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Measuring the Channels of Monetary Policy Transmission: A Factor-Augmented Vector Autoregressive (Favar) Approach

Abstract: There is more consensus on the effects of monetary policy than its transmission mechanism. Two channels of transmission mechanisms are the conventional interest rate channel and the credit channel. I investigate the channels of monetary policy transmission in the U.S. using the factor-augmented vector autoregressive (FAVAR) models developed by Bernanke, Boivin & Eliasz (2005). The newly developed FAVAR approach allows the researcher to include all relevant macroeconomic variables in the model and analyze them. Therefore, the FAVAR models span a larger information set and generate better estimates of impulse response functions than the commonly used vector autoregressive (VAR) models that utilize only 4–8 variables. I include 154 monthly U.S. time series variables for the period 1970–2014. The findings support the existence of the credit channel in the U.S. The conclusion remains the same when the nonborrowed reserve operating regime (October 1979–October 1982) is removed from the sample period.

Keywords: Monetary policy, Credit channel, Interest rate channel, Dynamic factors, VAR, FAVAR, Impulse response functions

JEL Classification: E52, E58, C32, C43

I. Introduction

There is more consensus on the effects of monetary policy than its transmission mechanism. Specifically, the debate continues on whether the monetary policy operates mainly through the traditional interest rate channel (money view) or the credit channel (credit view) or both (Bernanke, 1988, 1993; Bernanke and Blinder, 1992; Kashyap, Stein & Wilcox, 1993, 1996; Oliner and Rudebusch, 1996; McMillin, 1996; Mishkin, 1996; Kashyap and Stein, 2000; Els, Locarno, Mojon & Morgan, 2003; and Hosono, 2006, to cite a few). I investigate the issue using the factor-augmented vector autoregressive (FAVAR) models developed by Bernanke et al. (2005).

The traditional interest rate channel works as follows. In response to a tight monetary policy, the real interest rate increases, which in turn increases the cost of capital. This leads to a decline in investment, thereby reducing aggregate demand. All these will lead to a decline in output (Bernanke, 1988; Mishkin, 1996). Mishkin (1996) further argues that the above channel of transmission could equally affect consumers' decisions about durables and housing expenditures in a similar manner as it affects firms' decisions about investment.

On the other hand, the credit view emphasizes the existence of asymmetric information in financial markets and how banks are well suited in solving this problem. Banks have special roles in the financial markets because they bring borrowers and lenders together at a relatively low transaction cost (Bernanke, 1988). Certain borrowers, mainly small firms, do not have access to the credit market other than borrowing from banks. Therefore, banks' lending decisions could greatly affect investment decisions of these firms. Given this background, the credit channel of monetary transmission is given as follows. Following a contractionary monetary policy, bank reserves and deposits decline. Banks reduce the supply of loans. The reduction in loans will cause investment (and possible consumer) spending to fall (Bernanke, 1988). One implication of this argument is that small firms, which are mainly dependent on bank loans, are affected the most compared to large firms that can directly access the credit market by issuing stocks and bonds. The fall in investment due to reduction in the bank loans supply is in addition to the fall of investment described by the money view (Bernanke, 1988; Kashyap et al., 1993).

A typical paper that investigates the transmission mechanisms of monetary policy utilizes a vector autoregressive (VAR) approach, or a single equation model, to study the behavior of impulse responses of unemployment (or industrial production) and bank loans to a shock in monetary policy measures. For example, the VAR model used by McMillin (1996) includes unemployment rate as a measure of economic activity, bank loans, deposits, bank security holdings, commercial paper of nonfinancial corporations, the spread between the prime rate on bank loans and the commercial paper rate, and the federal funds rate. He analyzes the way these variables react to a shock in the federal funds rate.

The standard VAR approach suffers from a sparse information set due to the limited number of variables included in the model. VAR models and single equation models, used for the analysis of transmission mechanisms, also impose an assumption that economic activity can be captured by unemployment, industrial production, or GDP. These basic limitations could be overcome by recent development in econometric techniques, namely, the FAVAR approach.

This study investigates the existence of the credit channel in the United States based on the FAVAR model. This will be an improvement over previous studies similar to those mentioned above. The study makes two contributions. First, I include more than 150 variables in my model because the factor analysis takes care of the problems arising due to degrees-of-freedom. This will expand the information set of the model and approximate the information sets of policymakers. The expanded information set produces more reliable impulse response functions (Bernanke et al., 2005). Second, I treat "economic activity" as an unobserved variable to be determined by a number of observable macroeconomic time series (such as capacity utilization, inventories, sales, housing starts, average hours of weekly production, real consumption, employment, and so on) in addition to unemployment and industrial production. Furthermore, in addition to aggregate bank loans, which are employed by many past studies, I disaggregate bank loans into commercial and industrial loans, consumer (individual) loans, and real estate loans as they could react differently to policy changes. Overall, the result of this study gives a wide picture on the policy transmission mechanisms.

This study analyzes 154 United States monthly variables between 1970 and 2014. The findings support the existence of the credit channel in the United States for the sample period. Specifically, in response to tight monetary policy, aggregate bank loans, as well as bank loans disaggregated into commercial and industrial loans, real estate loans, and consumer (individual) loans decline while commercial paper issued by nonfinancial firms increases. In addition, savings and checking deposits decline following tight monetary policy. Banks respond to a decrease in the deposits first by reducing in securities and later by decreasing loans. The results are stable when the nonborrowed reserve operating regime (October 1979–October 1982) or the Great Recession (December 2007–June 2009) is removed from the sample period.

II. Review of Related Studies

Many studies, including Bernanke (1988, 1993), Bernanke and Blinder (1992), Kashyap et al. (1993), Cecchetti (1995), McMillin (1996), Bernanke and Gertler

(1995), Hubbard (1995), Kashyap and Stein (2000), Mihov (2001), Ramlogan (2004), and Hosono (2006), Jimborean (2009), Adrian and Shin (2009), Sun, Gan & Hu (2010) find evidence of the credit channel of monetary policy transmission. Other studies, such as Taylor (1995), Oliner and Rudebusch (1995), Morries and Sellon (1995), Favero, Giavazzi & Flabbi (1999), and Den Haan, Sumner & Yamashiro (2007), Elbourne and de Haan (2006), Jayaraman and Choong (2009) do not find strong evidence of a credit channel for the United States and other countries.

Bernanke (1988) lays down the theoretical framework as to why we should carefully consider a monetary policy transmission mechanism that he calls the "credit view," in addition to the standard interest rate channel called the "money view."

The conventional channel of monetary policy transmission works mainly through the interest rate's impact on the cost-of-capital. A contractionary monetary policy drains reserves from the banking system. The money supply declines. This, in turn, pushes the interest rate up. The higher interest rate discourages firms from making investments. It also discourages households from spending on housing and other consumer durables. This low spending will reduce the economic activity. Similarly, expansionary monetary policy does the reverse (Bernanke, 1988).

However, Bernanke warns that the conventional transmission mechanism considers only the liability side of the banking system and that it is only part of the story in the monetary policy transmission mechanism. Banks make loans, and their willingness and ability to extend loans to different types of customers has its own independent impact on the aggregate economic activity. Bank loans are not perfect substitutes for other forms of financing, such as commercial paper and bonds. Furthermore, not all firms have the same access to the credit market (Bernanke, 1988; Kashyap et al., 1993; McMillin, 1996). Large firms have the option of issuing commercial paper or borrowing from banks, while small firms' finances are entirely dependent on bank loans. Monetary policy alters the portfolio of banks (the mix of securities held by banks and loans). The banks' decisions to reduce the bank loans in their portfolios will have an effect on the aggregate economy independent of the policy's impact on interest rates or the money supply. This results in output and investment falling by more than can be accounted for by the conventional interest rate channel (Bernanke, 1988; Bernanke and Blinder, 1988, 1992; Kashyap et al., 1993; McMillin, 1996).

Bernanke and Blinder (1992) investigate the existence of credit channel using a VAR model for the period 1959:01–1978:12. They estimate three different VAR models, each including the federal funds rate as a measure of policy instrument, the unemployment rate as a measure of economic activity, the CPI, and one of the three balance sheet variables: deposits, securities, and loans. They display the impulse response functions of the four variables to a contractionary monetary policy shock (a positive innovation in the federal funds rate).

Deposits, securities, and loans decline in response to contractionary monetary policy, while the unemployment rate increases. Bernanke and Blinder (1992) pay special attention to the timing and pattern of the response of these variables to a monetary policy shock to describe the credit channel of monetary policy transmission. Following a contractionary monetary policy, deposits and securities fall immediately while loans fall gradually. Bernanke and Blinder interpret this result as follows. Banks react to a decline in deposits by selling off their securities in the immediate short run because loans are quasi-contractual in nature and take some time to change. Securities holdings reach their lowest point in about three quarters and start turning back when the loans start to decline. In about two years, the entire decline in deposits is absorbed by a decline in loans while securities return to their original value. The timing of unemployment response corresponds with the timing of loans' response to tight monetary policy. Unemployment starts to rise at about the time loans start to decline, which is about three quarters after the initial shock on the federal funds rate. The response of unemployment reaches the maximum in about two years before returning to zero. Similarly, loans reach their minimum point in about two years, after the policy shock, before turning back to the original value. Bernanke and Blinder argue that this is consistent with the credit view. They conclude that the lending channel is an important monetary policy transmission mechanism.

However, as Bernanke and Blinder (1992) also recognize, one can argue that the direction of causality should not necessarily move from loans to unemployment. Such reactions could equally be described as a response of loans to the economic decline–an argument that fits the money view. In other words, the decline in loans could be due to the fall in demand for loans, instead of the fall in the supply of loans.

Kashyap et al. (1993) investigate the existence of the credit channel by solving the potential identification problem of Bernanke and Blinder's (1992) approach. Kashyap et al. attempt to identify 1) if there is a decline in bank loans as a response to tight monetary policy, and 2) if the decline is coming from the supply or the demand side. In addition, they also investigate the impact of loans on the level of investment and output.

Kashyap et al. (1993) focus on the behavior of the volume of commercial paper issued by nonfinancial firms as a response to tight monetary policy in order to determine whether there is a decline in demand for loans or in the supply for loans in the economy. They also study the spread between the prime loan rate and the commercial paper rate so that they will have information from interest rate as well as the quantity movements. They argue that studying the behavior of commercial paper will solve the problem for the following reasons. Suppose that the monetary policy works entirely through the traditional interest rate channel. A decline in bank loans following contractionary monetary policy would simply be a decline in demand for loans due to higher interest rates. It follows that the demand for nonbank credit, like the commercial paper, should also decline. However, if tight monetary policy reduces the supply of bank loans, we expect that firms with access to the credit market (like commercial paper) would substitute bank loans for commercial paper. This would lead to a surge in the volume of nonfinancial commercial paper following a contractionary monetary policy (Kashyap et al., 1993). They show that the commercial paper significantly increases in response to contractionary monetary policy while loans decline. This finding supports the existence of the credit channel by solving the identification problem of Bernanke and Blinder (1992).

McMillin (1996) investigates the existence of the credit channel over the period of 1973:1–1994:11 using VAR models. Specifically, McMillin (1996) reexamines the findings of Bernanke and Blinder (1992) on whether a decline in loans following contractionary monetary policy is due to a decline in the loan supply–as the credit view argues or a decline in the loan demand–as the money view argues. For this, he introduces the volume of commercial paper and the spread between the prime rate on bank loans and the commercial paper rate as additional variables into the VAR models. He also tests the stability of the result over the sample period. Additionally, he uses two measures of policy instrument: the Federal funds rate and the nonborrowed reserves. His findings are consistent with the credit view or the bank lending channel. Specifically, in response to a contractionary monetary policy shock measured by positive innovations to the federal funds rate, deposits, loans, and securities decline while unemployment increases. The volume of commercial paper, as well as the spread between the prime rate and commercial paper rate, responds positively to the contractionary monetary policy. This is in line with the credit view supporting the argument that a fall in loans comes from the supply side and not from the demand side.

The sample period employed by McMillin (1996) spans different monetary policy operating regimes. During the periods prior to October 1979 and after October 1982, the federal funds rate was the policy instrument of the Fed. However, during the period between October 1979 and October 1982, the monetary policy instrument was shifted to nonborrowed reserves. McMillin tested the stability of his results during these monetary regimes and found instability over the period 1979–1982. He then estimated the model after excluding the data between 1979:10 and 1982:10. The response of unemployment, deposits, securities, commercial paper and the spread to contractionary monetary policy remain the same as before, although the magnitude of this response declined. However, the response of loans is strikingly different. Loans respond positively to contractionary monetary policy. The response of loans remains above zero for about a year before becoming insignificant. Therefore, when the data of nonborrowed reserve operating regime is removed from the sample, the credit view does not hold. After investigating the loan series, McMillin found that the real values of loans declined sharply around the end of 1979 and remained around this lower level until the end of 1982. He argued that the entire findings of decline of loans following contractionary monetary policy, and hence the credit view, could be dictated by this single episode.

Kashyap and Stein (2000) investigate the transmission mechanism of monetary policy by analyzing microeconomic data on all insured U.S. commercial banks between 1976Q1 and 1993Q2 (about a million observations). Their objective is to study how tight monetary policy affects the lending behavior of the banking system at individual (disaggregate) level instead of dealing with aggregate lending data. The pattern of the data shows that small banks tend to hold more securities and make fewer loans compared to large banks. This is because it is more difficult for small banks to raise external finance, especially in the form of unsecured borrowing. The data show that only the largest 2% of banks make extensive use of the federal funds market as a means of external financing. It follows that small banks need a secure portfolio to shield themselves from unforeseen circumstances (such as tight monetary policy).

Kashyap and Stein's (2000) findings show that contractionary monetary policy leads to a significant cut in lending of smaller banks (banks below the 95th percentile based on size). Small banks cannot shield their loans portfolio without a severe reduction in security holdings. However, larger banks are better suited to respond to unforeseen hardships (such as tight policy) and protect loan portfolios by drawing down their large stock of securities. Tight monetary policy prompts small banks (which cover about 25% of total loan supply) to cut their loan supplies. However, the loan supply of larger banks does not significantly decline in response to tight monetary policy. Overall, Kashyap and Stein's (2000) findings provide evidence for the existence of the credit channel in the United States in the period 1976–1993.

2.1 Problems with Existing Models

Most of the literature surveyed above base their analyses on the impulse response functions obtained from VAR models or use a single equation models. The VAR models, despite their popularity, suffer from major limitations. The information sets utilized by VAR models or single equation models are very small. This makes it difficult for these models to capture the information set of policymakers.

This will bring at least three problems according to Bernanke et al. (2005). First, if the information sets captured by the VAR models fail to capture the information sets of policymakers, the presumed policy shocks as well as other responses may be contaminated. This is because we utilize about four to eight variables in the VAR setup while policymakers follow literally hundreds if not thousands of variables, which makes the VAR models suffer from omitted variable bias (Bernanke et al., 2005; Stock and Watson, 2005).

Second, with the standard VAR or single equation models, one has to take a stand on representing certain "theoretical constructs," like economic activity, by a single series (Bernanke et al., 2005). In this regard, economic activity is represented by industrial production, GDP, or unemployment by all of the studies surveyed above. However, the concept of economic activity may not be captured by a single variable. In such cases, it is better to treat concepts like economic activity as an unobservable variable determined by a number of time series variables. In order to understand the movement in economic activity we might need to look at capacity utilization, employment, sales, inventories, housing starts, consumption, consumer confidence, average weekly hours worked, and so on, in addition to the industrial production or unemployment (Bernanke et al., 2005).

Third, the impulse response functions of VAR models are observed only for the limited number of variables included in the model (Bernanke et al., 2005). It is always difficult to make an extensive study of the impact of a policy and draw reliable conclusions in such small-scale models.

As a solution to these problems, Bernanke et al. (2005) developed a factor-augmented vector autoregressive (FAVAR) model. The idea behind the FAVAR model is to expand the information set of the VAR models by incorporating hundreds of variables into the model without running into degrees-of-freedom problems. The FAVAR model has the following advantages. First, we have an information set that better represents the information set of policymakers. This makes the FAVAR models more reliable than the VAR models. Second, we can treat certain theoretical concepts, such as economic activity, credit conditions, and inflation, as unobservable variables to be determined by many observable time series variables. Third, with the FAVAR model, one can generate the impulse responses functions for all the hundreds of variables incorporated in the model. This gives an in-depth look at the impact of policy on the economy as well as the transition mechanisms.

III. The FAVAR Model

In a FAVAR model, information contained in a large data set is summarized by a few variables called factors, which are incorporated into a VAR model. In this way, we can expand the information set used in VAR models, and we can generate the response of hundreds of variables to monetary policy innovations. Based on Bernanke et al. (2005) and Senbet (2008, 2011) the FAVAR methodology is discussed in this section.

Let X_t be an $(N \times 1)$ vector of informational time series that contains many stationary time series variables. Let Y_t be an $(M \times 1)$ vector of observable stationary time series economic variables assumed to affect the dynamics of the economy. Y_t is a subset of X_t, and it might include policy variables as well as observable measures of real activity and prices. In most cases, estimation using standard VAR models uses only these observable measures summarized by four to eight variables. One of the problems of this standard approach is that Y_t cannot span the same information set as X_t.

Assume that most of the information set contained in X_t can be effectively summarized by a few unobserved $(K \times 1)$ vector of factors, F_t. According to Bernanke et al. (2005), "We might think of the unobserved factors as capturing fluctuations in unobserved potential output or reflecting theoretically motivated concepts such as 'economic activity,' 'price pressures,' or 'credit conditions' that cannot easily be represented by one or two series but rather are reflected in a wide range of economic variables" (p. 391).

The idea behind the factor models is that economy is driven by a few common forces or factors and idiosyncratic errors (Favero et al., 2005). Following Stock and Watson (2005) and Favero et al. (1999), the dynamic factor model expresses Y_t as a distributed lag of a small number of unobserved factors and idiosyncratic disturbances that are allowed to be serially correlated.

$$Y_t = \lambda(L)F_t + u_t \tag{1}$$

$$u_t = \delta(L)u_{t-1} + v_t \tag{2}$$

where F_t is a (K × 1) vector of unobserved dynamic factors,

$\lambda(L)$ is an (M × K) dynamic factor loadings, and v_t is white noise. Also assume that factors and disturbances are not correlated or $E(F_t u_s) = 0, \forall$ t, s.

From Equation (2),

$u_t = [I - \delta(L)L]^{-1} v_t$, and hence (1) becomes

$$Y_t = \Lambda(L)F_t + \delta(L)Y_{t-1} + v_t \tag{3}$$

where $\Lambda(L) = [I - \delta(L)L]\lambda(L)$.

Define the evolution of factors as

$$F_t = \Phi(L)F_{t-1} + \eta_t \tag{4}$$

where η_t is a (K × 1) disturbance vector.

Substituting (4) into (3) and rearranging

$$Y_t = \Lambda(L)\Phi(L)F_{t-1} + \delta(L)Y_{t-1} + \omega_t \tag{5}$$

where $\omega_t = \Lambda(L)\eta_t + \upsilon_t$.

Combining Equation (5) with the factor evolution Equation (4) yields the FAVAR model:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \begin{bmatrix} \Phi(L) & 0 \\ \Lambda(L)\Phi(L) & \delta(L) \end{bmatrix} \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \begin{bmatrix} \eta_t \\ \omega_t \end{bmatrix} \tag{6}$$

The above system reduces to the standard VAR if we assume the terms in Φ(L) are all zero. Therefore, if the true system is FAVAR, the standard VAR models suffer from omitted variable bias. Furthermore, the above expression for FAVAR nests the VAR model (i.e., when Φ(L) = 0), which makes an easy comparison between the two models.

3.1. Identification of the Factors

It is not possible to directly estimate Equation (6) because the factors are not observed. One approach to the estimation technique then involves a two-step procedure outlined in Stock and Watson (2002, 2005) and Bernanke et al. (2005). It makes use of the "informational" time series variables represented by (N × 1) vector X_t. The number of informational time series is assumed to be much larger than the number of factors and observed variables in the FAVAR (or N >> K + M). Next, assume that X_t is related to F_t and Y_t as follows (Bernanke et al., 2005):

$$X_t = \Lambda^f F_t + \Lambda^y Y_t + \varepsilon_t \tag{7}$$

where Λ^f is an (N × K) matrix of factor loadings, Λ^y is an (N × M) matrix, and ε_t is disturbance term of dimension (N × 1).

Following Bernanke et al. (2005), I start by conducting principal component analysis using all the variables in X_t to get the first K + M principal components denoted by $\hat{C}(F_t, Y_t)$. The estimated factors, $\hat{F}_t$, are the part of the space covered by $\hat{C}(F_t, Y_t)$ that is not covered by Y_t. Therefore, we need to remove the dependence of $\hat{C}(F_t, Y_t)$ on Y_t. Removing the dependence of $\hat{C}(F_t, Y_t)$ on Y_t involves the following steps. First, the series in X_t are divided into fast-moving variables and slow-moving variables. The fast-moving variables are those variables that are assumed to be contemporaneously responsive to policies. Those variables are highly sensitive to contemporaneous policy shocks or news, such as the stock market prices and financial assets (Bernanke et al., 2005). The slow-moving variables are those that are assumed to be contemporaneously unresponsive to monetary policy. Those are variables not sensitive to contemporaneous news or policy shocks, such as employment, earnings, and output.[1] (The classification of the variables into slow and fast moving is given in the appendix.) Next, I use principal components analysis on the slow-moving variables to get a matrix of slow-moving factors, $C(F_t)$. Then, I run the following regression:

$$\hat{C}(F_t, Y_t) = \beta^f C(F_t) + \beta^y Y_t + e_t \tag{8}$$

The estimated factors, $\hat{F}_t$, are taken as the difference $\hat{C}(F_t, Y_t) - \hat{\beta} Y_t$.

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[1] This classification is similar to Cholesky ordering, where the variables ordered before the monetary policy shock are assumed to be slow moving or contemporaneously unaffected by the policy, and the variables ordered after the policy measures are assumed to be contemporaneously affected by the policy. These variables are labeled as fast moving.

3.2. Identification of the VAR

Once the estimated factors are obtained, the next step involves estimation of the VAR model that includes $\hat{F}_t$ and Y_t as described in Equation (6). Y_t contains only the monetary policy instrument. All other variables, including inflation or output, are treated as unobservable variables (Bernanke et al., 2005). Like a standard VAR, this step requires an identifying assumption for the monetary policy innovation. Following Bernanke et al. (2005), I assume recursive Cholesky ordering with the monetary policy last in the ordering.[2]

IV. Data

The data for this study is obtained from Stock and Watson (2005), the Federal Reserve Bank of St. Louis (FRED), OECD Main Economic Indicators, and the Global Financial Statistics. I include 154 U.S. monthly variables from 1970–2014.

As indicated in the model (section III), it is assumed that all variables in Xt are stationary. For this purpose, all the variables are subject to unit root tests (based on the augmented Dickey-Fuller test).[3] When a unit root is found, transformation is made to attain stationarity. The possible transformations include taking logarithms, differencing the variable, or both. If the variable with a unit root is in a form of rate or ratio, then difference is taken. For all others, logarithms or differences of logarithms are taken. Finally all data series are transformed such that each variable is expressed in standard units (i.e., each variable has zero mean and unit standard deviation).[4]

The impacts of tight policy on bank portfolio variables and economic activity are analyzed. The bank portfolio variables are listed in the appendix under the category of credit. They include commercial and industrial loans at all commercial banks, consumer (individual) loans at all commercial banks, real estate loans at all commercial banks, total loans and leases at all commercial banks, and the U.S.

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[2] This assumption implies that policy affects other economic variables with a lag.

[3] The lag length of the augmented Dickey-Fuller test is determined by Akaike information criteria.

[4] The unit of measurement and the variance of the variables affect the principal component analysis (PCA). Therefore, it is important to account for these variations. Transforming the data to have a zero mean and unit variance is the same as conducting the PCA on the correlation matrix instead of the variance-covariance matrix of the original data set.

government securities at all commercial banks.[5] Furthermore, the impact of tight policy on the volume (in dollars) of commercial paper issued by nonfinancial firms (nonfinancial commercial paper) is considered to determine if a decline in bank loans described above is coming from the shortage of demand or supply following tight monetary policy.

V. Empirical Results

In this section, the empirical results from the FAVAR model are presented. I estimate the model based on the principal component analysis described in section III. The results are based on the impulse response functions generated from the FAVAR model. An impulse response function traces out the impact of a shock in a variable on the current and future values of each variables of interest in the model. Five factors that represent information from the large dataset (X_t) are included.[6] Based on Akaike information criteria (AIC), seven lags are selected.[7]

This section is divided into five subsections. First, I show the impact of contractionary monetary policy (measured by the federal funds rate) on bank portfolio variables. Second, I show the impact of a negative shock in total bank loans on the economic activity variables. Third, I show the impact of contractionary policy (the federal funds rate) on economic activity variables. I analyze the arguments for the credit channel of monetary transmission based on these results. Fourth,

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[5] According to definitions given by the Federal Financial Institutions Examination Council (FFIEC):

- Commercial and industrial loans include loans for commercial and industrial purposes to sole proprietorships, partnerships, corporations, and other business enterprises, whether secured (other than by real estate) or unsecured, single-payment, or installment. They are also called business loans.
- Consumer (individual) loans include loans to individuals for household, family, and other personal expenditures (other than those secured by real estate and other than those for purchasing or carrying securities). It includes outstanding credit card balances.
- Real estate loans include loans to finance the purchase of real estate, usually with specified payment periods and interest rates.

Total loans and leases include all forms of loans extended by commercial banks, including the commercial and industrial loans, consumer loans, and real estate loans.

[6] The first factor accounts for 16.6% of the total variation in the data set, the second factor accounts for 12.2%, the third for 5.3%, the fourth for 4.9%, the fifth for 4.1%, the sixth for 3.2%, the seventh for 2.7%. FAVAR models with six and seven factors are also estimated. The results are similar to the results including only five factors, as presented in this paper.

[7] The lag selection methodology is similar to that of the standard VAR models. The only difference here is that the VAR model consists of five factors and the federal funds rate.

I present a test for the stability of the results over the period of the study. Finally, I present robustness checks of the results with an alternative specification of the FAVAR model and an alternative policy measure, namely, the nonborrowed reserves.

5.1. Impact of Policy on Bank Portfolio Variables

Figure 1 gives the impulse response functions of bank portfolio variables to a contractionary monetary policy shock represented by a one-standard-deviation positive shock in the federal funds rate. A 95% confidence interval around the impulse responses is also given.[8] In response to a tight monetary policy, there is a significant decline in bank loans, both in the aggregate as well as disaggregated level. Specifically, the response of consumer (individual) loans, real estate loans, and commercial and industrial loans turn negative after about 1, 3, and 9 months, respectively. When considered at the aggregate level, the response of total bank loans turns negative after about 3 months. As expected, total reserves and deposits (in the form of savings and checkable deposits) also decline on impact. The responses of total reserve and deposits remain significant for about 10 months.

As Figure 1 also shows, government security holdings by commercial banks decline on impact following tight monetary policy. The response remains significant for about 9 months. Then, it turns positive for more than a year before becoming insignificant. The immediate decline in security holdings and the relatively longer lag in the response of loans imply that banks respond first by cutting security holdings in the short run. Loans decline in the longer horizon.

The next question is whether a decline in loans in response to tight monetary policy is because of a decline in the supply of loans by banks or a decline in demand for loans. Unless we know the force behind the response of loans, we do not have enough evidence to support either channel of monetary policy transmission. If a decline in loans comes from the demand side, one can argue in support of the traditional interest rate channel only. In this case, monetary policy works in the conventional interest rate channel, raising the interest rate and reducing the economic activity. The slowdown in economic activity reduces the demand for loans and hence the decline in loans is purely a passive reaction to economic conditions. Therefore, for the credit channel to work, the decline in loans should come from the supply side. In order to solve this identification problem, I included the volume of commercial paper issued by nonfinancial firms following Kashyap et

[8] These are bootstrap confidence intervals developed by Killian (1998).

al. (1993) and McMillin (1996). Commercial paper is another source of financing investment (besides loans from banks) for firms with access to the credit market. Therefore, if there is a decline in demand for loans, the demand for commercial paper by nonfinancial firms should also decline.

As shown in Figure 1, there is a significant positive surge in commercial paper immediately following tight monetary policy for about 9 months. Then it remains insignificant for about one year before its slight decline. This implies that at least for about 21 months following a tight policy, there is no shortage of demand for borrowing. The decline in loans comes from the supply side, which is consistent with the credit view of bank lending channel.

5.2. Impact of Loans on Economic Activity Variables

Another way of testing whether loans have any impact on the economy or whether they are simply a passive reaction to economic conditions is to see the reaction of economic activity variables to a shock in loans. Figure 2 displays the reaction of economic activity variables to a negative shock in total bank loans. In response to a negative shock in total bank loans, there is a mild, but significant, decline in economic activity.

Specifically, the responses of industrial production, the capacity utilization rate and inventories turn negative after about 18 months following a negative shock in total bank loans. The responses remain significant for at least six months. Furthermore, housing starts and real consumption respond negatively after about 9 and 12 months, respectively. Unemployment also responds positively after about a year and remains significant for about the same time. Interestingly, nonfinancial commercial paper responds positively on impact and remains positive for about a year. When there is a shortage of bank loans, firms with access to the financial market resort to other forms of financing. Overall, the results show that a decline in loans following tight monetary policy has an impact on an economy's turndown.

5.3. Impact of Policy on Economic Activity Variables

Figure 3 reports the impulse response functions of economic activity variables to a contractionary monetary policy (measured by a positive shock in the federal funds rate). In response to tight monetary policy, economic activity declines as expected. Industrial production, the capacity utilization rate, real consumption, inventories, and housing starts all decline, and the responses remain significant for up to two years. Similarly, the unemployment rate responds positively.

We can also compare the magnitudes of the responses of these economic activity variables to the contractionary monetary policy shock and the negative shock in the total bank loans. Figure 4 presents the impulse responses of some economic activity variables to a positive shock in the federal funds rate (the solid lines), and the 95% confidence bands from the impulse response of the same variables to a negative shock in the total bank loans (the dotted lines). The magnitudes of the responses of these economic activity variables to a contractionary monetary policy are larger. They lie outside the 95% confidence bands obtained from the negative shock in total bank loans. This implies that the decline in economic activity is not entirely because of a decrease in loans. However, this is perfectly in line with the argument of the credit view: policy works at least in part through the credit channel.

5.4. Stability of Results

The period of this study (1970:01–2014:12) spans different monetary policy regimes. Specifically, as indicated in many studies (such as Bernanke and Blinder, 1992; McMillin, 1996; and Bernanke and Mihov, 1998), the Fed switched its target from the federal funds rate to nonborrowed reserves during the period between October 1979 and October 1982. After October 1982, the Fed went back to targeting the federal funds rate. The natural question is whether the results are stable over these different policy regimes. In other words, do the results change when the Fed shifted its policy instrument from the federal funds rate to the nonborrowed reserves? In order to test stability of the result over the nonborrowed reserve regime, I follow the strategy proposed by Dufour (1980) and used by McMillin (1996).

In this test, 0–1 dummy variables, representing each month suspected of instability (October 1979–October 1982), are included to each equation of the FAVAR model. Therefore, there are 37 such dummy variables, each defined to be 1 during a given month between October 1979 and October 1982 and 0 otherwise.[9] The model is unstable if the null hypothesis that the coefficients on the dummy variables are jointly zero is rejected. The joint significance of the coefficients of

[9] For example, the first dummy variable is 1 for October 1979 and 0 in all other cases. The second dummy is 1 for November 1979 and 0 for all other periods. The third dummy is 1 for December 1979 and 0 otherwise.

the dummy variable is tested using the following Sims (1980) degrees-of-freedom adjusted likelihood ratio test:

$$LR = (T - K) * (\log|DR| - \log|DUR|) \sim \chi^2_d$$

where |DR| is the determinant of the variance-covariance matrix of the residuals from the restricted model.
|DUR| is the determinant of the variance-covariance matrix of the residuals from the unrestricted model (model with the dummy variables).
T is the number of observations in the sample period.
K is the number of parameters in the unrestricted model.
χ^2_d, the test statistic, has a χ^2 distribution with degrees of freedom, *d*, equal to the number of restrictions (i.e., the number of the dummies in the model).

Stability of the results is tested based on the above test statistic. The hypothesis that the coefficients on the dummy variables are jointly zero is rejected at the 1% significance level. This indicates that the model is not stable during the nonborrowed reserve regime of October 1979–October 1982.[10] This result is the same as the finding of McMillin (1996). Using a similar test, McMillin (1996) found instability of his model over the period of October 1979–October 1982.

The next question is to determine whether the results presented in this section are influenced by the data from the nonborowed reserve regime, where instability of the model is detected. Following McMillin (1996), I removed the period between October 1979 and October 1982 from my sample and re-estimated the model.[11] For the reduced sample, the Akaike information criteria select six lags. The results are given in Figures 5 and 6.

As can be seen from Figures 5 and 6, these results are strikingly similar to the result from the whole period estimation. Following tight monetary policy, commercial and industrial loans, consumer (individual) loans, real estate loans, total bank loans, total reserves, deposits, bank security holdings decline. On the other hand, nonfinancial commercial paper rises following tight monetary policy. As

10 The computed test statistic is LR = 371.5. The critical value of the χ^2 distribution with 37 degrees of freedom (the number of restrictions made in the model) and the 1% significance level is 59.89. We reject the null hypothesis if the calculated value is greater than the critical value at the given level of significance.

11 The model is determined to have six lags (based on Akaike information criteria). No observation from the nonborrowed reserve regime appears as a lag for any variable. The period 1982:11 comes right after 1979:09.

shown in Figure 6, a negative shock in total bank loans leads to a decline in industrial production, capacity utilization rate, real consumption, inventories and housing starts. It also leads to a rise in unemployment. Therefore, removing the nonborrowed reserve regime where instability of the model is detected does not change the results as opposed to the findings of McMillin (1996).[12] This is because the results presented in this study are not driven by the data from the nonborrowing reserve regime. Furthermore, when I limit the sample to post the October 1982 period, the conclusion of this study remains the same.[13, 14]

5.5. Robustness Check: Nonborrowed Reserves as Policy Instrument

According to Bernanke and Blinder (1992), the federal funds rate is the best measure of monetary policy. However, Eichenbaum (1992) argues that the nonborrowed reserves are the preferred measure of monetary policy. In addition to the federal funds rate, many studies consider the nonborrowed reserves as an alternative monetary policy measure (McMillin, 1996; Christiano et al., 1996; Bernanke and Mihov, 1998; Clarida et al., 2000, to cite some). In this light, I use an alternative measure of monetary policy–nonborrowed reserves. The results are displayed in Figures 8 and 9.

Figure 8 shows that the bank portfolio variables react to a tight policy measured by a negative shock in nonborrowed reserves in the same way as they do to a tight policy measured by a positive shock in the federal funds rate. Specifically, in response to a negative shock in the nonborrowed reserves, commercial and industrial loans, consumer (individual) loans, real estate loans, total loans, consumer credit outstanding, deposits (both savings and checkable deposits), and security holdings by banks decline. There is also a short-run surge in the volume of nonfinancial commercial paper following the tight monetary policy. The decline in the securities held by banks is significant only for about a month.

Figure 9 displays the response of economic activity variables to a tight policy as measured by a negative shock in the nonborrowed reserves. All the variables have

[12] In McMillin (1996), the credit channel is not supported once the nonborrowed reserve regime of October 1979–October 1982 is removed from the sample.

[13] I also estimate the model for the whole sample period (1970:01–2014:12), including 37 dummy variables representing each month of the nonborrowed reserve period (October 1979–October 1982). The result is qualitatively the same as the estimation omitting the nonborrowed reserve period from the sample (Figures 5–7).

[14] Removing the period of the "Great Recession" (December 2007 to June 2009), also does not change the result, implying that the findings are not driven by the "credit crunch" of the period.

a significant response with the expected direction. Specifically, industrial production, capacity utilization rate, real consumption, inventories, housing starts, and help-wanted index decline in response to a negative shock in nonborrowed reserves. In addition, unemployment rate responds positively as expected.

Overall, the result presented when policy is measured by nonborrowed reserves shows that policy reduces all types of bank loans and economic activity. The surge in the volume of nonfinancial commercial paper following the tight policy also implies that there is no shortage of demand for loans because of the decline in economic activity. In other words, bank loans decline because of the supply of the loans. This argument is consistent with the credit view. Therefore, the result is robust to an alternative policy measures.

In summary, the findings of this study support the existence of credit channel for the United States over the period 1970–2014. Tight monetary policy reduces the supply of bank loans, and the decline in bank loans has a negative impact on the economic activity.

VI. Conclusions

There is more consensus on the impact of monetary policy rather than the transmission mechanism of its actions. There are many debates on whether monetary policy acts mainly through the traditional interest rate channel (money view) or the credit channel (credit view). There are also mixed empirical results on the issue for the United States as well as other countries.

In this study, I use the factor-augmented vector autoregressive (FAVAR) model, developed by Bernanke et al. (2005), to investigate the existence of the credit channel for the United States, I use an extensive information set compared to the standard VAR approach by incorporating 154 monthly time series variables between 1970 and 2014. The larger information set spanned by the FAVAR models generates more reliable monetary policy shocks and impulse responses of individual variables.

I present the impact of policy on bank portfolio variables, the impact of loans on economic activity variables, and the impact of policy on economic activity variables to assess the validity of arguments of the credit view. The overall results suggest the existence of the credit channel in the United States over the sample period of the study. Specifically, tight monetary policy leads to a decline in loans supply, and the decline in loans leads to a reduction in economic activity. The result of this study suggests that policy works though the credit channel. However, the decline in economic activity due to a negative shock in bank loans is lower in magnitude than the decline in economic activity due to tight monetary policy. This paper supports the view that monetary policy works in part through the credit channel.

Figure 1: Impulse response functions of bank portfolio variables to a contractionary monetary policy shock (measured by the FFR), generated from the FAVAR model. The dotted lines represent a 95% confidence band around the impulse response functions.

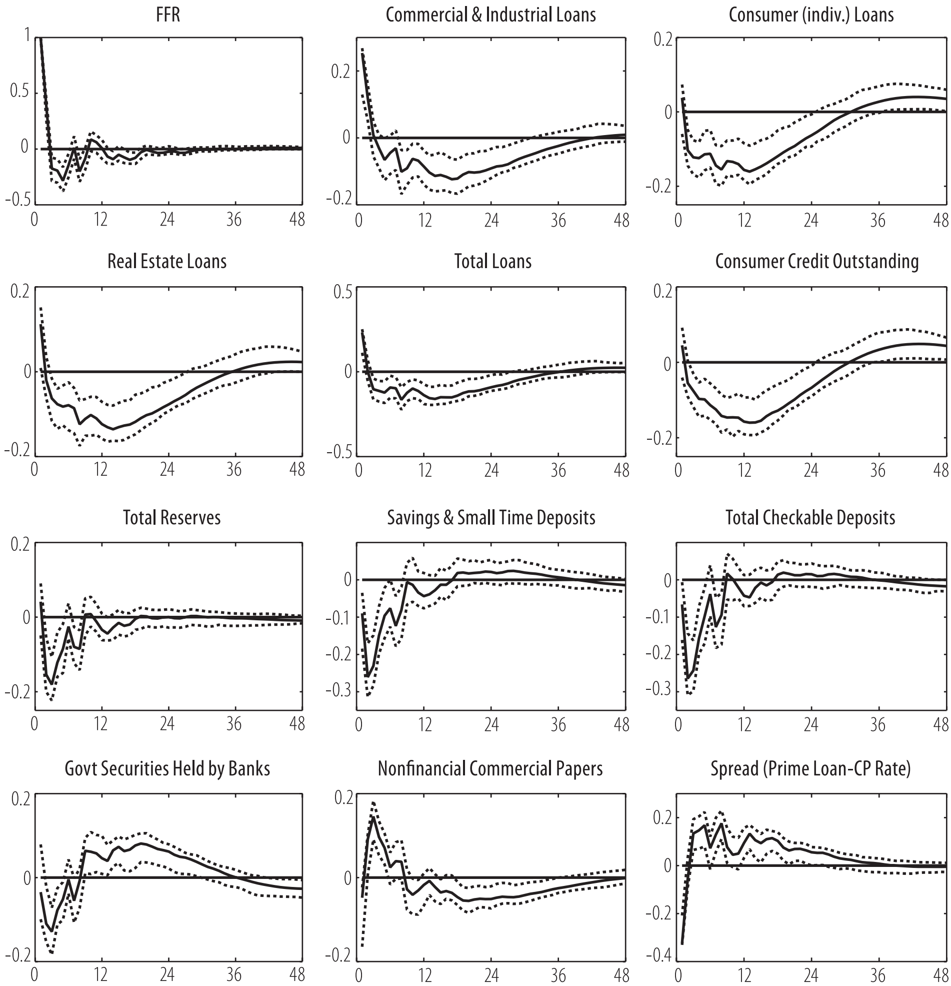


Figure 2: Impulse response functions of economic activity variables to a negative shock of the total bank loans, generated from the FAVAR model. The dotted lines represent a 95% confidence band around the impulse response functions.

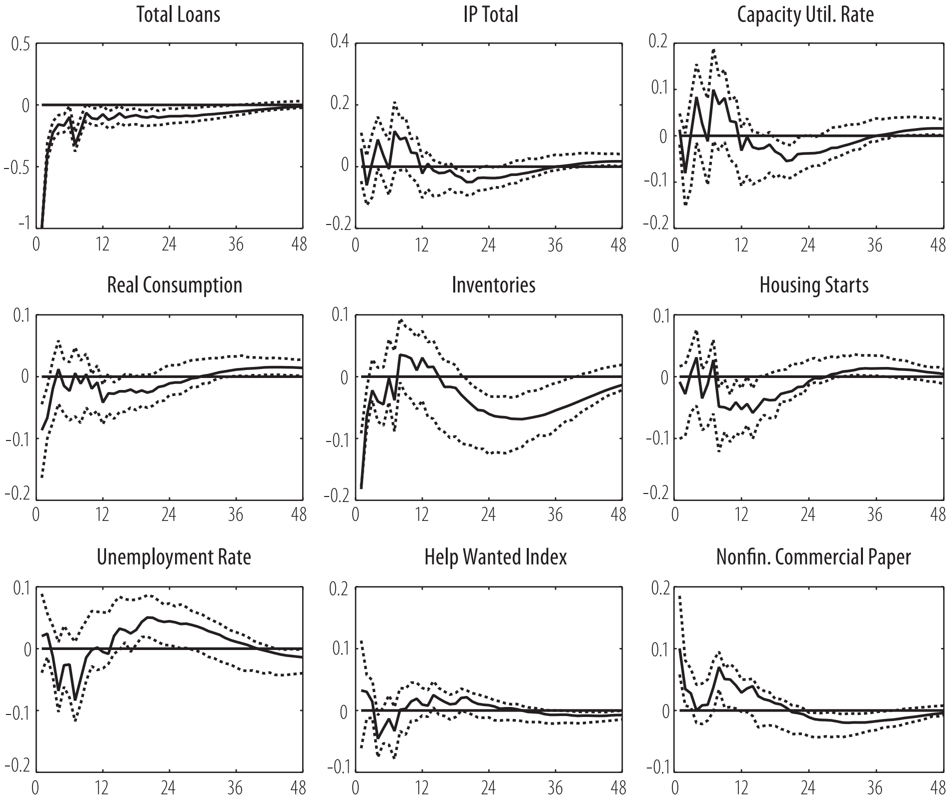


Figure 3: Impulse response functions of economic activity variables to a contractionary monetary policy shock (measured by the FFR), generated from the FAVAR model. The dotted lines represent a 95% confidence band around the impulse response functions.

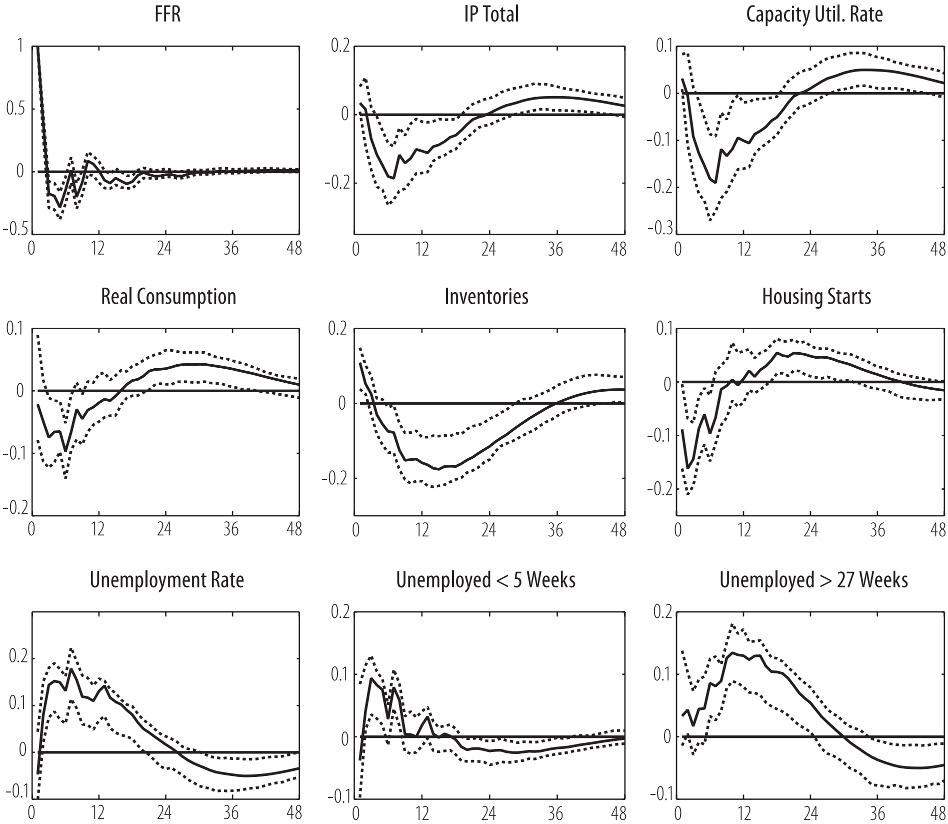


Figure 4: The solid lines are the impulse responses to a contractionary monetary policy shock (measured by the FFR) and the dotted lines are the 95% confidence bands around the impulse response functions of the same variables to a negative shock in total bank loans.

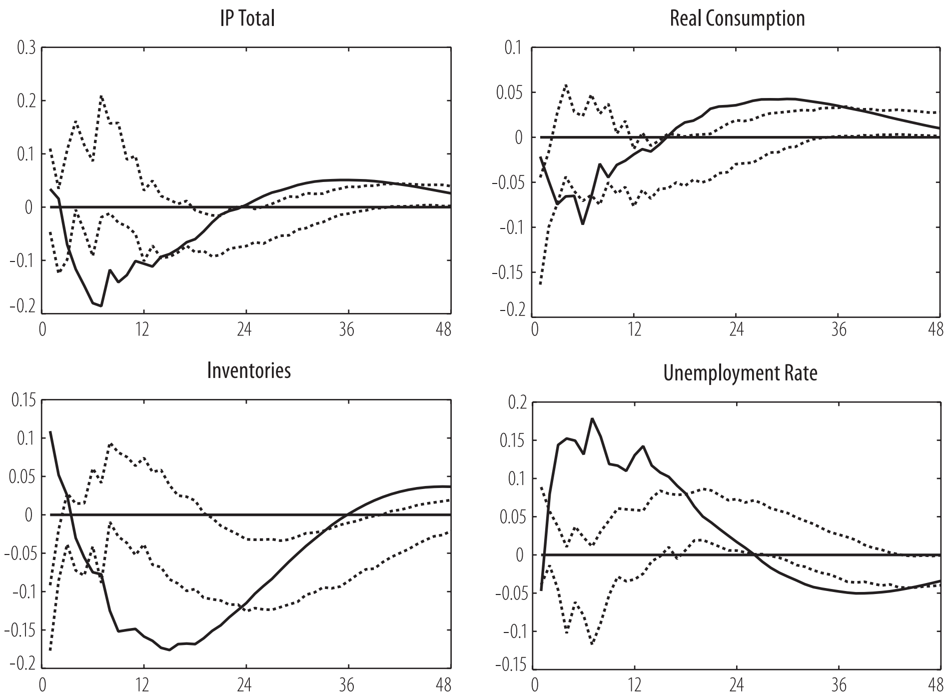


Figure 5: Impulse response functions of bank portfolio to a contractionary monetary policy shock (measured by the FFR), generated from the FAVAR model (excluding the nonborrowed reserve regime between Oct. 1979 and Oct. 1982). The dotted lines represent a 95% confidence band around the impulse response functions.

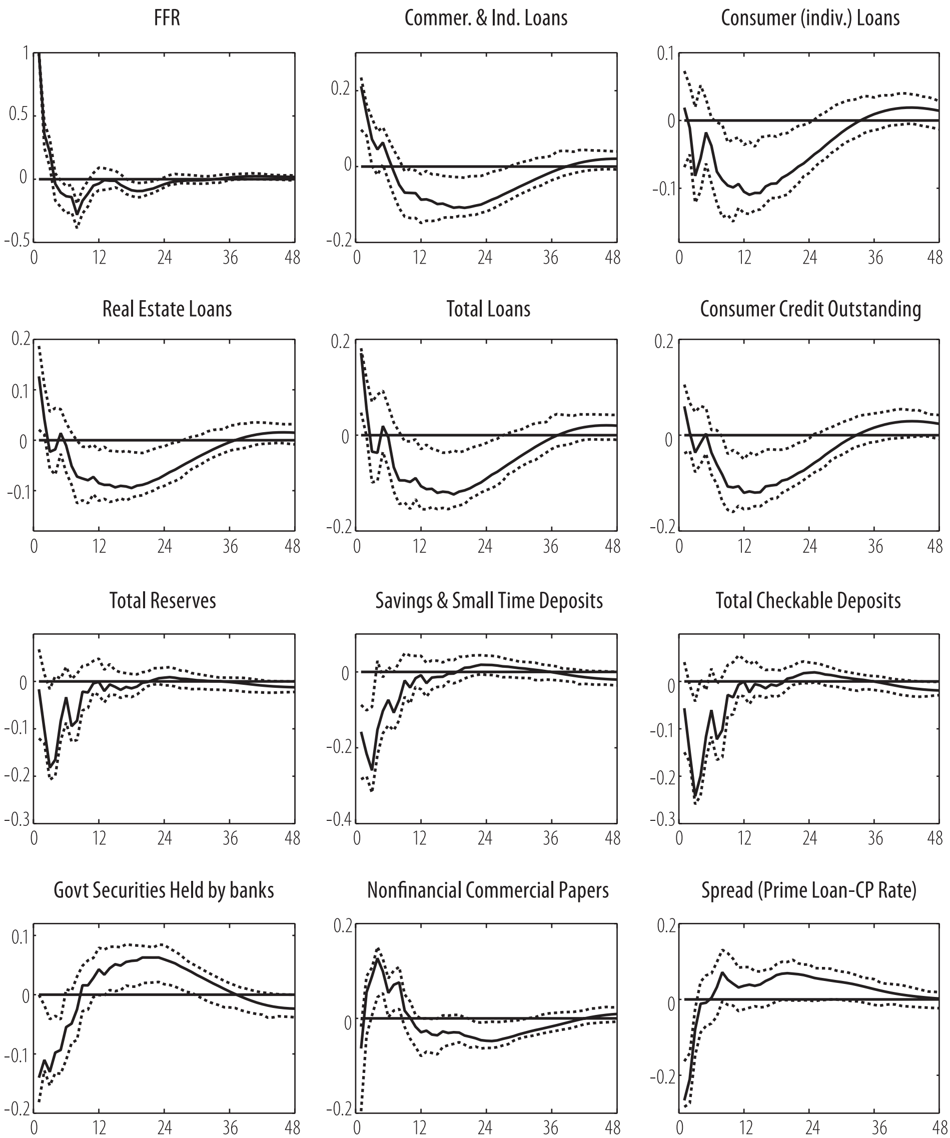


Figure 6: Impulse response functions of economic activity variables to a negative shock of the total bank loans, generated from the FAVAR model (excluding the nonborrowed reserve regime between Oct. 1979 and Oct. 1982). The dotted lines represent a 95% confidence band around the impulse response functions.

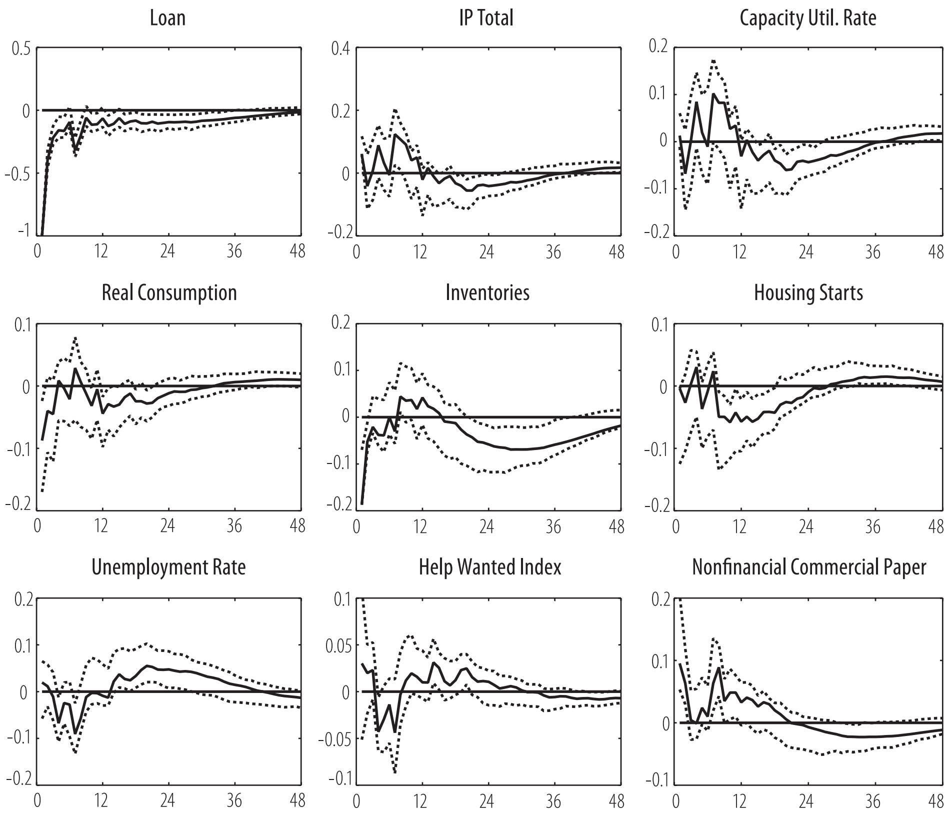


Figure 7: Impulse response functions of economic activity variables to a contractionary monetary policy shock (measured by the FFR), generated from the FAVAR model (excluding the nonborrowed reserve regime between Oct. 1979 and Oct. 1982). The dotted lines represent a 95% confidence band around the impulse response functions.

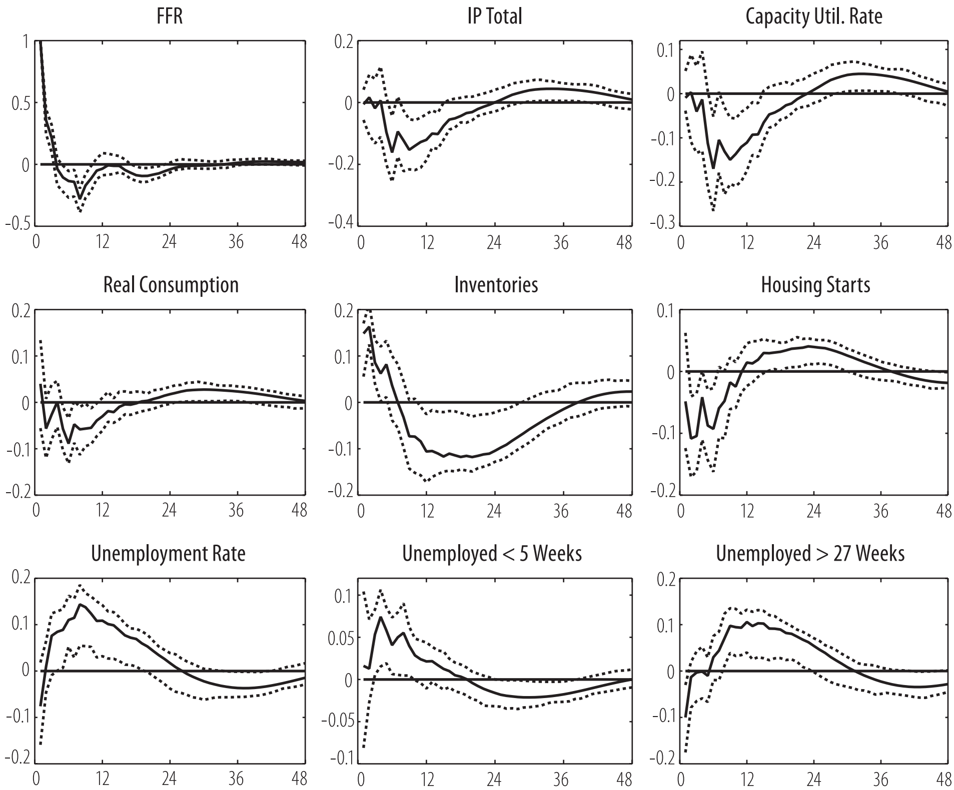


Figure 8: Impulse response functions of bank portfolio variables to a contractionary monetary policy shock (measured by the nonborrowed reserves), generated from the FAVAR model. The dotted lines represent a 95% confidence band around the impulse response functions.

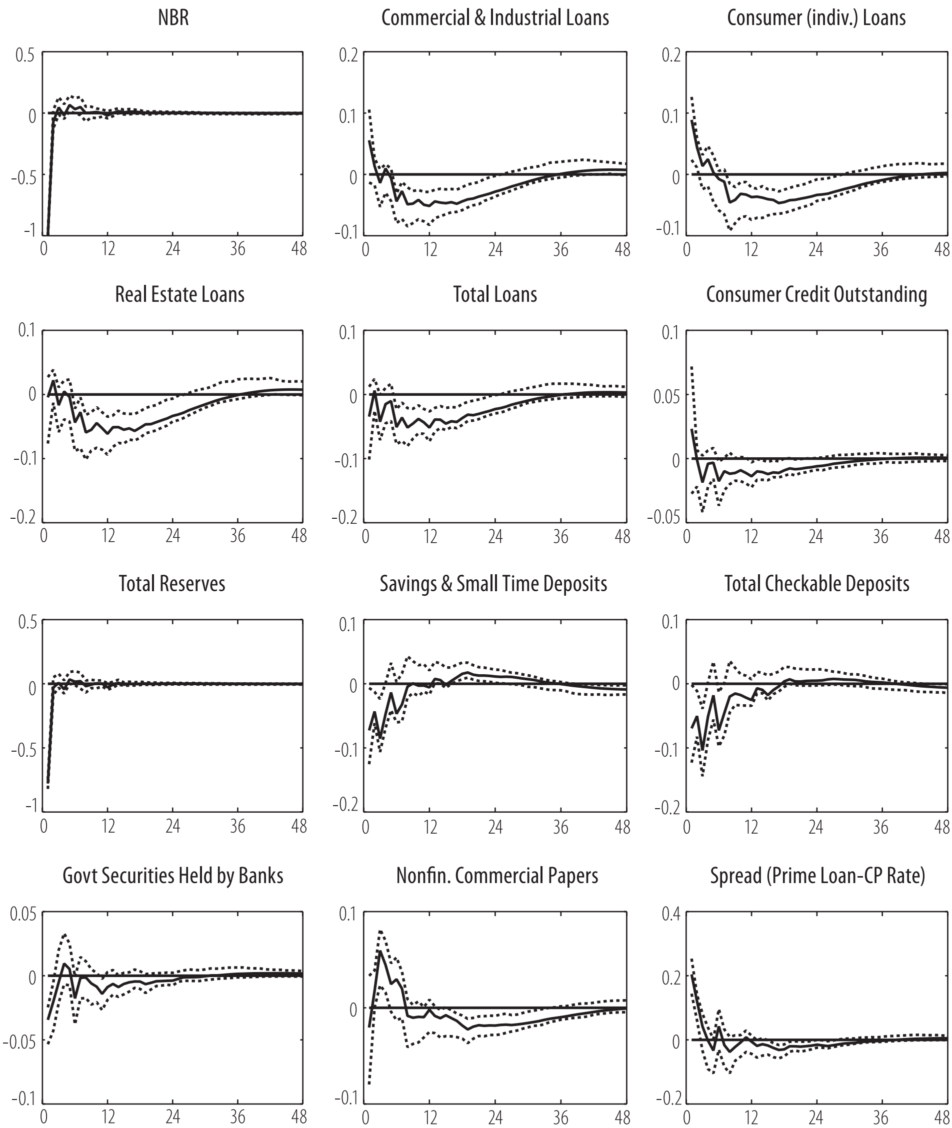
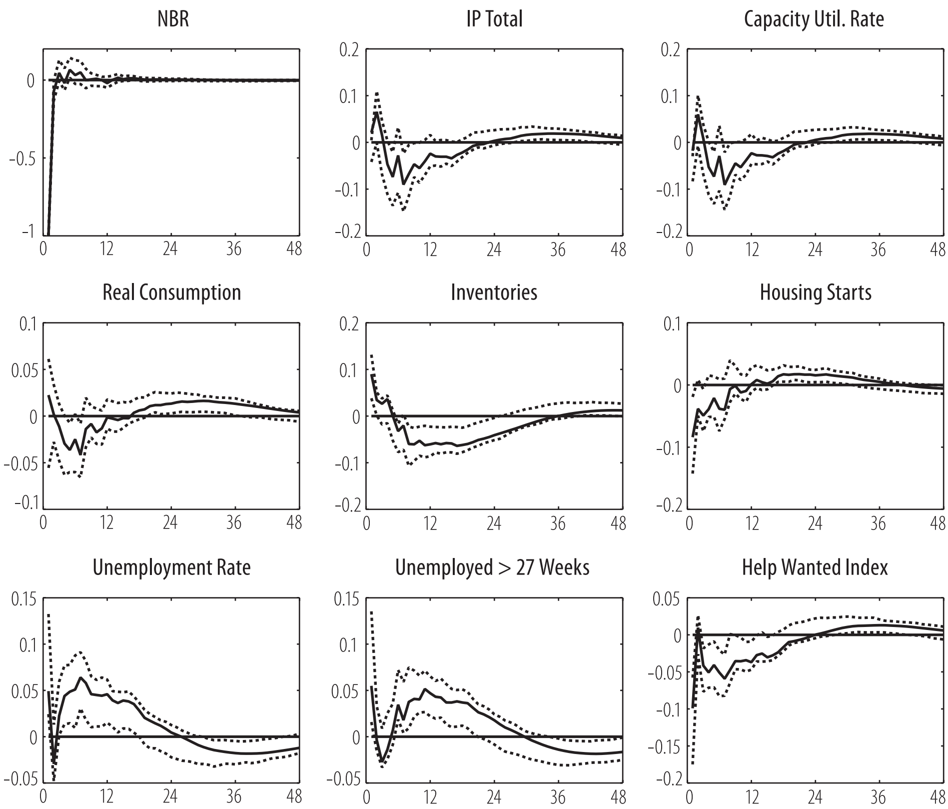


Figure 9: Impulse response functions of economic activity variables to a contractionary monetary policy shock (measured by the nonborrowed reserves), generated from the FAVAR model. The dotted lines represent a 95% confidence band around the impulse response functions.



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Appendix: Data Description

The appendix shows the brief description of the data, whether it is assumed to be slow (S) or fast (F) moving variable and the transformations taken to attain stationarity. The transformation codes are: 1 – no transformation (i.e. the variable is stationary at level), 2 – first difference of the level and 3 – first difference of logarithm.

	Economic Activity	Fast or Slow?	Transformation
1	Industrial Production Index - Total Index	S	3
2	Industrial Production Index - Products, Total	S	3
3	Industrial Production Index - Final Products	S	3
4	Industrial Production Index - Consumer Goods	S	3
5	Industrial Production Index - Durable Consumer Goods	S	3
6	Industrial Production Index - Nondurable Consumer Goods	S	3
7	Industrial Production Index - Business Equipment	S	3
8	Industrial Production Index - Materials	S	3
9	Industrial Production Index - Durable Goods Materials	S	3
10	Industrial Production Index - Nondurable Goods Materials	S	3
11	Industrial Production Index - Manufacturing	S	3
12	Industrial Production Index - Residential Utilities	S	3
13	Industrial Production Index - Fuels	S	3
14	Personal Income (AR, Bil. Chain 2000 $)	S	3
15	Personal Income Less Transfer Payments (AR, Bil. Chain 2000 $)	S	3
16	Real Consumption	S	3
17	Manufacturing and Trade Sales (Mil. Chain 1996 $)	S	3
18	Sales of Retail Stores (Mil. Chain 2000 $)	S	3
19	Capacity Utilization - Manufacturing	S	3
20	Capacity Utilization - Total Industry	S	3
21	Index of Help-Wanted Advertising in Newspapers (1967=100; SA)	S	3
22	Employment: Ratio; Help-Wanted Ads: No. Unemployed	S	2
23	Civilian Labor Force: Employed, Total (Thous.,SA)	S	3
24	Civilian Labor Force: Employed, Nonagricultural Industries (Thous.,Sa)	S	3
25	Unemployment Rate: All Workers, 16 Years & Over (%,SA)	S	3
26	Unemployment by Duration: Average (Mean) Duration in Weeks (SA)	S	3
27	Unemployment by Duration: Persons Unemployed less than 5 Weeks (Thous.,SA)	S	3
28	Unemployment by Duration: Persons Unemployed 5 to 14 Weeks (Thous.,SA)	S	3

29	Unemployment by Duration: Persons Unemployed 15 Weeks + (Thous.,SA)	S	3
30	Unemployment by Duration: Persons Unemployed 15 to 26 Weeks (Thous.,SA)	S	3
31	Unemployment by Duration: Persons Unemployed 27 Weeks + (Thous,SA)	S	3
32	Average Weekly Initial Claims, Unemployment Insurance (Thous.)	S	3
33	Employees on Nonfarm Payrolls - Total Private	S	3
34	Employees on Nonfarm Payrolls - Goods-Producing	S	3
35	Employees on Nonfarm Payrolls - Mining	S	3
36	Employees on Nonfarm Payrolls - Construction	S	3
37	Employees on Nonfarm Payrolls - Manufacturing	S	3
38	Employees on Nonfarm Payrolls - Durable Goods	S	3
39	Employees on Nonfarm Payrolls - Nondurable Goods	S	3
40	Employees on Nonfarm Payrolls - Service-Providing	S	3
41	Employees on Nonfarm Payrolls - Trade, Transportation, and Utilities	S	3
42	Employees on Nonfarm Payrolls - Wholesale Trade	S	3
43	Employees on Nonfarm Payrolls - Retail Trade	S	3
44	Employees on Nonfarm Payrolls - Financial Activities	S	3
45	Employees on Nonfarm Payrolls - Government	S	3
46	Employee Hours in Nonagricultural Establishments (AR, Bil. Hours)	S	3
47	Average Weekly Hours of Production or Nonsupervisory Workers on Private Nonfarm Payrolls – Goods Producing	S	3
48	Average Weekly Hours of Production or Nonsupervisory Workers on Private Nonfarm Payrolls – Mfg Overtime Hours	S	3
49	Average Weekly Hours, Mfg. (Hours)	S	3
50	Housing Starts: Total Farm & Nonfarm (Thous.,SAAR)	S	3
51	Housing Starts: Northeast (Thous., SA)	S	3
52	Housing Starts: Midwest (Thous., SA)	S	3
53	Housing Starts: South (Thous., SA)	S	3
54	Housing Starts: West (Thous., SA)	S	3
55	Housing Authorized: Total New Private Housing Units (Thous.,SAAR)	S	3
56	Houses Authorized By Building Permits: Northeast (Thous., SA)	S	3
57	Houses Authorized By Building Permits: Midwest (Thous., SA)	S	3
58	Houses Authorized By Building Permits: South (Thous., SA)	S	3
59	Houses Authorized By Building Permits: West (Thous., SA)	S	3
60	Purchasing Managers' Index (SA)	S	3
61	Mfrs' New Orders, Consumer Goods and Materials (Bil. Chain 1982 $)	S	3
62	Mfrs' New Orders, Durable Goods Industries (Bil. Chain 2000 $)	S	3
63	Mfrs' New Orders, Nondefense Capital Goods (Mil. Chain 1982 $)	S	3
64	Mfrs' Unfilled Orders, Durable Goods Indus. (Bil. Chain 2000 $)	S	3
65	Manufacturing and Trade Inventories (Bil. Chain 2000 $)	S	3
66	Ratio, Mfg. and Trade Inventories to Sales (Based On Chain 2000 $)	S	1

67	Average Hourly Earnings of Production or Nonsupervisory Workers on Private Nonfarm Payrolls – Goods-producing	S	3
68	Average Hourly Earnings of Production or Nonsupervisory Workers on Private Nonfarm Payrolls - Construction	S	3
69	Average Hourly Earnings of Production or Nonsupervisory Workers on Private Nonfarm Payrolls - Manufacturing	S	3
	Money		
70	Money Stock: M1(Curr,Trav.Chks,Dem Dep,other Ck'able Dep)(Bil$,SA)	F	3
71	Money Stock:M2(M1+O'nite Rps,Euro$,G/P&B/D Mmmfs&Sav&Sm Time Dep(Bil$, SA)	F	3
72	Money Stock: M3(M2+Lg Time Dep,Term Rp's&Inst Only Mmmfs)(Bil$,SA)	F	3
73	Money Supply - M2 In 1996 Dollars (Bci)	F	3
74	Monetary Base, Adj For Reserve Requirement Changes(Mil$,SA)	F	3
75	Depository Inst Reserves:Total,Adj For Reserve Req Chgs(Mil$,SA)	F	3
76	Depository Inst Reserves:Nonborrowed,Adj Res Req Chgs(Mil$,SA)	F	3
77	Total Borrowings Of Depository Institutions From The Federal Reserve	F	3
78	Savings Deposits - Total	F	3
79	Small Time Deposits - Total	F	3
80	Savings And Small Time Deposits At Commercial Banks	F	3
81	Savings And Small Time Deposits - Total	F	3
82	Total Checkable Deposits	F	3
	Credit		
83	Commercial And Industrial Loans At All Commercial Banks	F	3
84	Consumer (Individual) Loans At All Commercial Banks	F	3
85	Total Loans And Investments At All Commercial Banks	F	3
86	Total Loans And Leases At Commercial Banks	F	3
87	Real Estate Loans At All Commercial Banks	F	3
88	Commercial & Industrial Loans Oustanding In 1996 Dollars (Bci)	F	3
89	Wkly Rp Lg Com'l Banks:Net Change Com'l & Indus Loans(Bil$,SAAR)	F	1
90	Other Securities At All Commercial Banks	F	3
91	U.S. Government Securities At All Commercial Banks	F	3
92	Total Nonrevolving Credit Outstanding	F	3
93	Total Revolving Credit Outstanding	F	3
94	Total Consumer Credit Outstanding	F	3
95	Ratio, Consumer Installment Credit To Personal Income (Pct.)	F	2
	Financial Market		
96	S&P's Common Stock Price Index: Composite (1941-43=10)	F	3
97	S&P's Common Stock Price Index: Industrials (1941-43=10)	F	3
98	S&P's Composite Common Stock: Dividend Yield (% Per Annum)	F	2
99	S&P's Composite Common Stock: Price-Earnings Ratio (%,NSA)	F	2
100	Nonfinancial Commercial Paper Outstanding; (SA, Bil. $)	F	3

	Interest Rate		
101	3-Month Commercial Paper Yiled	F	2
102	Interest Rate: U.S.Treasury Bills,Sec Mkt,3-Mo.(% Per Ann, NSA)	F	2
103	Interest Rate: U.S.Treasury Bills,Sec Mkt,6-Mo.(% Per Ann, NSA)	F	2
104	Interest Rate: U.S.Treasury Const Maturities,1-Yr.(% Per Ann, NSA)	F	2
105	Interest Rate: U.S.Treasury Const Maturities,5-Yr.(% Per Ann, NSA)	F	2
106	Interest Rate: U.S.Treasury Const Maturities,10-Yr.(% Per Ann, NSA)	F	2
107	1-Month Certificate Of Deposit: Secondary Market Rate	F	2
108	3-Month Certificate Of Deposit: Secondary Market Rate	F	2
109	6-Month Certificate Of Deposit: Secondary Market Rate	F	2
110	Bond Yield: Moody's Aaa Corporate (% Per Annum)	F	2
111	Bond Yield: Moody's Baa Corporate (% Per Annum)	F	2
112	Bank Prime Loan Rate	F	2
	Exchange Rate		
113	United States Effective Exchange Rate (Index No.)	F	3
114	Foreign Exchange Rate: Switzerland (Swiss Franc Per U.S.$)	F	3
115	Foreign Exchange Rate: Japan (Yen Per U.S.$)	F	3
116	Foreign Exchange Rate: United Kingdom (Cents Per Pound)	F	3
117	Foreign Exchange Rate: Canada (Canadian $ Per U.S.$)	F	3
	Price		
118	Producer Price Index: Finished Goods (82=100,SA)	F	3
119	Producer Price Index: Finished Consumer Goods (82=100,SA)	F	3
120	Producer Price Index: Intermed Mat.Supplies & Components(82=100,SA)	F	3
121	Producer Price Index: Crude Materials (82=100,SA)	F	3
122	Spot Market Price Index: Bls & Crb: All Commodities(1967=100)	F	3
123	Index Of Sensitive Materials Prices (1990=100)(Bci-99a)	F	3
124	CPI-U: All Items (82-84=100,SA)	S	3
125	CPI -U: Apparel & Upkeep (82-84=100,SA)	S	3
126	CPI -U: Transportation (82-84=100,Sa)	S	3
127	CPI -U: Medical Care (82-84=100,SA)	S	3
128	CPI -U: Commodities (82-84=100,SA)	S	3
129	CPI -U: Durables (82-84=100,SA)	S	3
130	CPI -U: Services (82-84=100,SA)	S	3
131	CPI -U: All Items Less Food (82-84=100,SA)	S	3
132	CPI -U: All Items Less Shelter (82-84=100,SA)	S	3
133	CPI -U: All Items Less Medical Care (82-84=100,SA)	S	3
134	Pce,Impl Pr Defl:Pce (1987=100)	S	3
135	Pce,Impl Pr Defl:Pce; Durables (1987=100)	S	3
136	Pce,Impl Pr Defl:Pce; Nondurables (1996=100)	S	3
137	Pce,Impl Pr Defl:Pce; Services (1987=100)	S	3

	Expectations		
138	U. Of Mich. Index Of Consumer Expectations(Bcd-83)	F	2
139	Napm Production Index (Percent)	F	1
140	Napm Employment Index (Percent)	F	1
141	Napm New Orders Index (Percent)	F	1
142	Napm Vendor Deliveries Index (Percent)	F	1
143	Napm Inventories Index (Percent)	F	1
144	Napm Commodity Prices Index (Percent)	F	1
145	Mprime - Ipusac3d (Bank Prime rate – 3 Month CP Rate Spread)	F	1
146	Cp90-Fyff (CP – FFR Spread)	F	1
147	Fygm3-Fyff (3 Month T-bill – FFR Spread)	F	1
148	Fygm6-Fyff (6 Month T-bill – FFR Spread)	F	1
149	Fygt1-Fyff (1 Yr T-bond – FFR Spread)	F	1
150	Fygt5-Fyff (5 Yr T-bond – FFR Spread)	F	1
151	Fygt10-Fyff (10 Yr T-bond – FFR Spread)	F	1
152	Fyaaac-Fyff (Aaa bond – FFR Spread)	F	1
153	Fybaac-Fyff (Baa bond – FFR Spread)	F	1
	Federal Funds Rate		
154	Effective Federal Funds Rate (% Per Annum)	F	2