Private nonresidential - Total, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
287 Construction put in place: Private nonresidential - Industrial, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
288 Construction put in place: Private nonresidential - Other commercial, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
289 Construction put in place: Private nonresidential - Hotels and motels, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
290 Construction put in place: Private nonresidential - Religious, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
291 Construction put in place: Private nonresidential - Educational, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
292 Construction put in place: Private nonresidential - Hospital, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
293 Construction put in place: Private nonresidential - Miscellaneous, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
294 Construction put in place: Private public utilities - Telecommunications, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
295 Construction put in place: Private - Other, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
296 Construction put in place: Public - Total, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
297 Construction put in place: Public buildings - Total, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
298 Construction put in place: Public buildings - Housing and redevelopment, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
299 Construction put in place: Public buildings - Industrial, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
300 Construction put in place: Public buildings - Educational, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
301 Construction put in place: Public buildings - Hospital, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
302 Construction put in place: Public buildings - Other, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
303 Construction put in place: Public - Highways and streets, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 5b	MONTHLY	1
304 Construction Put in Place: Public Construction - State and local - Conservation and Development, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
305 Construction Put in Place: Public Construction - State and local - Sewer Systems, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
306 Construction Put in Place: Public Construction - State and local - Water supply facilities, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
307 Construction Put in Place: Public Construction - State and local - Miscellaneous Non-building, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
308 Construction Put in Place: Public Construction - Federal - Total, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
309 Construction Put in Place: Public Construction - Federal Buildings, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
310 Construction Put in Place: Public Construction - Federal Buildings - Housing, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
311 Construction Put in Place: Public Construction - Federal Buildings - Industrial, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
312 Construction Put in Place: Public Construction - Federal Buildings - Educational, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
313 Construction Put in Place: Public Construction - Federal Buildings - Hospital, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
314 Construction Put in Place: Public Construction - Federal Buildings - Other, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
315 Construction Put in Place: Public Construction - Federal - Military Facilities, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
316 Construction Put in Place: Public Construction - Federal - Conservation and Development, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
317 Construction Put in Place: Public Construction - Federal - Miscellaneous Non-building, (Bil. 96$, SAAR)	Bureau of Census: Construction Put in Place (C30) - Table 9b	MONTHLY	1
318 LIBOR Rates: 1-Month US Dollar Deposits, (%, NSA)	Daily Press; Change in source at Jan1998	MONTHLY	1
319 LIBOR Rates: 3-Month US Dollar Deposits, (%, NSA)	Daily Press; Change in source at Jan1998	MONTHLY	1
320 LIBOR Rates: 6-Month US Dollar Deposits, (%, NSA)	Daily Press; Change in source at Jan1998	MONTHLY	1
321 Interest Rates: Federal Funds Rate, (%,P.A.)	Federal Reserve Board: H15	MONTHLY	1
322 Interest Rates: CDs secondary Market -1 Month, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
323 Interest Rates: CDs secondary Market -3 Month, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
324 Interest Rates: CDs secondary Market -6 Month, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
325 Interest Rates: Eurodollar Deposits ; London - 1 Month, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
326 Interest Rates: Eurodollar Deposits ; London - 3 Month, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
327 Interest Rates: Eurodollar Deposits ; London - 6 Month, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
328 Interest Rates: Bank Prime Rate, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
329 Interest Rates: Discount Window Borrowing, (% p.a.)	Federal Reserve Board: H15	MONTHLY	1
330 Interest Rates: 3-Month T-Bill AuctionAverage, (%)	Federal Reserve Board: H15; Bureau of Public Debt	MONTHLY	1
331 Interest Rates: 6-Month T-Bill AuctionAverage, (%)	Federal Reserve Board: H15; Bureau of Public Debt	MONTHLY	1
332 Interest Rates: 3-Month Treasury Bills - Secondary Market, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
333 Interest Rates: 6-Month Treasury Bills - Secondary Market, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
334 Interest Rates: 12-Month Treasury Bills - Secondary Market, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
335 Interest Rates: 1-Year Constant Maturity Securities, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
336 Interest Rates: 3-Year Constant Maturity Securities, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
337 Interest Rates: 5-Year Constant Maturity Securities, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
338 Interest Rates: 10-Year Constant Maturity Securities, (% P.A.)	Federal Reserve Board: H15	MONTHLY	1
339 Bond Buyer Index: General Obligation 20-Years to Maturity, (%)	Federal Reserve Board: H15	MONTHLY	1
340 Interest Rates: Moodys AAA Seasoned, (%)	Federal Reserve Board: H15	MONTHLY	1
341 Interest Rates: Moodys BAA Seasoned, (%)	Federal Reserve Board: H15	MONTHLY	1
342 Industrial Production: Total Index, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
343 Industrial Production: Manufacturing, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
344 Industrial Production: Primary Processing, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
345 Industrial Production: Advanced Processing, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
346 Industrial Production: Durable Manufacturing, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
347 Industrial Production: Lumber And Products SIC=24, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
348 Industrial Production: Furniture And Fixtures SIC=25, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
349 Industrial Production: Stone Clay And Glass Products SIC=32, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
350 Industrial Production: Primary Metals SIC=33, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
351 Industrial Production: Iron And Steel SIC=3312, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
352 Industrial Production: Raw Steel SIC=331PT, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
353 Industrial Production: Nonferrous Metals SIC=333-69, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
354 Industrial Production: Fabricated Metal Products SIC=34, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
355 Industrial Production: Industrial Machinery And Equipment SIC=35, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
356 Industrial Production: Computer And Office Equipment SIC=357, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
357 Industrial Production: Electrical Machinery SIC=36, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
358 Industrial Production: Transportation Equipment SIC=37, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
359 Industrial Production: Motor Vehicles And Parts SIC=371, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
360 Industrial Production: Aerospace And Misc. Transp. Equipment SIC=372-69, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
361 Industrial Production: Instruments SIC=38, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
362 Industrial Production: Miscellaneous Manufactures SIC=39, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
363 Industrial Production: Nondurable Manufacturing, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
364 Industrial Production: Foods SIC=20, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
365 Industrial Production: Tobacco Products SIC=21, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
366 Industrial Production: Textile Mill Products SIC=22, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
367 Industrial Production: Apparel Products SIC=23, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
368 Industrial Production: Paper And Products SIC=26, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
369 Industrial Production: Printing And Publishing SIC=27, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
370 Industrial Production: Chemicals And Products SIC=28, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
371 Industrial Production: Petroleum Products SIC=29, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
372 Industrial Production: Rubber And Plastics Products SIC=30, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
373 Industrial Production: Leather And Products SIC=31, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
374 Industrial Production: Mining, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
375 Industrial Production: Metal Mining SIC=10, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
376 Industrial Production: Coal Mining SIC=12, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
377 Industrial Production: Oil And Gas Extraction SIC=13, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
378 Industrial Production: Stone And Earth Minerals SIC=14, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
379 Industrial Production: Utilities, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
380 Industrial Production: Electric Utilities SIC=491493PT, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
381 Industrial Production: Gas Utilities SIC=492493PT, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
382 Industrial Production: Manufacturing Ex. Motor Vehicles And Parts, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
383 Industrial Production: Manufacturing Ex. Computer And Office Equipment, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
384 Industrial production: Total X-Computers and semiconducters, (Index 1992=100, SA.US)	Federal Reserve BOG: Industrial Production	MONTHLY	3
385 Industrial Production: Total Motor Vehicle Assemblies, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
386 Industrial Production: Auto Assemblies, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
387 Industrial Production: Total Truck Assemblies, (Index 1992=100, SA)	Federal Reserve Board, G.17	MONTHLY	3
388 Reserves: Total reserves adjusted for changes in reserve requirements, (Mil. $, SA)	FRB: Aggregate Reserves of Depository Institutions - H.3	MONTHLY	3
389 Reserves: Nonborrowed reserves adjusted for changes in reserve requirements, (Mil. $, SA)	FRB: Aggregate Reserves of Depository Institutions - H.3	MONTHLY	3
390 Reserves: Nonborrowed reserves plus Extended Credit adjusted for changes in reserve requirements, (Mil. $, SA)	FRB: Aggregate Reserves of Depository Institutions - H.3	MONTHLY	3
391 Reserves: Required reserves adjusted for changes in reserve requirements, (Mil. $, SA)	FRB: Aggregate Reserves of Depository Institutions - H.3	MONTHLY	3
392 Reserves: Excess reserves adjusted for changes in reserve requirements, (Mil. $, NSA)	FRB: Aggregate Reserves of Depository Institutions - H.3	MONTHLY	3
393 Reserves: Monetary base adjusted for changes in reserve requirements, (Mil. $, SA)	FRB: Aggregate Reserves of Depository Institutions - H.3	MONTHLY	3
394 Money Stock; M1, (SA Billions $)	Federal Reserve: H.6 Money Stock and Liquid Assets, and Debt Measures	MONTHLY	3
395 Money Stock; M2, (SA Billions $)	Federal Reserve: H.6 Money Stock and Liquid Assets, and Debt Measures	MONTHLY	3
396 Money Stock; M3, (SA Billions $)	Federal Reserve: H.6 Money Stock and Liquid Assets, and Debt Measures	MONTHLY	3

397	Money Stock: Overnight and Term Eurodollars, (SA Billions $)	Federal Reserve: H.6 Money Stock and Liquid Assets, and Debt Measures	MONTHLY	3
398	Money stock: Debt of domestic non-financial sectors, (Bil. $, SA)	Federal Reserve: H.6 Money Stock and Liquid Assets, and Debt Measures	MONTHLY	3
399	Money stock: Federal debt, (Bil. $, NSA)	Federal Reserve: H.6 Money Stock and Liquid Assets, and Debt Measures	MONTHLY	3
400	Money stock: Nonfederal debt, (Bil. $, SA)	Federal Reserve: H.6 Money Stock and Liquid Assets, and Debt Measures	MONTHLY	3
401	PPI: Finished goods, (1982=100, SA)	BLS: PPI	MONTHLY	4
402	PPI: Finished consumer goods, (1982=100, SA)	BLS: PPI	MONTHLY	4
403	PPI: Finished consumer foods, (1982=100, SA)	BLS: PPI	MONTHLY	4
404	PPI: Finished consumer goods excluding foods, (1982=100, SA)	BLS: PPI	MONTHLY	4
405	PPI: Consumer nondurable goods less food, (1982=100, SA)	BLS: PPI	MONTHLY	4
406	PPI: Consumer durable goods, (1982=100, SA)	BLS: PPI	MONTHLY	4
407	PPI: Capital equipment, (1982=100, SA)	BLS: PPI	MONTHLY	4
408	PPI: Intermediate materials supplies and components, (1982=100, SA)	BLS: PPI	MONTHLY	4
409	PPI: Finished goods; excluding foods, (1982=100, SA)	BLS: PPI	MONTHLY	4
410	PPI: Intermediate materials less foods and feeds, (1982=100, SA)	BLS: PPI	MONTHLY	4
411	PPI: Intermediate foods and feeds, (1982=100, SA)	BLS: PPI	MONTHLY	4
412	PPI: Crude materials less agricultural products, (1982=100, SA)	BLS: PPI	MONTHLY	4
413	S&P Stock Price Index: 500 Composite, (Index 1941-43=10, Monthly Average)	Standard & Poors: Security Price Index Record	MONTHLY	3
414	S&P Composite Common Stock: Dividend Yield, (%, NSA)	Standard & Poors: Security Price Index Record	MONTHLY	3
415	S&P Composite Common Stock: Price Earnings Ratio, (%, NSA)	Standard & Poors: Security Price Index Record	MONTHLY	3
416	Dow Jones Industrials: 30 Industries, (Index 1920=100, Monthly End)	Dow Jones Co.	MONTHLY	3
417	Household survey: Unemployment rate, (% SA)	Bureau of Labor Statistics: CPS Household Survey	MONTHLY	1
418	Household survey: Unemployment rate - 20 yrs. & over Male, (% SA)	Bureau of Labor Statistics: CPS Household Survey	MONTHLY	1
419	Household survey: Unemployment rate - 20 yrs. & over Female, (% SA)	Bureau of Labor Statistics: CPS Household Survey	MONTHLY	1
420	Household survey: Unemployment rate - 16-19 yrs., (% SA)	Bureau of Labor Statistics: CPS Household Survey	MONTHLY	1
421	Household survey: Unemployment rate - White, (% SA)	Bureau of Labor Statistics: CPS Household Survey	MONTHLY	1
422	Avg. Weekly Hours: Food and kindred products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
423	Avg. Weekly Hours: Tobacco products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
424	Avg. Weekly Hours: Blast furnaces and basic steel products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
425	Avg. Weekly Hours: Fabricated metal products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
426	Avg. Weekly Hours: Industrial machinery and equipment, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
427	Avg. Weekly Hours: Transportation equipment, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
428	Avg. Weekly Hours: Motor vehicles and equipment, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
429	Avg. Weekly Hours: Construction, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
430	Avg. Weekly Hours: Miscellaneous manufacturing industries, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
431	Avg. Weekly Hours: Goods-producing, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
432	Avg. Weekly Hours: Manufacturing, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
433	Avg. Weekly Hours: Durable goods, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
434	Avg. Weekly Hours: Nondurable goods, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
435	Avg. Weekly Hours: Mining, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
436	Avg. Weekly Hours: Private service-producing, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
437	Avg. Weekly Hours: Total private, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
438	Avg. Weekly Hours: Retail trade, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
439	Avg. Weekly Hours: Wholesale and retail trade, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
440	Avg. Weekly Hours: Transportation and public utilities, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
441	Avg. Weekly Hours: Services, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
442	Avg. Weekly Hours: Wholesale trade, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
443	Avg. Weekly Hours: Printing and publishing, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
444	Avg. Weekly Hours: Paper and allied products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
445	Avg. Weekly Hours: Textile mill products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
446	Avg. Weekly Hours: Lumber and wood products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
447	Avg. Weekly Hours: Chemicals and allied products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
448	Avg. Weekly Hours: Apparel and other textile products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
449	Avg. Weekly Hours: Furniture and fixtures, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
450	Avg. Weekly Hours: Rubber and miscellaneous plastics products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
451	Avg. Weekly Hours: Stone clay and glass products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
452	Avg. Weekly Hours: Leather and leather products, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
453	Avg. Weekly Hours: Primary metal industries, (# of Hrs., SA)	BLS: Form 790	MONTHLY	3
454	Hours per capita Manufacturing	BLS: Productivity & Costs	QUARTERLY	3
455	Output per capita Manufacturing	BLS: Productivity & Costs	QUARTERLY	3
456	Output Per Hour Manufacturing	BLS: Productivity & Costs	QUARTERLY	3
457	Hourly Compensation Manufacturing	BLS: Productivity & Costs	QUARTERLY	3
458	Real Hourly Compensation Manufacturing	BLS: Productivity & Costs	QUARTERLY	3
459	Hours per capita Manufacturing durable	BLS: Productivity & Costs	QUARTERLY	3
460	Output per capita Manufacturing durable	BLS: Productivity & Costs	QUARTERLY	3
461	Output Per Hour Manufacturing durable	BLS: Productivity & Costs	QUARTERLY	3
462	Hourly Compensation Manufacturing durable	BLS: Productivity & Costs	QUARTERLY	3
463	Real Hourly Compensation Manufacturing durable	BLS: Productivity & Costs	QUARTERLY	3
464	Hours per capita Manufacturing non durabble	BLS: Productivity & Costs	QUARTERLY	3
465	Output per capita Manufacturing non durabble	BLS: Productivity & Costs	QUARTERLY	3
466	Output Per Hour Manufacturing non durabble	BLS: Productivity & Costs	QUARTERLY	3
467	Hourly Compensation Manufacturing non durabble	BLS: Productivity & Costs	QUARTERLY	3
468	Real Hourly Compensation Manufacturing non durabble	BLS: Productivity & Costs	QUARTERLY	3
469	Hours per capita Nonfarm Business	BLS: Productivity & Costs	QUARTERLY	3
470	Output per capita Nonfarm Business	BLS: Productivity & Costs	QUARTERLY	3
471	Output Per Hour Nonfarm Business	BLS: Productivity & Costs	QUARTERLY	3
472	Hourly Compensation Nonfarm Business	BLS: Productivity & Costs	QUARTERLY	3
473	Real Hourly Compensation Nonfarm Business	BLS: Productivity & Costs	QUARTERLY	3
474	Implicit Price Deflator Nonfarm Business	BLS: Productivity & Costs	QUARTERLY	3
475	relative prices durables	BLS: CPI	MONTHLY	3
476	relative price commodities	BLS: CPI	MONTHLY	3
477	relative price services	BLS: CPI	MONTHLY	3
478	relative price nondurables	BLS: CPI	MONTHLY	3
479	output gap %	Our computations from Federal Reserve of Saint-Louis potential output	QUARTERLY	0