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The Role of Nonbank Financial Institutions in the Monetary Transmission Mechanism: Theory and Evidence

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Abstract

Nonbank financial institutions (NBFIs) have substantially increased their market share since 1980s. In spite of the growing importance of NBFIs, they have received much less attention in the monetary transmission mechanism. This paper examines if monetary policy affects NBFIs in the similar way as banks. First, I theoretically explain how monetary policy influences the loan supply of *all* financial intermediaries (banks and NBFIs) through changes in their net worth. Then, I empirically test whether these two kinds of lending institutions decrease their *net worth* and the *intermediated loans* in response to a tight monetary shock. I find that, at the statistically significant level, NBFIs shrink their net worth and a type of loan, especially C&I loans―but not all types of loans decrease, as predicted―in the same way as banks. In particular, NBFIs' C&I loans "decrease" substantially in the *beginning periods*; however, NBFIs' mortgages and consumer credit "increase" in the *middle periods*, showing a statistically significant level. These evidences suggest that the theoretical explanation is, at least, consistent with the evidence of C&I loans―but not mortgages and consumer loans. One possible explanation is that, while banks reject mortgages and consumer loans, NBFIs may increase mortgages and consumer loans by picking up the demand for these two types of loans.

Keywords: monetary policy, nonbank financial institutions, net worth, loan supply
JEL Classification: E51, E52, E58

I. INTRODUCTION

Over 50 years from 1959 to 2009, the market share of assets held by banks had significantly fallen from 55 to 27%, whereas the market share of assets held by nonbank financial institutions (hereafter, NBFIs) had dramatically increased from 45 to 73%.[1] In spite of the growing importance of NBFIs, they have received little emphasis and are not treated at all in the transmission mechanism of monetary policy. The main reason is that in the literature of the monetary transmission mechanism, monetary policy affects the real economy through changes in the behavior of banks, which are subject to reserve requirements and thus are under the direct control of monetary policy. In particular, the bank lending channel asserts that *only* banks are special type of financial intermediaries in supplying loans. This is because they are well-suited to deal with information problems of a class of borrowers, especially small firms, who pose severe asymmetric information problems in credit markets (see Bernanke & Blinder, 1988; Kashyap & Stein, 1994; Kashyap, Stein, & Wilcox, 1993, for the bank lending channel). On the other hand, the NBFIs, which are not subject to reserve requirements, are excluded in the analysis of monetary policy.

However, a number of researches suggest that, just like banks, NBFIs are also a special type of financial intermediaries. They are also well-suited to overcome information problems of some types of borrowers, who are usually small and less-well known firms known as "information-problematic borrowers." Information-problematic borrowers are those who pose severe information problems in credit markets because they have much more information than others about their credit quality, and thus they can obtain credit only through lenders that perform broad credit analysis. Just as banks are well-suited for making short-term loans to information-problematic borrowers (small firms), finance companies are well-positioned for making collateralized loans to information-problematic borrowers (riskier firms), and insurance companies are well trained for making long-term loans to information-problematic borrowers (medium to large firms), and so on.

[1] In this paper, a "bank" is defined as a *depository* institution such as a commercial bank, a credit union, or a saving institution. Also, a "nonbank financial institution" is defined as a *nondepository* institution such as an insurance company, a finance company, a mortgage company, a brokerage company, or a leasing company.

If different credit suppliers are specialized in overcoming information problems to different classes of borrowers, banks are not the unique lenders. *Financial intermediaries in general*—not banks in particular—are special with respect to information. Most financial intermediaries obtain on their own information about borrowers through intermediaries' due diligence and loan monitoring—i.e., by screening of borrowers, evaluating the riskiness of projects, and monitoring the borrowers' performance after the loan. Through this information production, NBFIs may develop their own specialties and accumulate their own information capital with regard to their borrowers. Therefore, financial intermediaries as a whole may have a comparative advantage over open-markets lenders, who do not have such specialties.

Several researchers' empirical studies support the reasoning suggested above. Carey, Post, and Sharpe (1998) find that finance companies are skilled at handling relatively riskier borrowers who have a high probability of default. Because of borrowers' high default risk, finance companies specialize in originating *asset-based* lending, a business loan secured by borrowers' assets such as inventories, accounts receivable, and equipment. Carey, Prowse, Rea, and Udell (1993) and Prowse (1997) find that insurance companies are proficient at dealing with (medium to) large firms who pose "moderate" information problems. Because of their moderate information problems, insurance companies specialize in providing *long-term* debt instruments known as private placements.[2] Insurance companies especially make long-term, fixed-rate loans due to characteristics of their source of funds—i.e., long term, fixed rate liabilities. Preece and Mullineaux (1994) and Billett, Flannery, and Jon (1995) find that capital markets react in the same way to agreements with nonbanks (such as insurance companies and finance companies) as with bank loan agreements. Similarly, Szewczyk and Varma (1991) find that larger sales of public utilities' private placements have more favorable effects on their stock prices than smaller sales of them.

[2] The private placement is a security issued by a firm. The private placement must be sold to a limited number of institutional investors such as insurance companies and finance companies. It is exempted from registration with the SEC, and its initial offering and secondary transaction is not allowed in the markets.

To argue the impact of monetary policy on output through most financial intermediaries (including banks, finance companies, insurance companies and so on), we have seen that different financial intermediaries may specialize in supplying loans to different classes of borrowers. The next question is how monetary policy influences the behavior of these intermediaries, banks and NBFIs. There is no reason why monetary policy should selectively affect the loan supply of *just* banks. If instead monetary policy affected the loan supply of *both* banks and NBFIs in some general ways, then the loan status of all intermediaries may influence investment spending through information-problematic borrowers.

In this paper, I provide an explanation of how monetary policy affects the loan supply of *all* intermediaries. The link between monetary policy and the intermediaries' loan supply can be made in the following procedures. First, we can apply the bank capital channel thesis (Van den Heuvel, 2002, 2007) to all intermediaries. Monetary policy can influence the net worth of these two kinds of lending institutions through a change in the "maturity mismatch" of intermediaries' balance sheets. For example, suppose that the Fed increases short-term interest rates. Because most intermediaries have a longer maturity on assets than on liabilities, they must pay higher rates on short-term borrowings (i.e., interest expense), while receiving the fixed rates from long-term assets (i.e., interest income). This squeezes intermediaries' profits, thus leading to a decrease in their net worth. Second, after the reduction of financial intermediaries' net worth, they will be constrained to raise "uninsured sources of funds" because adverse selection becomes an issue (Stein, 1998). As intermediaries turn to uninsured wholesale-market funds, lenders of wholesale markets will charge a higher premium because, as a result of intermediaries' shrunken net worth, an adverse selection problem would arise. This ultimately leads to a decrease of the loan supply to information-problematic borrowers. If this reasoning is accurate, a fundamental tenet of the bank lending channel—which implies that banks play a unique role in the transmission mechanism of monetary policy—can and should be expanded to all private suppliers of credit.

This research paper attempts to examine the role of NBFIs in the transmission mechanism of monetary policy, both theoretically and empirically. First, drawing from Bernanke's (2007) general idea, I theoretically explain how contractionary monetary policy affects the quantity of loans of all financial intermediaries (banks and NBFIs) through changes in their balance sheet conditions, particularly net worth. If this theoretical explanation is correct, we should expect the *net worth* and the *intermediated loans* of both kinds of lending institutions to fall in response to a contractionary monetary policy shock. Second, I empirically test whether the net worth and the intermediated loans of banks and NBFIs decrease following tight monetary policy.

I empirically seek some evidence of theoretical explanation, employing two different methods: the traditional OLS methodology and the VAR methodology. This empirical study strongly supports the first part of the theory, which is that NBFIs reduce their net worth after tightening monetary policy, presenting consistent results with two different methodologies—particularly the statistically significant results with 2% for the OLS model. On the other hand, it supports, in part, the second part of the theory, which is that NBFIs decrease their loans in response to a monetary policy shock. As predicted by the theoretical explanation, I find that NBFIs' C&I loans *decrease* substantially in response to a monetary shock. However, NBFIs' mortgages and consumer credit *increase*, showing a statistically significant level in the middle periods. This evidence suggests that, although NBFIs decrease C&I loans like banks, they increase mortgages and consumer loans by picking up the demand for loans that are rejected by banks.

The remainder of this paper is organized in the following way: Section II describes a theoretical explanation which posit that monetary policy actions can affect both banks and NBFIs; Section III describes the data and methodology employed in the study; Section IV reports the empirical results of the study; Section V reports some supplementary tests for NBFIs' loans; and Section VI summarizes and concludes the work.

II. A THEORETICAL EXPLANATION

In this section, I provide an explanation of how monetary policy influences investment spending through a changes in financial conditions of financial intermediaries in general, including both banks and NBFIs. To clarify this explanation, I divided the whole explanation into three sequent parts. The first part of the explanation is how monetary policy influences the financial condition, particularly net worth, of most financial intermediaries (banks and NBFIs). The second part is how the financial conditions of these intermediaries affects costs of funds in the wholesale market. The final part is how costs of funds affect investment spending in the economy.

A. How Does Monetary Policy Affects Intermediaries' Financial Conditions?

First, monetary policy must be able to shift not only the financial condition of banks but also that of NBFIs. We may think that this procedure is initially problematic. The reason is that monetary policy, according to the conventional bank lending channel, affects the supply of loans from *only* depository institutions through changes in bank reserves. Hence, NBFIs that are not subject to reserve requirements cannot be influenced by monetary policy. To address this issue, I introduce the idea of the bank capital channel (Van den Heuvel, 2002, 2007), which maintains that monetary policy affects the supply of bank loans through direct changes in bank's *equity capital* (also called net worth). Since NBFIs must hold equity capital on their balance sheets, the bank capital channel thesis can be reasonably applied to NBFIs. Monetary policy, then, can influence most intermediaries' balance sheets through its direct impact on their equity capital.[3]

[3] Equity capital can be directly influenced by monetary policy in two ways: (1) through changes in intermediaries' *profits* and (2) through changes in their *stock prices*. Van den Heuvvel (2002, 2007), as will be described shortly in this section, argues that monetary policy has an impact on intermediaries' equity capital through changes in profits. In addition, monetary policy may directly influence intermediaries' equity capital through changes in their "stock prices." For example, a sharply rising interest rate (induced by tight monetary policy) is directly able to reduce the stock prices of intermediaries in the following ways. First, higher interest rates make given future dividend less valuable in today's value. Second, higher interest rates make interest-paying financial assets more attractive than stocks, reducing the willingness to pay for stocks (Bernanke, 2003). A larger number of scholars empirically find that unexpected tighter or easier monetary policy is associated with an increase or decrease, respectively, in the overall U.S. stock prices (Bernanke, 2003; Bernanke & Kuttner, 2005; Rigobon & Sack, 2004; Thorbecke, 1997) In particular, English, Van den Heuvel, and Zakrajsek (2012) find that unanticipated changes in interest rate (induced by FOMC announcement) have large negative effects on bank stock prices.

Van den Heuvel (2002, 2007) asserts that monetary policy can directly influence banks' equity capital through changes in their profits. In his argument, the influence of monetary policy on equity capital arises from a key function of banks: maturity transformation. It is the transformation of securities with short maturities that depositors desire into securities with long maturities that borrowers desire. Such a function can be extended to NBFIs such as financial companies, mortgage companies, funding companies, and so on. This is because NBFIs raise nondeposit sources of funds by issuing short-term debt in the money market and used them to make long-term loans, even though they do not have access to deposits. So, it is reasonable that financial intermediaries in general perform a maturity transformation function—i.e., borrowing short and lending long—in credit markets.

As a result of the maturity transformation of most financial intermediaries, they are exposed to interest rate risk. A change in market interest rates can cause intermediaries' profits and consequently equity capital to fluctuate. For example, as market interest rates sharply rise (after tightening monetary policy), the "interest expense" from short-term debts grows more rapidly than the "interest income" from long-term assets. The discrepancy between the interest income and expense squeezes intermediaries' profits, therefore reducing their equity capital. Such a reduction of equity capital, or net worth, is more serious for financial intermediaries because they are highly leveraged institutions compared to nonfinancial firms. A small change in their profits may lead to a large fluctuation in their net worth.

B. How Do Intermediaries' Financial Conditions Affect Costs of Funds?

Second, a change in intermediaries' financial conditions influence the costs of funds available to all intermediaries in the wholesale market.[4] Under the condition where all intermediaries rely on nondeposit

[4] Of course, to operate the second part, both banks and NBFIs must resort to nondeposit sources of funding in the wholesale market. In particular, NBFIs that lack access to insured deposits must depend on nondeposit funds as a main source for their lending. Banks also have increasingly used the same nondeposit funds to supplement a traditional source of deposits (Feldman & Schmidt, 2001)—as a consequence of high competition for household savings from institutional investors. Thus, these two lending institutions have become increasingly dependent on nondeposit funds.

sources of funds (uninsured funds) in their lending business, deterioration of intermediaries' financial conditions causes them to pay higher rates to borrow funds in the wholesale market.

Why are the costs of funds closely associated with the financial conditions of borrowers? A concept of an external finance premium, or lemon premium, shed light on this relationship. The external finance premium is defined as the difference between the cost of external funds (funds raised from outsiders) and opportunity cost of internal funds (the firm's cash flows or funds controlled by insiders) (See Bernanke, 1993). External funds are always more expensive than internal funds because outsiders, who cannot perfectly observe and control the risk associated with their lending to firms, must bear the costs for evaluating and monitoring firms—or the cost of the "lemon's premium" arising from the fact that borrowers have better information about their prospects than lenders. Although the external finance premium is generally used in the balance sheet channel (of nonfinancial firms), such a concept can be applied to financial intermediaries too. The reason is that information problems make it difficult for outsiders to observe the risk associated with activities of financial intermediaries like those of nonfinancial firms. So, when raising external funds, financial intermediaries would face the same information problems to outsiders (lenders of wholesale market) as nonfinancial firms would face to outsiders (financial intermediaries). This form of the balance sheet channel of *financial intermediaries* was suggested by researchers such as Kashyap and Stein (1995) and Stein (1998).[5]

In particular, Stein's (1998) adverse selection model gives us some insight into why banks and NBFIs can be subject to the "adverse selection" problem under asymmetric information. According to Stein's model, banks mainly use insured deposits in their business, and insured deposits are always cheaper than uninsured funds. If banks are somehow forced to tap into uninsured funds, they will be constrained to raise uninsured funds due to asymmetric information problems. Wholesale-market lenders, who have fewer information about the value of bank' assets than banks, request a lemons' premium (and ultimately

[5] See, for example, Kashyap and Stein (1995), Houston, James, and Marcus (1997), Stein (1998), and Jayaratne and Morgan (2000).

an external finance premium) to disentangle an adverse selection issue. On the other hand, depositors do not request such a premium because deposits are federally insured "asymmetric-information-proof" funds and thus circumvent such an issue. In the explanation of intermediaries' balance sheets channel, insured deposits can be thought of as a form of *internal funds* or cash flow without adverse selection problem (Jayaratne & Morgan, 2000). In contrast, uninsured funds can be thought of as a form of *external funds* with an adverse selection problem. Such an adverse selection problem explains why uninsured funds are intrinsically more costly than insured deposits to banks. In addition to banks, the same logic can be applied to NBFIs. For NBFIs, uninsured deposits are also more expensive than their internal funds because NBFIs confront the same adverse selection problem in the wholesale market. Therefore, NBFIs, which pose the same information problems to the lenders of uninsured funds as banks, also can fall into the adverse selection model.

Importantly, the costs of uninsured funds depend on the financial health of all financial intermediaries. In the market for uninsured funds, adverse selection becomes an important issue in the presence of asymmetric information problem—i.e., intermediaries have more information about the quality of their loans than the lenders of uninsured funds. Thus, uneasiness of lenders of uninsured funds about the quality of intermediaries' assets creates an external finance premium (reflecting a lemons' premium) for intermediaries. Therefore, financial intermediaries face the same external finance premium for the quality of their assets in the intermediaries' balance channel as nonfinancial firms face it in the firms' balance sheet channel. Essentially, the theory of balance sheet channel predicts that the external finance premium a borrower must pay should rely on the strength of the borrowers' financial condition—the larger the borrowers' net worth is, the smaller the external finance premium should be.[6] So, intermediaries' net worth affects their external finance premium and ultimately the costs of uninsured funds.

C. How Do Costs of Funds Affect Investment Spending?

[6] "Intuitively, a stronger financial position (greater net worth) enable a borrower to reduce her potential conflict of interest with the lender, either by self-financing a greater share of her investment her project or purchase or by offering more collateral to guarantee the liability she does issue" (Bernanke, 1995, p. 35).

Finally, the costs of funds (in the wholesale market) affect firms' investment spending in the economy. When facing an increase in the costs of funds, most financial intermediaries respond by decreasing the loan supply to their own borrowers. In turn, the borrowers, who are constrained to raise funds elsewhere, are forced to cut back their investment spending. In this explanation, it is important to note that different intermediaries have ability to reduce their loan supply to different classes of borrowers because each intermediary specializes in dealing with some information-problematic borrowers. Why do financial intermediaries in general have such abilities? This question is closely associated with the special role of all financial intermediaries in the credit markets.

The idea of the specialness of overall financial intermediaries is essentially based on a theory of the bank lending channel. Banks are, according to the bank lending channel, special because they are well-positioned to deal with some classes of borrowers—especially small firms, who pose severe information problems. They overcome the information problems of borrowers by gathering borrowers' information, while evaluating and monitoring borrowers. Without information production of banks, small firms would not able to obtain funds owing to a great uncertainty about their investment plan. Therefore, banks are unique in supplying loans to small firms.

However, a number of economists suggest that, just like banks, NBFIs are unique in the credit markets too. The reason is that NBFIs are also well-suited to handle different information-problematic borrowers by producing their own information about borrowers, while screening and monitoring borrowers; such borrowers are unable to find funds elsewhere due to their asymmetric information problems. In support of this view, Carey et al. (1998) suggest that finance companies specialize in the "collateralized loans" based on borrowers' accounts receivable, inventories, and equipment to highly risky firms, who pose severe information problems to lenders. Carey et al. (1993) and Prowse (1997) suggest that insurance companies specialize in the "long-term loans" to the medium to large firms, who pose somewhat moderate information problems. By the same token, thrift institutions and mortgage companies may specialize in "home mortgage lending" to households, who pose somewhat different information problems that firms pose.[7] Since NBFIs, accordingly, are able to influence the loans supply to their own information-problematic borrowers, they also play a special role in the credit markets.

Therefore, it is reasonable that *financial intermediaries in general* specialize in overcoming the information problems of different types of borrowers. Each financial intermediary accumulates their own "informational capital" by developing their expertise in understanding financial condition of borrowers―possibly through continuous relationship with customers. By using information capital, financial intermediaries are able to provide the *information-intensive* loans to their borrowers. These intermediaries are undoubtedly different from the lenders of public debt market who do not have such information capital and thus cannot make the information-intensive loans to borrowers. For this reason, financial intermediaries in general have a comparative advantage over the lenders of public debt markets.[8] In support of this view, a number of research finds that intermediated loans in general play a unique role in the credit markets. (see Szewczyk & Varma, 1991; Carey et al. 1993, 1998; Preece & Mullineaux, 1994; Billett, Flannery & John, 1995). Because overall financial intermediaries are unique in supplying loans to some borrowers, cost of funds (of intermediaries at the wholesale market) can influence borrowers' investment spending.

III. DATA DESCRIPTION AND METHODOLOGY

[7] In contrast to credit supplying intermediaries, some financial intermediaries do not provide credit directly to businesses and households, but they may *indirectly* influence the credit supplied in the economy. For example, the fund managers of pension or mutual funds, who may have superior knowledge of future prospects for firms, may be good at picking up more profitable securities such as stocks and bonds. So, they may indirectly influence the credit supply through changes in the prices of securities. Investment banks also play a somewhat different role in the intermediation process. Rather than attracting household savings and investing in different sectors of the economy, investment banks deal with the underwriting of new firm stock and bond issues as well as the distribution of such securities to individuals. For instance, if a firm's profit is expected to increase in the future, fund managers will purchase the firm's stocks or bonds and increase the price of these securities. Then, the higher prices in stocks or the lower interest rate in bonds makes the firm easier to finance, which in turn increases the credit supplied in the economy.

[8] Although financial intermediary loans in general are special to intermediary-dependent borrowers, bank loans, insurance company loans, and finance company loans are not likely to be identical. Each has its own specialty to different information-problematic borrowers.

A. Data Description

The balance-sheet data of financial intermediaries are available from various issues of the *Flow of Funds Accounts of the United States*, hereinafter called the Flow of Funds Accounts or the FFA. The publication is issued quarterly by the Federal Reserve System.[9] The data sets for the empirical test utilized in this study are collected from 1954 Q3 to 2010 Q2. Because our purpose is to examine the question of whether or not NBFIs behave in the same way as banks do after a monetary tightening, the basic setup for handling the data should facilitate a comparison and contrast of banks and NBFIs.

In the FFA, financial intermediaries are divided into 14 groups: Commercial Banking, Savings Institutions, Credit Unions, Property-Casualty Insurance Companies, Life Insurance Companies, Private Pension Funds, State and Local Government Retirement Funds, Government-Sponsored Enterprises (GSE), Agency- and GSE-backed Mortgage Pools, Issuers of Asset-Backed Securities (ABS), Finance Companies, Real Estate Investment Trusts (REITs), Security Brokers and Dealers, and Funding Corporations. To facilitate my analysis, I have organized those 14 financial intermediaries into two groups: banks and NBFIs. The category of banks includes depository institutions, which are the first three intermediaries (i.e., commercial banking, savings institutions, and credit unions), while the category of NBFIs incorporates nondepository institutions, which are the remaining 11 financial intermediaries.

I have also created three categories of loans—C&I loans, mortgages, and consumer loans—across banks and NBFIs. Because the FFA provides the balance-sheet data for each of the 14 financial intermediaries, we can identify those three types of loans across these two groups by examining the items on the asset side of each of the 14 balance sheets. For example, to measure the total quantity of consumer loans for banks, I added up all consumer loans on the asset side of the balance sheets for commercial banks, savings institutions, and credit unions. Similarly, to measure the total quantity of consumer loans for

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[9] Data are available at http://www.federalreserve.gov/releases/z1/Current/data.htm. Also, all FFA data are available via *Data Download Program* (DDP) at the Federal Reserve System.

NBFIs, I aggregated all consumer loans on the asset side of them for other remaining financial intermediaries. C&I loans and mortgages were aggregated in a similar manner across banks and NBFIs.

NBFIs had gradually increased the market share of total loans over 50 years, eroding the corresponding market share of banks. In 1959, NBFIs provided only 17% of total credit with the U.S economy. By 2009, however, they accounted for 59 % of total credit supplied. For components of loans, NBFIs increased their market share of C&I loans, mortgages, and consumer loans over banks―respectfully by 37%, 65%, and 52% over banks in 2009. For NBFIs, all C&I loans are made only by finance companies; all mortgages are made by Property-Casualty Insurance Companies, Life Insurance Companies, Private Pension Funds, State and Local Government Retirement Funds, GSE, ABS, Finance Companies, REITs; all consumer loans are made by GSE, ABS, Finance Companies.

B. Methodology

This study has employed two approaches to measuring the impact of monetary policy on the aggregate loan, the components of loans, and net worth. The first methodology that I have used is a traditional Ordinary Least Squares (OLS) regression model, following the analysis of Kashyap, Stein, and Willcox (1993)―hereafter identified as KSW. Following the analysis of Bernanke and Blinder (1992), I have utilized a vector autoregression (VAR) model as my second methodology.

1. A KSW-Style Approach

KSW (1993) used "Granger causality tests" to examine the relationship between monetary policy and financial variables―i.e., to see if the past values of monetary policy provide important information to predict the values of financial variables. Following the analysis of KSW (1993), I employed the Granger-causality tests in two basic ways: a *bivariate* model and a *multivariate* model. Similarly in the bivariate specification of equation (1), I regress the change in intermediated loans (L) on 6 quarterly lags of itself, 6 lags of a monetary policy indicator (MP), and a constant. In the multivariate specification of equation (2), I add 6 lags of the growth of real GDP to equation (1) because, according to KSW, the growth of real

GDP should be added to the equation “in an effort to control for cyclical factors other than monetary policy which might conceivably affect the financial variables” (1993, p. 86). Specifically, I run the following regression:

$$\Delta L_t = c + \sum_{i=1}^{6} \alpha_i \Delta L_{t-i} + \sum_{i=1}^{6} \beta_i \Delta MP_{t-i} + u_t \cdots\cdots\cdots\cdots (1)$$

$$\Delta L_t = c + \sum_{i=1}^{6} \alpha_i \Delta L_{t-i} + \sum_{i=1}^{6} \beta_i \Delta MP_{t-i} + \sum_{i=1}^{6} \gamma_i \Delta GDP_{t-i} + u_t \cdots\cdots (2)$$

These regressions test whether monetary policy Granger-causes financial variables. Such tests equate in fact to determining whether the β_i coefficients equal zero in a regression. For example, in equation (1), we want to test whether the past values of monetary policy are useful in forecasting the quantity of loans. If these past values significantly improve the prediction of the loan quantity, we can say that monetary policy Granger-causes the loan quantity. To be precise, in order for monetary policy to Granger-cause the loan quantity, (1) the coefficients on the lags of monetary policy must be statistically different from zero “as a group”—i.e., $\beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 \neq 0$. Therefore, when this condition holds, we can conclude that changes in the stance of monetary policy have some impact on the quantity of loans available in the financial system.

The financial variables applied in this analysis are these: *net worth*, *total intermediary loans*, and the *components of intermediary loans* (i.e., commercial and industry (C&I) loans, mortgages, and consumer loans). In particular, to measure the effect of monetary policy on the components of loans, I estimate equation (1) or (2), replacing the intermediary-loan variable with the mortgage variable.

In this analysis, the Federal funds rate is used as an indicator of monetary policy.[10] Bernanke and Blinder (1992) assert persuasively that changes in the Federal funds rate are a good indicator of monetary policy. According to their argument, changes in the Federal funds rate measure policy-induced shocks to reserve supply. However, "the funds rate would not be a good measure of monetary actions if its information content stemmed from shocks to reserve demand—arising from changes in the economy—rather than from shocks to reserve *supply*" (Bernanke et al. 1992, p. 914).[11]

All variables except the Federal funds rate take the logged form. All variables, including the Federal funds rate, have been tested for stationarity with the Augmented Dickey Fuller test (ADF), and those variables turned out to have a unit root. Following the KSW, therefore, I determined that all variables are *first-differenced* in order to be transformed into stationary variables, and that 6 lags are applied to the regression.[12]

2. A VAR Approach

A KSW-Style approach has been criticized because it does not distinguish between *endogenous* and *exogenous* monetary-policy actions. *Endogenous* policy actions are the actions of a monetary authority responding systemically to the developments of the economy, while *exogenous* policy actions consist of all other actions of the monetary authority. In order to focus on the independent effect of monetary policy, we need to identify the exogenous monetary-policy shocks.

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[10] Also, Romer's *dummy* variables have been frequently used as an indicator of monetary policy in the literature. Romer and Romer (1989) read the minutes of the FOMC and select some dates as markers of the beginning of an anti-inflationary tightening of monetary policy, or *exogenous shocks*. However, since "Romer dates" are not available after 1988, "Romer dates" are not applicable to the data from 1989 to 2010. Therefore, I have employed only changes in the Federal funds rate as an indicator of the stance of monetary policy in this study.

[11] "For the funds rate to be a good measure of monetary-policy actions, it must be essentially unresponsive to changes in reserve demand within a given month" (Bernanke et al. 1992, p. 914). This means that the supply curve of nonborrowed reserves is extremely elastic at the target federal funds rate. Using both monthly and weekly data, Bernanke et al. (1992) find little effect of reserve demand shocks on the funds rate, which supports the idea that the funds rate is mostly driven by policy decisions.

[12] When 2 lags, 4 lags, and 8 lags are applied to the regression, the result of analysis is not materially different from 6 lags.

To identify such exogenous shocks of monetary policy, Bernanke and Blinder (1992) found a variable, the Federal funds rate, whose innovations to the Federal-fund-rate equation can be interpreted as the exogenous shocks in a VAR. Specifically, rather than assuming the entire structure of the economy in detail as in a structural VAR, they employed a recursive VAR to identify the dynamic effects of the exogenous-policy shocks on various macroeconomic variables.[13] As a result, these researchers can measure the true structural response of the economy to exogenous monetary-policy shocks, a response that more accurately reflects the dynamic response of the economy to changes in the Federal fund rate. Examining the responses to a Federal-funds rate shock across financial variables and target macroeconomic variables allows us to "see" the monetary-transmission mechanism open up. Following their analysis, I have employed this recursive VAR model to measure the impact of monetary policy on financial variables.

To demonstrate the identification made by VAR, consider the following as the structure of the economy:

$$Y_t = \sum_{i=1}^{6} B_i Y_{t-i} + \sum_{i=1}^{6} C_i P_{t-i} + u_t \cdots\cdots\cdots\cdots\cdots\cdots (3)$$

$$P_t = \sum_{i=0}^{6} D_i Y_{t-i} + \sum_{i=1}^{6} G_i P_{t-i} + v_t \cdots\cdots\cdots\cdots\cdots\cdots (4)$$

Y is a vector of nonpolicy variables that capture economic conditions; it includes macroeconomic variables such as real GDP growth, consumer-price index, and other real financial variables. **P** is a vector of policy variables; it includes only the Federal funds rate. The symbols *u* and *v* are *orthogonal* disturbances, which mean that *u* and *v* represent mutually uncorrelated white-noise disturbance in the structure of the economy. The assumption embodied in equations (3) and (4) is that the current P does not

[13] In the recursive VAR, it is sufficient to identify one of the following assumptions; (1) there is no feedback from the economy to policy actions within the period, but policy actions affect the macroeconomic variable within the period—according to this assumption, the Federal funds rate is placed *first*—or (2) policy actions affect the macroeconomic variables with "only lags"—according to this assumption, the Federal funds rate is placed *last*.

enter the equation (3)—that is, that C_0=0—so that the Federal funds rate affects the other macroeconomic variables with *only lags,* but macroeconomic variables affect the Federal funds rate within the period.

This identification assumption is consistent with an ordering in the VARs that the Federal funds rate is placed *last*—especially in a Choleski decomposition of the variance-covariance matrix of the residuals. In particular, depending on the unit of data employed in our analysis, an *identification* assumption can be appropriately chosen. For example, if we use the *annual data* the assumption that monetary policy affects other macroeconomic variables within periods is more plausible. So, we place the policy variable "first." On the other hand, if we use the *monthly data*, or *quarterly data*, the assumption that the actions of monetary authority affect macroeconomic variables with only lags is more reasonable. So, we place the policy variable "last" (see Walsh 2003). However, regardless of the order of the Federal funds rate, if the residuals correlations turn out low, the impulse-response functions are not sensitive to the ordering of variables (see Enders, 2004).

The VARs are estimated using the quarterly data from these sources: (1) the log of real GDP (RGDP), (2) the log of the consumer-price index (CPI), (3) the log of produce-price index (PPI), (4) the log of real financial variables, and (5) the Federal funds rate (FFR). Financial variables (4) are represented as net worth (NW), intermediary loans (L), commercial and industrial loans (CI), mortgages (M), and consumer loans (CL). I have included the Producer Price Index (PPI) in the VAR in order to resolve the existing "price puzzle" in the literature.

In the VAR I use in this study, each of the real financial variables—NW, L, CI, M, and CL—is entered into the model. For example, in order to assess the response of *net worth* to monetary policy, I place the variables in the system in this way: RGDP, CPI, PPI, NW, and FFR. Although this four-variable VAR provides a very simple description of the economy, it has advantages of retaining the minimum set of variables necessary for the study without loss of the available data set, and it produces reasonable impulse-response functions.

After all variables—except the Federal funds rate—are seasonally adjusted and are logged, all variables are tested for stationarity for the Augmented Dickey Fuller (ADF) test. All variables are found to be *I* (1); that is, they all contain a unit root. However, Sims (1980) argued that we should not difference the time series data to transform nonstationary variables into stationary variables. The reason is that differencing the data in such a way drops valuable information about the long-term relationship between variables in the system out of the equations. Therefore, in the procedures undertaken in this study, all variables are not differenced. In addition, the lag length in the VAR is determined by two factors: the Alkaike information criterion (AIC) and the final-prediction error (FPE), whose determination was that 6 lags are optimal.[14]

IV. EMPIRICAL RESULTS

This section examines the behavior of banks and NBFIs separately following the shifts of monetary policy because an important question is whether NBFIs behave in the same way as banks do in these kinds of circumstances. As discussed in Section II, a monetary tightening reduces the net worth of banks and NBFIs; the fall of their net worth, in turn, causes the cost of wholesale funds to rise, thus reducing the supply of intermediated loans. So in this empirical test, I first examine the response of the *net worth* of intermediaries to a monetary policy shock.

A. The Response of the Net Worth

To test whether monetary policy has a significant impact on the net worth of financial intermediaries, I use the KSW-style methodology described in Section III. From the equations (1) or (2), I replace an intermediary loan variable (L) with net worth (NW). Specifically, I run this regression:[15] [16]

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[14] In EViews, Schwarz Information Criterion (SIC) selects 2 lags, Hannan-Quinn information criterion (HQ) selects 3 lags, and both Alkaike Information Criterion (AIC) and Final Prediction Error (FPE) select 6 lags (see Appendix A). Since 6 lags are mostly selected among different criteria, 6 lags are used in the VAR and reported in this paper. However, the results of the VAR in 2 lags or 3 lags generally demonstrate a result similar to those with 6 lags.

$$\Delta NW_t = c + \sum_{i=1}^{6} \alpha_i \Delta NW_{t-i} + \sum_{i=1}^{6} \beta_i \Delta MP_{t-i} + u_t \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (5)$$

$$\Delta NW_t = c + \sum_{i=1}^{6} \alpha_i \Delta NW_{t-i} + \sum_{i=1}^{6} \beta_i \Delta MP_{t-i} + \sum_{i=1}^{6} \gamma_i \Delta GDP_{t-i} + u_t \cdots\cdots\cdots (6)$$

Table 1 Responses of Net Worth
(1954: Q3 – 2010: Q3)

	Total Financial Institutions	Banks	NBIFs
	β_i sum	β_i sum	β_i sum
Net Worth	−0.026***	−0.030***	−0.027***
(bivariate)	(4.12)	(2.60)	(3.39)
Net Worth	−0.035***	−0.044***	−0.031***
(multivariate)	(4.95)	(3.20)	(3.51)

Notes: In the bivariate model, the net worth of financial intermediaries—total financial institutions, banks, and NBFIs, respectively—is regressed against a constant, 6 lags of itself, and 6 lags of a monetary policy indicator (MP). In the multivariate model, 6 lags of GDP are added to the regression. All variables except MP take the logged form, and all variables including MP were differenced to the stationary form. Entries in the "β_i sum" columns show the sum of coefficients on the lags of monetary policy indicator with the *t* statistics in parentheses. Entries in "exclusion" columns show the marginal significant level for the test that MP does not help forecast the net worth. *, **, and *** denote significance at 10%, 5 %, and 1%, respectively.

The net worth of financial intermediaries—total financial institutions, banks, and NBFIs, respectively—is entered into equations (5) and (6). If monetary policy Granger-causes the quantity of net worth, we can infer that monetary policy has some impact on the net worth of each group.

Table 1 reports the results of equations (5) and (6), which represent bivariate model and multivariate models individually across groups. In the *t* test approach, entries in the β_i *sum* report the sum of the β_i coefficients from each regression, and the parenthesis shows the *t* statistic for the test of the sum. In this

[15] All variables, like the net worth and real GDP growth, have been transformed into the log form; only the variable that is used as an indicator of monetary-policy remains unchanged. Although we do not difference all of the variables in the VAR model, variables in this OLS model have been differenced so they enter the regressions in stationary form. These variables are log net-worth, the Federal funds rate, log real-GDP growth.

[16] To determine the length of lags, I have looked at three different kinds of the lag tests: Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn criterion (HQ) (see Appendix B). In net worth, I report the results produced with 6 lags, which are shown as a baseline specification here. However, I report the results of 8 lags as well, which are chosen in testing the intermediated loans. (Refer to Appendix C for the result of 8 lags). Basically, the results of 8 lags are not materially different from the results produced with 6 lags.

case, a large *t* value, one exceeding the critical *t* value, indicates that the sum of the β_i coefficients is more reliable, and that the monetary-policy variable is important for predicting the behavior of net worth.

Under the theoretical justifications provided in Section II, we would expect the net worth of financial intermediaries to decrease in response to a monetary tightening. The results are strongly consistent with such a theoretical explanation. As shown in Table 1, β_i *sum* entries indicate that the net worth of total financial institutions—banks and NBFIs—decreases after a positive shock in the Federal funds rate in either the bivariate or multivariate model. After 1% increase in the Federal funds rate, banks decrease their net worth by 3% and NBFIs decrease by 2.7% in the bivariate model. Note that tight monetary policy has a somewhat stronger impact on the net worth of banks than on that of NBFIs: the β_i *sum* for banks is −0.030 in the bivariate model and −0.044 in the multivariate model; for NBFIs the β_i *sum* is −0.027 in the bivariate model, and −0.031 for the multivariate model. The *t* values for those β_i *sums* are statistically significant at the 2% level. All of these results are consistent with the theoretical explanation in Section II.

As we would expect, the behavior of aggregate data from total financial institutions is not much different from the behaviors of disaggregate data from banks or NBFIs. That is, for *total* financial institutions, the behavior of net worth declines following a monetary tightening at the statistically significant 2% level: the β_i *sum* is −0.026 for the bivariate model, and −0.035 for the multivariate model. Interestingly, the aggregate data show statistically higher *t* values than do disaggregate data. For *total* financial institutions, the *t* vales

Total Financial Institutions　　　　Banks　　　　Nonbank

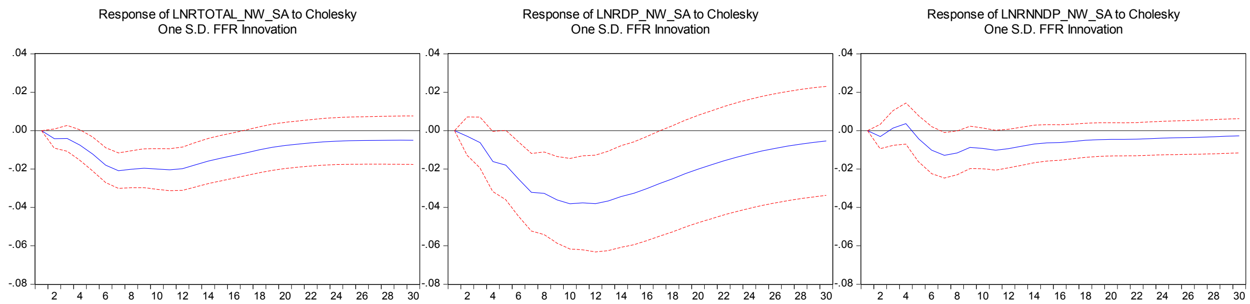


Figure 1 Responses of Net Worth (1954: Q3 – 2010: Q3)
VAR Ordering: Y, CPI, PPI, NW, FFR

are 4.12 for the bivariate model and 4.95 for the multivariate model. For *bank*, the *t* values are 2.60 for the bivariate model and 3.20 for the multivariate model. For *NBFIs*, the *t* values are 3.39 for the bivariate model and 3.51 for the multivariate model. All these results are consistent with the theoretical prediction made in Section II that monetary policy affects the net worth of banks and NBFIs both.

Alternately, I used the VAR methodology for this test. Figure 1 shows the behavior of net worth—total financial institutions, banks, and NBFIs, respectively—in response to a one-standard deviation shock to the Federal funds rate. The VAR methodology produces very similar results to those of the KSW-Style methodology: The net worth of each group reduces significantly after a monetary contraction. Consistent with the previous results, tight monetary policy impacts the net worth of banks more strongly than that of NBFIs. For NBFIs, however, the decrease of net worth is significant at the 10% level in quarter 6 to 14 after the shock. The impact of a monetary-policy shock reaches its lowest level after approximately 12 quarters: −0.023 for total financial institutions, −0.043 for banks, and −0.014 for NBFIs. Although a monetary policy shock influences banks and NBFIs in the same direction, as shown in Figure 1, the strength of impact shows that the trough of net worth is three times as deep for banks as it is for NBFIs.

B. The Response of Intermediated Loans

In the similar way in the net worth, I used the both OLS and VAR methodology for these empirical tests. The VAR methodology, in general, produces similar results to those produced by the OLS methodology. After tightening monetary policy, like banks NBFIs decrease "aggregate loans" in the same way as banks in OLS and VAR models. Although the decline of aggregate loans is statistically significant for banks, this is not the case for NBFIs. For the components of loans, banks decrease mortgages and consumer loans in both models, but NBFIs decrease only mortgages. So the movement of components is less uniform in NBFIs than in banks. Such decline of loan components is also statistically significant for banks, but this is not for NBFIs. Due to the insignificant empirical results for NBFIs, the response of intermediated loans is not reported here. To address this problem, I conduct some supplementary tests by using a new measure of monetary policy in Section V.

V. SUPPLEMENTARY TESTS

The previous section IV reports that NBFIs' net worth decreases at the statistically significant level in response to contractionary monetary policy. However, NBFIs reduce their aggregate loans and loan components at the statistically "insignificant" level even if they generally move together with banks in their loans. In this section, I introduce a new measure of monetary shocks to see if using a new measure helps us to address this issue.

A. A New Measure of Monetary Policy Shocks

In the previous section IV, I used the nominal federal funds rate—*shocks* to the funds rate—as an indicator of monetary policy because it is widely used in the literature of monetary policy. However, Romer and Romer (2004) argue that, although the federal funds rate can be considered a good measure of policy shocks, it is still subject to the problems: its endogeneity and anticipatory movements of the Fed.

1. A Problem with the Conventional Measure

First, the federal funds rate is influenced by its endogenous movements to economic conditions. During a boom, the federal funds rate increases when businesses increase demand for loans; during a recession, the funds rate decreases when they decrease it. Such endogenous movements produce a positive relationship between the federal funds rate and the quantity of loans. However, policymakers conduct monetary policy in the expectation of a negative relationship between the funds rate and loans. We would expect that the Fed' contractionary monetary policy—i.e., an *increase* in the funds rate—*decrease* the quantity of loans in the economy. Therefore, positive endogenous movements of funds rate surely offset a negative impact of monetary policy on the quantity of loans.

Second, the federal funds rate is also influenced by its anticipatory movements that are engineered by the Fed. The Fed forecasts the possible behavior of output and inflation and adjusts its policy in response to an anticipation of future economic developments. When the Fed perceives a sign of an excessive boom, it is likely to increase the funds rate to counteract the rapid growth of loan. Although the policy action has a constraining effect, the loans are nonetheless unlikely to fall in response to the interest-rate surge. Such countercyclical actions prevent us from finding a negative relationship between an increase in the funds rate and the quantity of loans. Therefore, the movements of funds rate that arise from the Fed's preemptive action fail to uncover such a negative effect, even if this relationship in fact exists.

2. The Derivation of a New Measure of Monetary Shocks

To address the problems, Romer and Romer (2004) derived a new measure of monetary policy shocks that are free of the problems of endogenous and anticipated movement. Such a new measure is obtained in the following procedures. The first procedure is to derive a series on intended funds rate changes around the time of the meetings of the Federal Open Market Committee (FOMC). For the sample period of 1966 Q1 to 1996 Q4, Romer and Romer (2004) read both quantitative records, which are *Weekly Report of the Manager of Open Market Operations*, and narrative accounts of each FOMC meeting, which is the *Record of Policy Actions of the Federal Open Market Committee*. By using this information, they were able to keep track of changes in the Fed's intended-funds rate. The resulting series on intended-funds-rate changes eliminates some short-term endogenous movements between the funds rate and the economic conditions and short-term noises—i.e., fluctuations of the funds rate from day to day.

In spite of circumventing endogenous movements, the series is still subject to the problems of the Fed's anticipatory movements because the Fed influences the funds rate in anticipation of future economic developments. The second procedure, therefore, is to eliminate the Fed's anticipatory movements from the intended funds rate series. Romer and Romer (2004) used the *Greenbook* forecasts as a proxy for policymakers' information about future economic developments—especially what will happen to prices, output, and unemployment. They take the regression of the intended funds rate series on the *Greenbook* forecasts. "The residuals from this regression show changes in the intended funds rate not taken in response to information about future economic developments. The resulting series for monetary shocks should be relatively free of both endogenous and anticipatory actions." (Romer and Romer, 2004, p. 1056)

3. Empirical Results

For the sample periods from 1966 Q1 to 1996 Q4, I reestimate equations (3) and (4) using a new measure series in place of the nominal federal funds rate. These sample periods are employed because a new measure of monetary policy shocks is available only for such sample periods. For the same sample periods, I also reestimate the same regression using the nominal federal funds rate. The comparisons of the new measure and the conventional measure show whether the new measure produces results that differ in important ways from those based on the conventional measure.

Figure 3 shows the response of total loans and components of loans (such as C&I loans, mortgages, and consumer credit) to one standard deviation innovation in the Romers' shocks. The total loans of banks fall sharply by 2.3% through quarter 9 and then reach their initial level at quarter 23. For banks, the decrease of total loans is significant at the 5% level in the "beginning" of the period, quarter 1 to 14. However, the total loans of NBFIs decline slowly by 0.3% through quarter 9 and then continuously *increase* through quarter 22; after that, they finally decline. For NBFIs, the increase of total loans is significant at the 5% level in the "middle" of the period, quarter 18 to 24.

Banks and NBFIs show almost a similar pattern in regard to the C&I loans after the shock. The C&I loans of these two types of lending institutions fall sharply by 2%, reaching their trough in the neighborhood of quarter 10. For these two lending institutions, the decline is significant at the 5% level in the "beginning" of the period—quarter 4 to 14 for bank and quarter 7 to 16 for NBFIs.

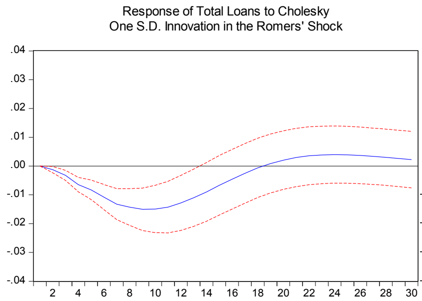
Unlike the similar pattern in C&I loans, banks and NBFIs exhibit quite a different pattern in regard to mortgages and consumer credit. Bank sharply *decrease* mortgages and consumer credit by quarter 9 or10. For banks, the declines of mortgages and consumer credit are significant at the 5% level in the "beginning" of the period, quarter 1 to 12. NBFIs, however, *increase* mortgages and consumer credit clearly in the "middle" of the period. In particular, NBFIs' mortgages slightly *decrease* for a short period in the beginning but substantially *increase* in the middle period and thereafter. Their consumer credit, on the other hand, steadily increases over time, reaching its peak in quarter 20. For NBFIs, the increase of mortgages and consumer credit is significant at the 5% level in the "middle" of the period—quarter 16 to 24 for mortgages and quarter 15 to 25 for consumer credit.

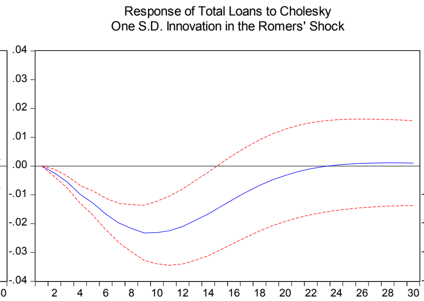
In general, the results have shown that the responses of banks and NBFIs are statistically significant, depending on the time periods. The responses of banks are statistically significant in the *beginning*, quarter 1 and 14, while the responses of NBFIs are statistically significant in the *middle*, quarter 14 and 25—except the C&I loans. Such a different pattern of the significant level may reflect the different lending behavior of each group of financial institutions. That is, banks tend to aggressively decrease loans in the beginning right after the shock, but NBFIs tend to aggressively increase loans in the middle periods.

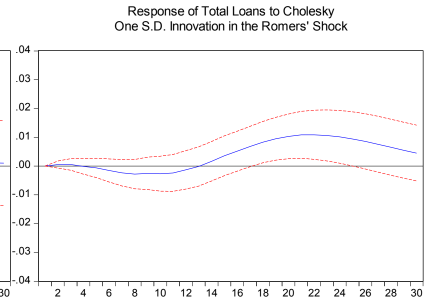
Why is it the case? One explanation is that banks may cut back on mortgages and consumer credit while NBFIs pick up the demand for loans. Because some borrowers cannot obtain mortgages and consumer credit from banks—at a time when borrowers still have demand for loans—they may turn to NBFIs to find

Total Loans

Total Financial Institutions | Banks | Nonbank

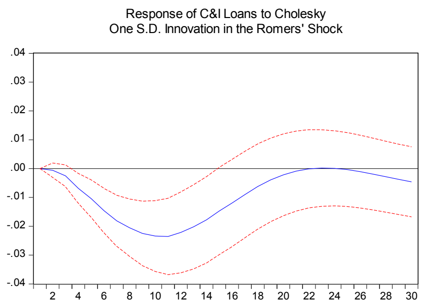


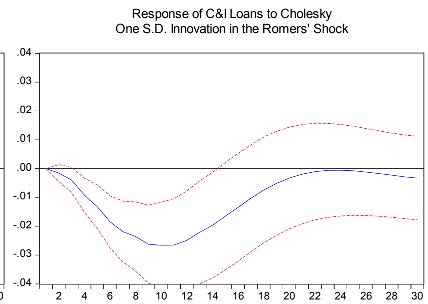


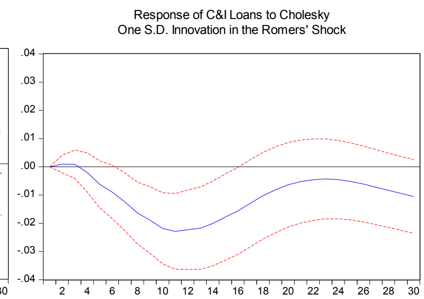


* C&I Loans

Total Financial Institutions | Banks | Nonbank

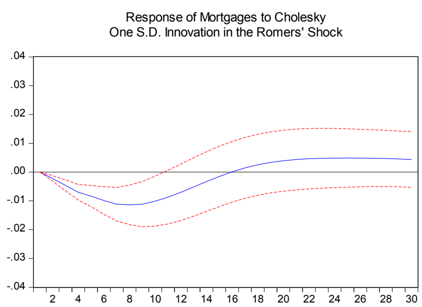


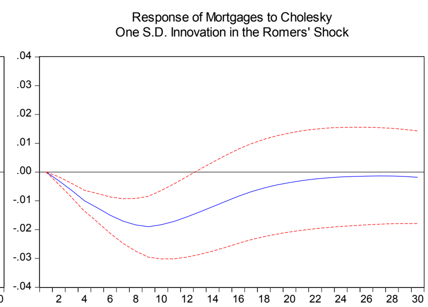


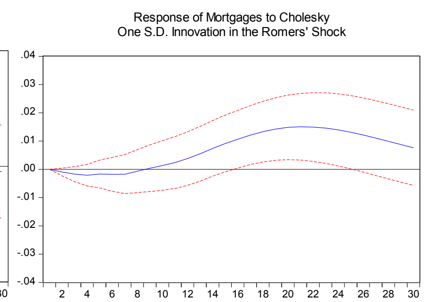


Mortgages

Total Financial Institutions | Banks | Nonbank







* Consumer Credit

Total Financial Institutions | Banks | Nonbank

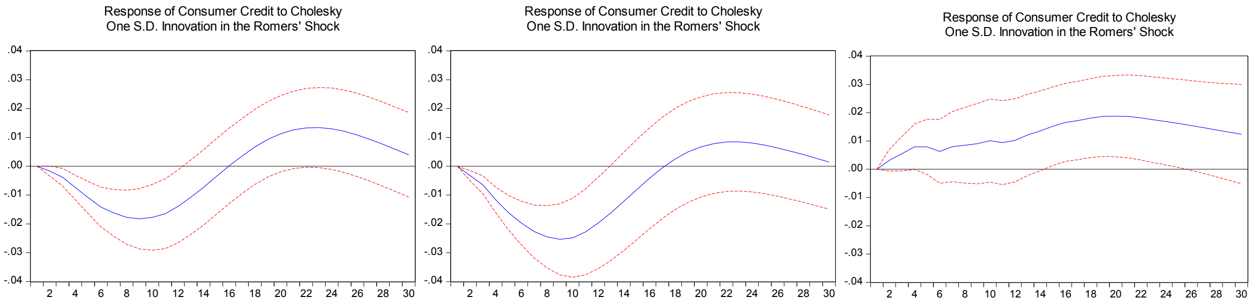


Figure 3 Responses of Total Loans and Components of Loans to a One S.D. a New Measure Innovation (1966: Q1 – 1996: Q4)

VAR Ordering: Y, CPI, PPI, Total Loans or Components of Loans, New Measure

credit. If NBFIs pick up the slack, borrowers may obtain mortgages and consumer credit from NBFIs. Such a substitution of credit may reflect the behavior of mortgages and consumer credit between banks and NBFIs. NBFIs' mortgages may slightly decrease in the beginning because it is difficult for borrowers to find appropriate nonbank lenders immediately for a "large" volume of loans. Yet, borrowers may be able to find appropriate nonbank lenders over time, increasing mortgages substantially in the middle periods. However, unlike mortgages, borrowers may find nonbank lenders easily for a "small" volume of consumer credit. Thus, NBFIs' consumer credit may increase instantaneously.

Figure 4 exhibits the responses of total loans and components of loans to either a federal funds rate shock or a new measure shock—for banks and NBFIs, respectively. The comparisons of the new measure and the conventional measure reveal that the VAR results using new measure (the right columns) shows somewhat stronger impact on total loans and components of loans than those using the conventional measure (the left columns). Overall, the impact of the new measure is somewhat larger, faster, and substantially more significant than the impact of the conventional measure to banks and NBFIs. These results are similar to the results produced by Romer and Romer (2004).

The responses of mortgages show that the impact of the new measure is very similar to or slightly stronger than that of the conventional measure—either for banks or NBFIs. However, the responses of C&I loans show that the impact of new measure is substantially stronger, quicker, and more statistically significant than that of the conventional measure for banks and NBFIs. Consumer loans respond somewhat more sensitively to new measure than to the conventional measure. All of these results are consistent with results produced from Romer and Romer (2004), who examine the relationship between their new measure (or conventional measure) and output. In particular, the substantially stronger, quicker, and significant impact of new measure to C&I loans suggests that the endogenous behavior of the funds rate and the anticipatory component of Federal Reserve actions may be substantial in C&I loans and may obscure some of the true relationship between monetary policy and the loan growth.

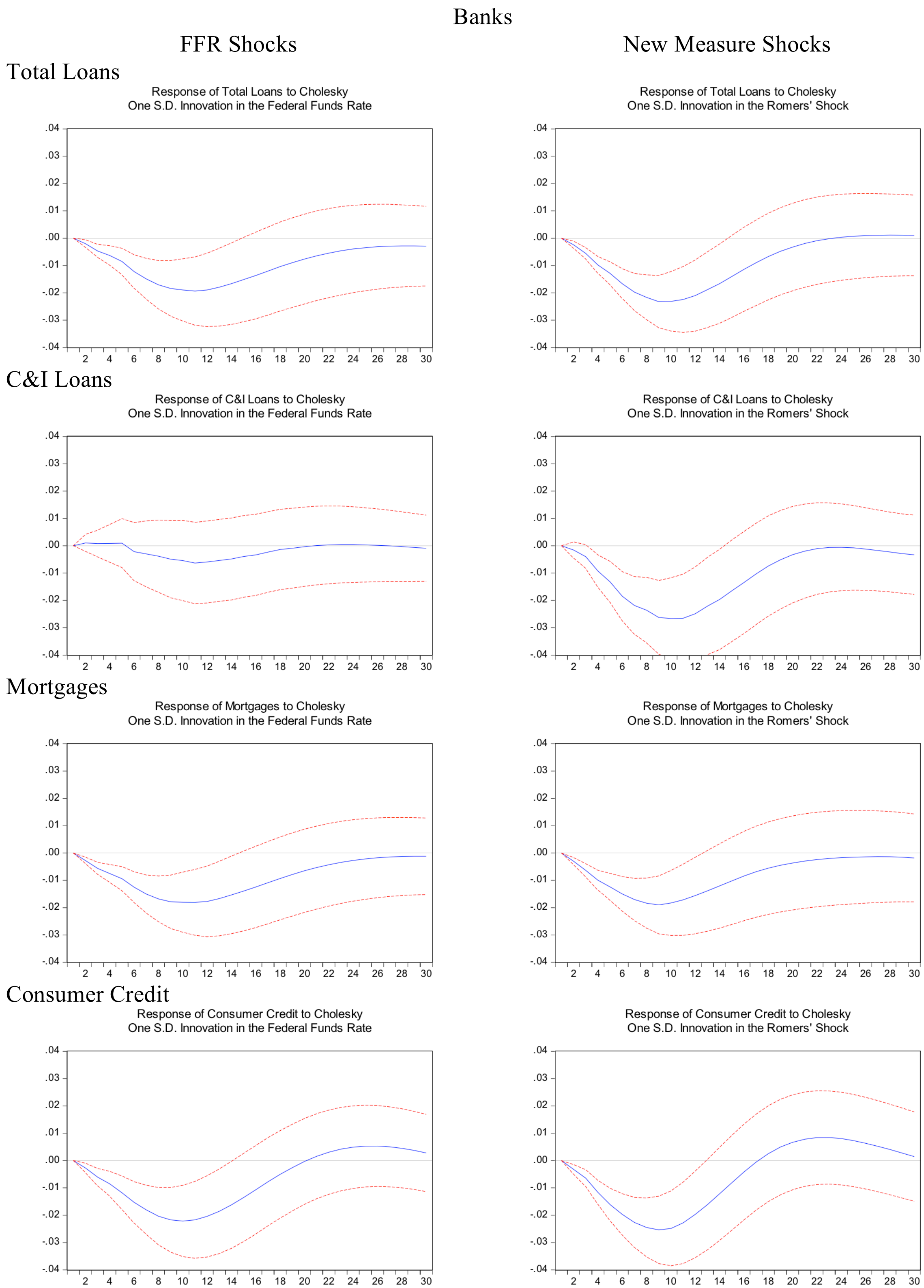
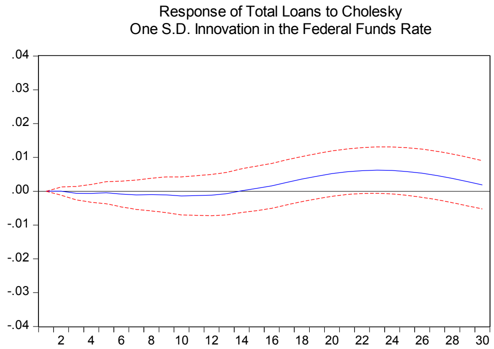


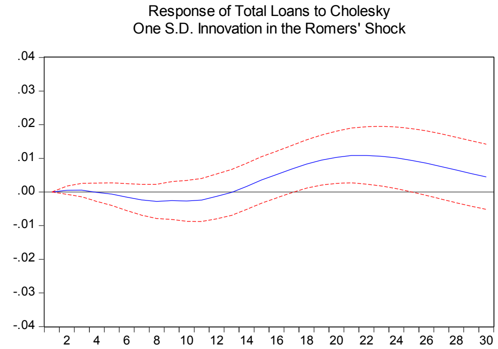
Figure 4 The Responses of Total Loans and Components of Loans to a Federal Funds Rate Shock and a New Measure Shock (1966: Q1 – 1996: Q4)

Nonbanks

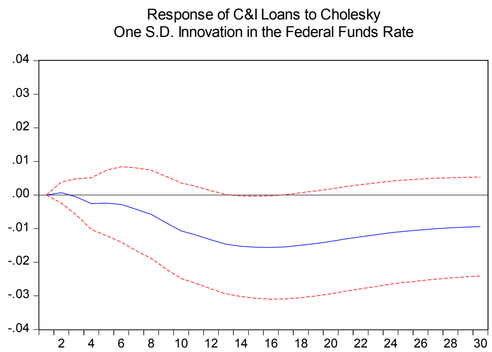
FFR Shocks | New Measure Shocks

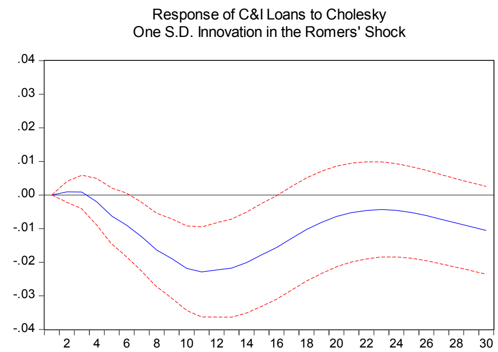
Total Loans



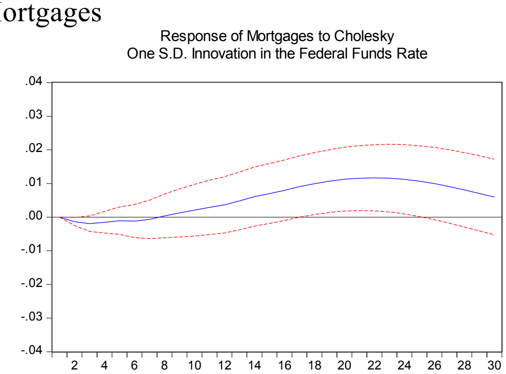


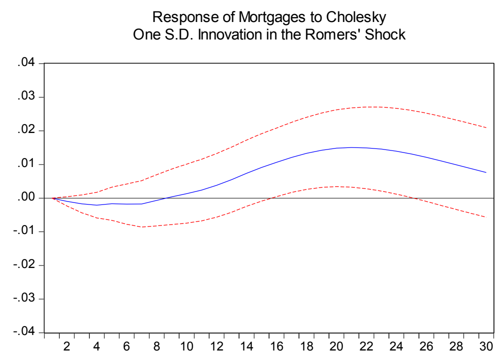
C&I Loans



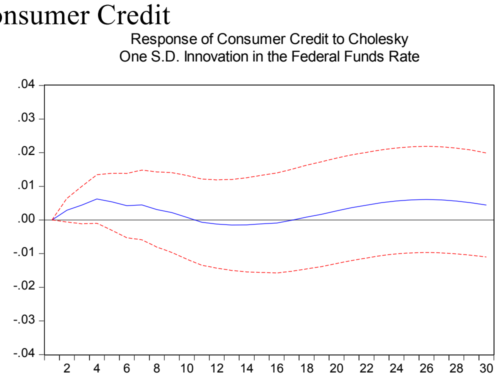


Mortgages





Consumer Credit



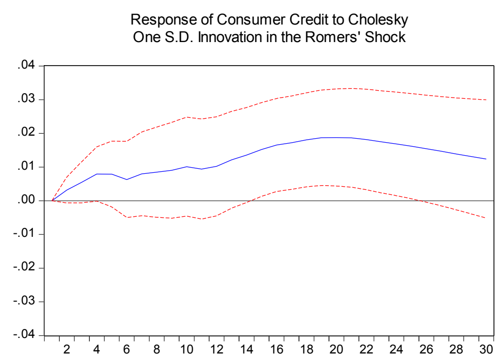


Figure 4 Continued

VI. CONCLUSION

Despite a substantially growing importance of NBFIs, the role of NBFIs in the monetary transmission mechanism has received much less attention. This research paper, both theoretically and empirically, addresses such an issue by examining the behavior of banks and NBFIs in response to a monetary shock.

I theoretically provide an explanation of how monetary policy affects the balance sheet conditions of banks and NBFIs and, after that, their intermediated loans to borrowers. According to the bank capital channel, tight monetary policy deteriorates the balance sheet conditions of all intermediaries through the decrease of their net worth. In turn, if all intermediaries must use uninsured nondeposit funds to continue lending, according to the adverse selection model, they will face the higher cost of funds in the wholesale market.

This is because lenders of uninsured nondeposit funds will charge the credit risks, or a lemon premium, associated with their uninsured lending. Therefore, all intermediaries that experience a higher cost of funds will reduce the supply of loans to their borrowers. This explanation suggests that monetary policy may exert significant influence on the supply of *intermediated loans* through the medium of *net worth* of all participating financial intermediaries.

I empirically test the theory suggested above. Employing the traditional OLS and the VAR methodology, I find that NBFIs shrink their net worth and a type of loan (C&I loans) in the similar ways as banks. My empirical results strongly support the first part of theory, showing that NBFIs decrease their net worth in the statistically significant level. However, it supports, in part, the second part of theory, showing that NBFIs decrease only C&I loans in response to a monetary policy shock. Unlike C&I loans, NBFIs' mortgages and consumer loans increase, presenting statistically significant level in the "middle" periods. This result suggests that, at a time when banks *initially* decreases mortgages and consumer credit immediately after a monetary tightening, NBFIs *continuously* increase these loans to borrowers who are discriminated from banks. Thus, NBFIs may play a role in the supply of loans as a supplementary lender during tight credit conditions.

My research contributes to the literature of monetary transmission mechanism in the subsequent manner. First, my empirical result suggests that, because finance companies are the only NBFI that makes C&I loans, at least these financial institutions behave in the similar way as banks after a monetary tightening. This supports the theoretical explanation suggest above. A negative monetary shock adversely affects the net worth of finance companies (i.e., the bank capital channel); then finance companies that borrow money in order to lend must pay higher cost of funds and decrease their loans (i.e., adverse selection model). Second, this evidence also suggests that NBFIs are one possible factor that leads to the substantial decline of output and that NBFIs provide a possible explanation for existing puzzles. This is because, according to the traditional interest rate channel, the effectiveness of monetary policy depends on interest-rate-sensitive components of aggregate expenditure; however, empirical studies have faced enormous difficulty in identifying the *quantitatively strong* effect of interest rates on real variables, such as aggregate output and employment, in terms of purportedly interest-rate-sensitive components of aggregate expenditure[17] (see Friedman, 1990; Shapiro, Blanchard, & Lovell, 1986, for such difficulty in empirical studies). By including these NBFIs within the boundaries of monetary policy, policymakers may be able to better understand the monetary transmission mechanism and, thereby, can more accurately assess the timing and effects of monetary policy on the economy.

[17] In other words, the estimated macroeconomic responses to policy induced interest rate changes are substantially larger than those inferred by conventional estimates of the interest rate sensitivity of consumption and investment.

APPENDIX

Appendix A: Determination in the Number of Lags (VAR)

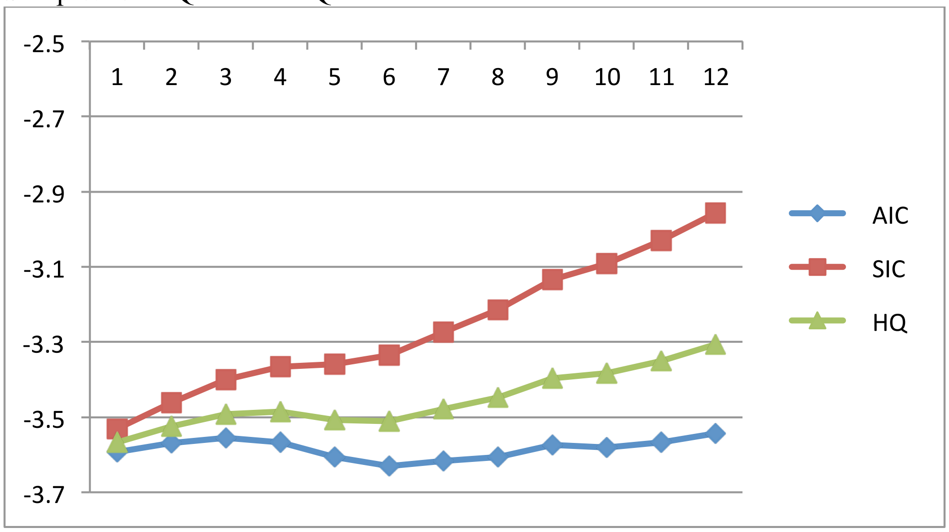
VAR Lag Order Selection Criteria
Endogenous variables: LNRGDP LNCPI LNRIM_SA FFR
Exogenous variables: C
Date: 04/14/11 Time: 17:08
Sample: 1954Q3 2010Q2
Included observations: 212

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-312.6660	NA	0.000233	2.987415	3.050747	3.013012
1	1957.030	4432.330	1.36e-13	-18.27386	-17.95720	-18.14588
2	2127.217	325.9259	3.18e-14	-19.72847	-19.15848*	-19.49809
3	2169.831	80.00009	2.47e-14	-19.97953	-19.15622	-19.64677*
4	2187.306	32.14743	2.44e-14	-19.99345	-18.91681	-19.55830
5	2198.508	20.18529	2.56e-14	-19.94819	-18.61822	-19.41065
6	2230.411	56.28188	2.21e-14*	-20.09822*	-18.51492	-19.45829
7	2240.968	18.22662	2.33e-14	-20.04687	-18.21025	-19.30455
8	2251.937	18.52168	2.45e-14	-19.99940	-17.90945	-19.15469
9	2268.180	26.81755	2.45e-14	-20.00170	-17.65842	-19.05460
10	2280.168	19.33886	2.56e-14	-19.96385	-17.36725	-18.91436
11	2303.958	37.48073*	2.40e-14	-20.03734	-17.18741	-18.88547
12	2314.667	16.46639	2.54e-14	-19.98742	-16.88416	-18.73316

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix B: Determination in the Number of Lags for Net Worth (OLS)[18]

Sample: 1954 Q3 ─ 2010 Q2



Notes: AIC (Akaike information criterion), SIC (Schwarz information criterion), HQ (Hannan-Quinn information criterion)

Appendix C: Responses of Net Worth (8 Lags)

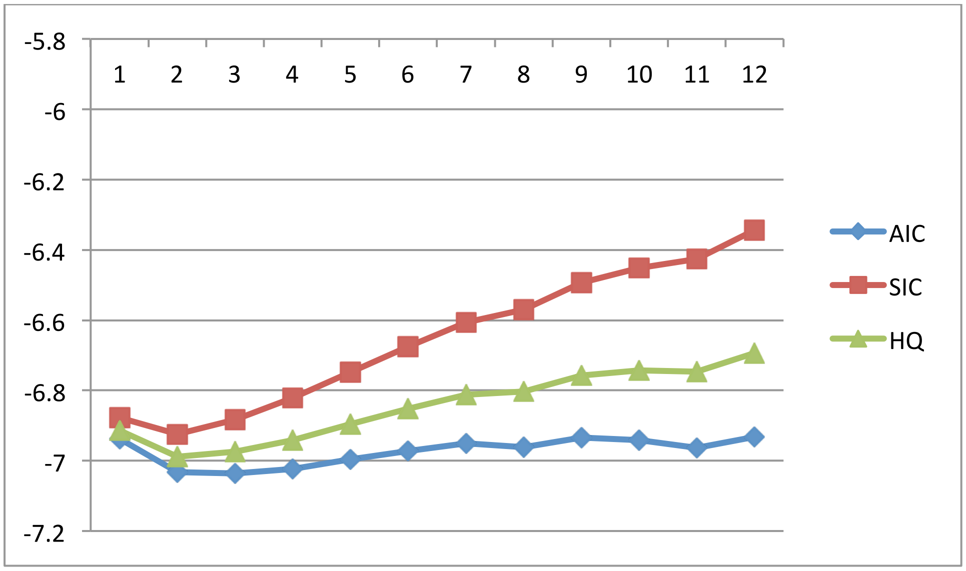
	Total Financial Institutions		Banks		NBIFs	
	β_i sum	Exclusion	β_i sum	Exclusion	β_i sum	Exclusion
Net Worth (bivariate)	−0.033*** (4.03)	0.0012***	−0.042*** (2.74)	0.0136***	−0.031*** (2.75)	0.026**
Net Worth (multivariate)	−0.042*** (4.48)	0.0001***	−0.048*** (2.72)	0.0253**	−0.041*** (3.26)	0.0032***

Notes: In the bivariate model, the net worth of financial intermediaries—total financial institutions, banks, and NBFIs, respectively—is regressed against a constant, 8 lags of itself, and 8 lags of a monetary policy indicator (MP). In the multivariate model, 8 lags of GDP are added to the regression. All variables except MP take the logged form, and all variables including MP were differenced to the stationary form. Entries in the "β_i sum" columns show the sum of coefficients on the lags of monetary policy indicator with the *t* statistics in parentheses. Entries in "exclusion" columns show the marginal significant level for the test that MP does not help forecast the net worth. *, **, and *** denote significance at 10%, 5 %, and 1%, respectively.

[18] AIC have chosen lag 6 as an optimum number of lag, whereas SIC and HQ have determined lag 1 as an optimum. However, as you see the graph above, HQ shows a strong tendency to decline at lag 6 as well. Therefore, the results of lag 6 in net worth are reported as a benchmark. In addition, to make a comparison with the number of lags in loans, the results of lag 8 are also reported in Appendix C.

Appendix D: Determination in the Number of Lags for Loans (OLS)

Sample: 1954Q3 2010Q2



Notes: AIC (Akaike information criterion), SIC (Schwarz information criterion), HQ (Hannan-Quinn information criterion)

Appendix E: Response of Loans (6 and 8 lags)

A. Responses of Loans (6 Lags)

Bivariate Model

	Total Financial Institutions		Banks		NBFIs	
	β_i sum	Exclusion	β_i sum	Exclusion	β_i sum	Exclusion
Total Loans	−0.0039***	0.0235**	−0.0058***	0.0043***	−0.0011	0.8782
	(3.21)		(3.57)		(0.87)	
C & I Loans	0.0018	0.5356	0.0029	0.1527	−0.0004	0.4705
	(0.66)		(0.96)		(0.10)	
Mortgages	−0.0044***	0.0003***	−0.0077***	0.0001***	−0.0011	0.2755
	(4.21)		(5.16)		(0.94)	
Consumer Loans	−0.0047**	0.0453**	−0.0119***	0.0051**	−0.0024	0.7092
	(3.04)		(3.63)		(0.48)	

Notes: In the bivariate model, aggregate loans (or components of loans) of financial intermediaries—total financial institutions, banks, and NBFIs, respectively—are regressed against a constant, 6 lags of itself, and 6 lags of a monetary policy indicator (MP). All variables except MP take the logged form, and all variables including MP were differenced to the stationary form. Entries in the "β_i sum" columns show the sum of coefficients on the lags of monetary policy indicator with the *t* statistics in parentheses. Entries in "exclusion" columns show the marginal significant level for the test that MP does not help forecast the net worth. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

Multivariate Model

	Total Financial Institutions		Banks		NBFIs	
	β_i sum	Exclusion	β_i sum	Exclusion	β_i sum	Exclusion
Total Loans	−0.0040***	0.0031***	−0.0053***	0.0049***	−0.0026**	0.4015
	(3.07)		(3.11)		(1.78)	
C & I Loans	0.0034	0.0459**	0.0038	0.0267**	0.0005	0.883
	(1.23)		(1.25)		(0.10)	
Mortgages	−0.0048***	0.0005***	−0.0076***	0.0003***	−0.0029**	0.1131
	(3.94)		(4.55)		(2.03)	
Consumer Loans	−0.0054***	0.0074***	−0.0075**	0.1068	−0.0051	0.7443
	(3.02)		(2.01)		(0.87)	

Notes: In the multivariate model, aggregate loans (or components of loans) of financial intermediaries—total financial institutions, banks, and NBFIs, respectively—are regressed against a constant, 6 lags of itself, 6 lags of a monetary policy indicator (MP), and 6 lags of GDP. All variables except MP take the logged form, and all variables including MP were differenced to the stationary form. Entries in the "β_i sum" columns show the sum of coefficients on the lags of monetary policy indicator with the *t* statistics in parentheses. Entries in "exclusion" columns show the marginal significant level for the test that MP does not help forecast the net worth. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

A. Responses of Loans (8 Lags)

Table 2 Bivariate Model

	Total Financial Institutions		Banks		NBFIs	
	β_i sum	Exclusion	β_i sum	Exclusion	β_i sum	Exclusion
Total Loans	−0.006***	0.0773*	−0.009***	0.0113***	−0.001	0.6753
	(3.27)		(3.91)		(0.82)	
C & I Loans	−0.001	0.6376	−0.001	0.2317	−0.001	0.884
	(0.47)		(0.30)		(0.14)	
Mortgages	−0.004***	0.0002***	−0.007***	0.0002***	−0.001	0.3198
	(2.93)		(3.76)		(0.55)	
Consumer Loans	−0.005**	0.0644*	−0.019***	0.0062***	0.009	0.3837
	(2.21)		(4.28)		(1.36)	

Notes: In the bivariate model, aggregate loans (or components of loans) of financial intermediaries—total financial institutions, banks, and NBFIs, respectively—are regressed against a constant, 8 lags of itself, and 8 lags of a monetary policy indicator (MP). All variables except MP take the logged form, and all variables including MP were differenced to the stationary form. Entries in the "β_i sum" columns show the sum of coefficients on the lags of monetary policy indicator with the t statistics in parentheses. Entries in "exclusion" columns show the marginal significant level for the test that MP does not help forecast the net worth. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

Table 3 Multivariate Model

	Total Financial Institutions		Banks		NBFIs	
	β_i sum	Exclusion	β_i sum	Exclusion	β_i sum	Exclusion
Total Loans	−0.005***	0.0302**	−0.007***	0.0181***	−0.002	0.5351
	(2.86)		(3.16)		(1.00)	
C & I Loans	0.002	0.1648	0.004	0.03**	0.005	0.6843
	(0.66)		(0.08)		(1.10)	
Mortgages	−0.004***	0.0012***	−0.007***	0.0014***	−0.002	0.1722
	(2.69)		(3.25)		(1.21)	
Consumer Loans	−0.005**	0.1361	−0.012***	0.2193	0.005	0.1219
	(2.00)		(2.39)		(0.73)	

Notes: In the multivariate model, aggregate loans (or components of loans) of financial intermediaries—total financial institutions, banks, and NBFIs, respectively—are regressed against a constant, 8 lags of itself, 8 lags of a monetary policy indicator (MP), and 8 lags of GDP. All variables except MP take the logged form, and all variables including MP were differenced to the stationary form. Entries in the "β_i sum" columns show the sum of coefficients on the lags of monetary policy indicator with the t statistics in parentheses. Entries in "exclusion" columns show the marginal significant level for the test that MP does not help forecast the net worth. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

Appendix F: The Impact of New Monetary Policy Shocks on Total Loans

Banks				NBFIs			
Period	Point prediction	Standard error	*t* value	Period	Point prediction	Standard error	*t* value
1	0	0		1	0	0	
2	-0.0024	0.0007	-3.72	2	0.0005	0.0006	0.85
3	-0.0056	0.0010	-5.36	3	0.0006	0.0010	0.54
4	-0.0098	0.0015	-6.36	4	-0.0001	0.0014	-0.07
5	-0.0129	0.0021	-6.09	5	-0.0006	0.0017	-0.38
6	-0.0167	0.0027	-6.10	6	-0.0015	0.0020	-0.76
7	-0.0197	0.0034	-5.80	7	-0.0023	0.0023	-1.02
8	-0.0216	0.0041	-5.29	8	-0.0028	0.0025	-1.10
9	-0.0232	0.0048	-4.85	9	-0.0025	0.0028	-0.90
10	-0.0231	0.0055	-4.24	10	-0.0027	0.0030	-0.88
11	-0.0224	0.0060	-3.72	11	-0.0024	0.0032	-0.75
12	-0.0210	0.0065	-3.22	12	-0.0013	0.0033	-0.39
13	-0.0188	0.0069	-2.72	13	-0.0001	0.0034	-0.04
14	-0.0166	0.0073	-2.29	14	0.0017	0.0034	0.48
15	-0.0140	0.0075	-1.87	15	0.0036	0.0035	1.04
16	-0.0114	0.0077	-1.48	16	0.0052	0.0035	1.49
17	-0.0090	0.0078	-1.15	17	0.0068	0.0035	1.93
18	-0.0067	0.0079	-0.85	18	0.0083	0.0036	2.31
19	-0.0048	0.0080	-0.60	19	0.0095	0.0037	2.54
20	-0.0032	0.0080	-0.40	20	0.0103	0.0039	2.66
21	-0.0019	0.0080	-0.24	21	0.0108	0.0041	2.66
22	-0.0009	0.0080	-0.12	22	0.0109	0.0043	2.55
23	-0.0002	0.0079	-0.03	23	0.0106	0.0044	2.39
24	0.0003	0.0079	0.04	24	0.0101	0.0046	2.21
25	0.0007	0.0078	0.09	25	0.0094	0.0047	2.00
26	0.0009	0.0077	0.12	26	0.0086	0.0048	1.78
27	0.0011	0.0076	0.14	27	0.0076	0.0049	1.56
28	0.0011	0.0075	0.15	28	0.0065	0.0049	1.34
29	0.0011	0.0074	0.15	29	0.0055	0.0049	1.13
30	0.0010	0.0074	0.14	30	0.0045	0.0049	0.92

Notes: The (adjusted) sample period is 1967 Q3– 1996 Q4. In each period, the *t* value is calculated by dividing the point prediction by the standard error.

Appendix G: The Impact of New Monetary Policy Shocks on Components of Loans (Banks)

Banks						
	C&I Loans		Mortgages		Consumer Credit	
Period	Point prediction	*t* value	Point prediction	*t* value	Point prediction	*t* value
1	0		0		0	
2	-0.0016	-1.08	-0.0030	-4.52	-0.0032	-3.72
3	-0.0040	-1.83	-0.0064	-5.27	-0.0064	-4.22
4	-0.0093	-3.13	-0.0099	-5.49	-0.0116	-5.33
5	-0.0132	-3.53	-0.0124	-5.00	-0.0161	-5.41
6	-0.0185	-4.10	-0.0150	-4.74	-0.0197	-5.21
7	-0.0219	-4.15	-0.0170	-4.39	-0.0226	-4.94
8	-0.0236	-3.94	-0.0184	-4.00	-0.0245	-4.54
9	-0.0263	-3.89	-0.0190	-3.58	-0.0254	-4.12
10	-0.0266	-3.57	-0.0183	-3.07	-0.0248	-3.63
11	-0.0265	-3.29	-0.0171	-2.63	-0.0228	-3.06
12	-0.0249	-2.91	-0.0156	-2.22	-0.0197	-2.49
13	-0.0221	-2.48	-0.0138	-1.87	-0.0161	-1.95
14	-0.0197	-2.14	-0.0120	-1.56	-0.0122	-1.43
15	-0.0165	-1.78	-0.0102	-1.28	-0.0082	-0.94
16	-0.0134	-1.44	-0.0084	-1.03	-0.0042	-0.48
17	-0.0103	-1.11	-0.0068	-0.82	-0.0006	-0.06
18	-0.0074	-0.81	-0.0055	-0.66	0.0025	0.29
19	-0.0052	-0.57	-0.0045	-0.52	0.0049	0.57
20	-0.0033	-0.37	-0.0036	-0.42	0.0067	0.77
21	-0.0020	-0.23	-0.0029	-0.34	0.0078	0.91
22	-0.0010	-0.13	-0.0024	-0.28	0.0084	0.98
23	-0.0006	-0.08	-0.0020	-0.23	0.0084	0.99
24	-0.0006	-0.08	-0.0017	-0.20	0.0080	0.95
25	-0.0008	-0.10	-0.0015	-0.18	0.0073	0.87
26	-0.0012	-0.16	-0.0014	-0.17	0.0063	0.76
27	-0.0017	-0.23	-0.0013	-0.16	0.0052	0.63
28	-0.0023	-0.31	-0.0014	-0.17	0.0040	0.49
29	-0.0029	-0.39	-0.0015	-0.19	0.0028	0.33
30	-0.0033	-0.45	-0.0018	-0.22	0.0015	0.18

Notes: The (adjusted) sample period is 1967 Q3– 1996 Q4. In each period, the *t* value is calculated by dividing the point prediction by the standard error.

Appendix H: The Impact of New Monetary Policy Shocks on Components of Loans (NBFIs)

NBFIs						
	C&I Loans		Mortgages		Consumer Credit	
Period	Point prediction	*t* value	Point prediction	*t* value	Point prediction	*t* value
1	0		0		0	
2	0.0009	0.60	-0.0010	-1.43	0.0032	1.65
3	0.0009	0.36	-0.0017	-1.28	0.0055	1.79
4	-0.0020	-0.58	-0.0021	-1.10	0.0079	1.97
5	-0.0062	-1.50	-0.0017	-0.68	0.0079	1.62
6	-0.0090	-1.89	-0.0018	-0.59	0.0063	1.11
7	-0.0124	-2.43	-0.0017	-0.50	0.0080	1.28
8	-0.0163	-2.99	-0.0007	-0.17	0.0085	1.26
9	-0.0189	-3.21	0.0004	0.09	0.0090	1.27
10	-0.0218	-3.46	0.0013	0.30	0.0101	1.38
11	-0.0229	-3.42	0.0024	0.52	0.0094	1.26
12	-0.0223	-3.18	0.0038	0.80	0.0102	1.39
13	-0.0217	-2.98	0.0055	1.13	0.0122	1.69
14	-0.0201	-2.67	0.0074	1.50	0.0136	1.93
15	-0.0178	-2.33	0.0091	1.82	0.0152	2.19
16	-0.0156	-2.02	0.0106	2.09	0.0166	2.40
17	-0.0129	-1.67	0.0121	2.32	0.0172	2.49
18	-0.0103	-1.34	0.0133	2.48	0.0181	2.59
19	-0.0081	-1.07	0.0142	-2.58	0.0187	2.64
20	-0.0064	-0.85	0.0148	2.60	0.0188	2.61
21	-0.0052	-0.71	0.0150	2.56	0.0187	2.55
22	-0.0046	-0.64	0.0149	2.46	0.0182	2.44
23	-0.0043	-0.61	0.0146	2.34	0.0175	2.31
24	-0.0046	-0.66	0.0139	2.19	0.0169	2.19
25	-0.0052	-0.76	0.0131	2.02	0.0162	2.08
26	-0.0061	-0.91	0.0121	1.85	0.0154	1.94
27	-0.0072	-1.09	0.0110	1.67	0.0147	1.81
28	-0.0084	-1.27	0.0099	1.49	0.0139	1.67
29	-0.0094	-1.44	0.0088	1.31	0.0131	1.54
30	-0.0105	-1.61	0.0076	1.14	0.0124	1.41

Notes: The (adjusted) sample period is 1967 Q3– 1996 Q4. In each period, the *t* value is calculated by dividing the point prediction by the standard error.

Appendix I: The Impact of Conventional Funds Rate Shocks on Total Loans

Banks				NBFIs			
Period	Point prediction	Standard error	*t* value	Period	Point prediction	Standard error	*t* value
1	0	0		1	0	0	
2	-0.0020	0.0007	-2.84	2	0	0.0006	0.02
3	-0.0047	0.0012	-3.92	3	-0.0006	0.0010	-0.60
4	-0.0063	0.0018	-3.53	4	-0.0006	0.0013	-0.48
5	-0.0085	0.0024	-3.52	5	-0.0004	0.0016	-0.27
6	-0.0122	0.0031	-3.99	6	-0.0008	0.0019	-0.44
7	-0.0149	0.0037	-3.98	7	-0.0011	0.0022	-0.49
8	-0.0170	0.0044	-3.86	8	-0.0010	0.0024	-0.42
9	-0.0184	0.0051	-3.62	9	-0.0011	0.0026	-0.41
10	-0.0189	0.0057	-3.32	10	-0.0014	0.0028	-0.49
11	-0.0194	0.0063	-3.10	11	-0.0013	0.0029	-0.43
12	-0.0189	0.0067	-2.82	12	-0.0012	0.0031	-0.38
13	-0.0179	0.0071	-2.51	13	-0.0007	0.0032	-0.23
14	-0.0166	0.0075	-2.23	14	0.0002	0.0032	0.05
15	-0.0151	0.0077	-1.96	15	0.0008	0.0033	0.25
16	-0.0137	0.0079	-1.72	16	0.0016	0.0033	0.47
17	-0.0120	0.0081	-1.49	17	0.0026	0.0033	0.79
18	-0.0104	0.0082	-1.27	18	0.0036	0.0033	1.07
19	-0.0090	0.0082	-1.09	19	0.0044	0.0034	1.32
20	-0.0076	0.0082	-0.93	20	0.0052	0.0034	1.55
21	-0.0064	0.0082	-0.78	21	0.0058	0.0034	1.71
22	-0.0055	0.0082	-0.67	22	0.0061	0.0034	1.79
23	-0.0046	0.0081	-0.57	23	0.0062	0.0034	1.82
24	-0.0040	0.0080	-0.49	24	0.0061	0.0035	1.77
25	-0.0035	0.0079	-0.44	25	0.0058	0.0035	1.65
26	-0.0031	0.0078	-0.40	26	0.0053	0.0036	1.49
27	-0.0029	0.0076	-0.38	27	0.0046	0.0036	1.29
28	-0.0028	0.0075	-0.38	28	0.0038	0.0036	1.05
29	-0.0028	0.0074	-0.38	29	0.0029	0.0036	0.79
30	-0.0029	0.0073	-0.40	30	0.0019	0.0036	0.53

Notes: The (adjusted) sample period is 1967 Q3– 1996 Q4. In each period, the *t* value is calculated by dividing the point prediction by the standard error.

Appendix J: The Impact of Conventional Funds Rate Shocks on Components of Loans (Banks)

Banks						
	C&I Loans		Mortgages		Consumer Credit	
Period	Prediction point	*t* value	Point prediction	*t* value	Point prediction	*t* value
1	0		0		0	
2	0.0010	0.66	-0.0027	-4.56	-0.0027	-3.13
3	0.0008	0.33	-0.0056	-5.07	-0.0061	-3.84
4	0.0009	0.25	-0.0075	-4.55	-0.0085	-3.74
5	0.0010	0.22	-0.0094	-4.24	-0.0118	-3.85
6	-0.0022	-0.41	-0.0125	-4.45	-0.0153	-4.05
7	-0.0030	-0.50	-0.0150	-4.32	-0.0180	-4.00
8	-0.0038	-0.58	-0.0168	-4.01	-0.0204	-3.89
9	-0.0049	-0.70	-0.0179	-3.65	-0.0217	-3.66
10	-0.0054	-0.74	-0.0180	-3.27	-0.0221	-3.39
11	-0.0063	-0.85	-0.0181	-3.00	-0.0217	-3.09
12	-0.0059	-0.79	-0.0177	-2.74	-0.0204	-2.74
13	-0.0054	-0.72	-0.0167	-2.44	-0.0186	-2.39
14	-0.0049	-0.65	-0.0153	-2.16	-0.0162	-2.04
15	-0.0039	-0.52	-0.0139	-1.91	-0.0135	-1.68
16	-0.0033	-0.45	-0.0124	-1.67	-0.0107	-1.32
17	-0.0023	-0.31	-0.0108	-1.44	-0.0077	-0.96
18	-0.0014	-0.19	-0.0093	-1.23	-0.0050	-0.63
19	-0.0009	-0.12	-0.0079	-1.03	-0.0026	-0.32
20	-0.0003	-0.05	-0.0065	-0.85	-0.0003	-0.04
21	0.0001	0.01	-0.0053	-0.70	0.0016	0.20
22	0.0003	0.04	-0.0043	-0.57	0.0031	0.40
23	0.0004	0.06	-0.0034	-0.46	0.0042	0.55
24	0.0004	0.06	-0.0027	-0.37	0.0049	0.65
25	0.0003	0.04	-0.0022	-0.29	0.0053	0.71
26	0.0002	0.02	-0.0017	-0.24	0.0053	0.72
27	0.0000	-0.01	-0.0015	-0.20	0.0050	0.69
28	-0.0003	-0.05	-0.0013	-0.18	0.0045	0.62
29	-0.0006	-0.10	-0.0012	-0.17	0.0037	0.52
30	-0.0009	-0.15	-0.0012	-0.17	0.0028	0.39

Notes: The (adjusted) sample period is 1967 Q3– 1996 Q4. In each period, the *t* value is calculated by dividing the point prediction by the standard error.

Appendix K: The Impact of Conventional Funds Rate Shocks on Components of Loans (NBFIs)

NBFIs						
	C&I Loans		Mortgages		Consumer Credit	
Period	Prediction point	*t* value	Point prediction	*t* value	Point prediction	*t* value
1	0		0		0	
2	0.0007	0.46	-0.0013	-2.21	0.0029	1.65
3	-0.0006	-0.20	-0.0019	-1.68	0.0044	1.58
4	-0.0025	-0.66	-0.0015	-0.94	0.0062	1.73
5	-0.0024	-0.49	-0.0010	-0.51	0.0054	1.27
6	-0.0028	-0.50	-0.0012	-0.48	0.0043	0.89
7	-0.0043	-0.69	-0.0007	-0.24	0.0045	0.86
8	-0.0057	-0.87	0.0004	0.11	0.0031	0.56
9	-0.0083	-1.20	0.0013	0.35	0.0022	0.37
10	-0.0106	-1.50	0.0021	0.54	0.0008	0.12
11	-0.0119	-1.65	0.0029	0.72	-0.0007	-0.10
12	-0.0133	-1.83	0.0036	0.87	-0.0012	-0.18
13	-0.0146	-1.98	0.0048	1.12	-0.0015	-0.22
14	-0.0152	-2.04	0.0061	1.40	-0.0015	-0.21
15	-0.0155	-2.04	0.0070	1.58	-0.0012	-0.16
16	-0.0156	-2.03	0.0080	1.78	-0.0009	-0.12
17	-0.0154	-1.98	0.0091	2.00	-0.0001	-0.01
18	-0.0149	-1.92	0.0100	2.16	0.0009	0.11
19	-0.0144	-1.85	0.0107	2.29	0.0017	0.22
20	-0.0138	-1.77	0.0113	2.38	0.0027	0.35
21	-0.0130	-1.68	0.0116	2.40	0.0036	0.46
22	-0.0124	-1.60	0.0117	2.37	0.0044	0.56
23	-0.0118	-1.54	0.0116	2.31	0.0051	0.65
24	-0.0112	-1.46	0.0112	2.19	0.0057	0.72
25	-0.0108	-1.41	0.0107	2.03	0.0060	0.76
26	-0.0104	-1.37	0.0100	1.86	0.0061	0.77
27	-0.0100	-1.33	0.0091	1.67	0.0060	0.76
28	-0.0098	-1.31	0.0081	1.47	0.0056	0.72
29	-0.0096	-1.29	0.0071	1.26	0.0051	0.66
30	-0.0094	-1.27	0.0060	1.06	0.0044	0.58

Notes: The (adjusted) sample period is 1967 Q3– 1996 Q4. In each period, the *t* value is calculated by dividing the point prediction by the standard error.

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