MONEY VERSUS CREDIT: EVIDENCE FOR THE NATIONAL BANKING ERA, 1880-1914

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1. Introduction

Does the monetary system impinge on the real economy through monetary liabilities -- bank deposits -- or monetary assets -- bank loans? A traditional view espoused by monetarists is that what matters is the change in the quantity of money on the liability side of the banks' balance sheet while the asset side -- the composition of bank portfolios -- does not. An opposing view is that the asset side matters in addition to or alternative to the liability side.

Recently many investigators have taken the tack of stressing the importance of credit rationing by the banking system. The argument they advance is that by rationing credit the banking system can impinge directly on the private sector's spending, independent of the level of bank reserves that monetary policy determines. Banks engage in credit rationing rather than raise interest rates because in a world of asymmetric information a rise in interest rates may encourage adverse selection, that is, borrowing by individuals and firms more likely to default. This approach, based on seminal work by Stiglitz and Weiss (1981, 1987), and studied by Gertler and Hubbard (1988) and others, follows an older tradition stressing the asset side of the balance sheet.

Theoretically, credit rationing has been cast as an equilibrium concept. Several authors (for example, Bernanke, 1986; Calomiris and Hubbard, 1989) have suggested that changes in the equilibrium quantity of credit rationing can explain short-run fluctuations in real output. The idea here is that changes in the "level of uncertainty" in the economy induce changes in the equilibrium quantity of loans, and thereby affect real activity. We refer to this account of output movements as the credit view.

In this paper we examine evidence for the U.S. national banking era on the possible independent role of bank lending as a determinant of short-run changes in economic activity. That era has several special features that make it a good test case for comparisons of monetarist and credit views of transmission:

(1) The absence of a central bank, from which two key implications follow: (a) the banking system itself could be a source of money supply shocks; (b) in the absence of an effective lender of last resort (if we ignore the lender of last resort role of clearing houses), banks would have greater incentive to engage in credit rationing as a form of monitoring bank loans.

(2) Under the gold standard that prevailed, we can identify international shocks. This feature would have minimized the importance of domestic influences.

(3) This was also a period that has been described as characterized by greater price flexibility than the twentieth century. This feature, assuming it is accurate, would have minimized output effects of disturbances, whether originating on the monetary or the credit side. On the other hand, deflation could have led to credit rationing by reducing borrowers' net worth.

Recently Calomiris and Hubbard (1989) provided support based on structural VARs for the credit view for the national banking period. We have followed their approach but expand it by considering additional factors that could explain the link they find between credit and the real economy. Our evidence restricted to VAR models suggests that it is difficult to distinguish between the two views. When monetary variables are introduced into the credit model, money is significant and credit declines in importance though its contribution is not eliminated. When credit variables are introduced into the monetarist model, money is robust but credit effects are also significant.

The inconclusive VAR results have led us to examine institutional data for the national banking period for evidence that helps distinguish between the two views. The key feature we focus on is the intimate connection between the stock market and the national banking system. A substantial fraction of the reserves of all national banks ended up being invested in the New York City call loan market.

We show that loans secured by stock in New York City were volatile. However, other loans were not, yet these are the principal candidates for credit effects, if such effects were present. A similar but more muted pattern is found for the U.S. as a whole. This pattern suggests that disturbances in the stock market were mirrored in the call loan market, which in turn dominated total New York City bank loans, and to a lesser extent, total U.S. loans. Thus the significant influence of bank loans found in credit VAR models may simply be reflecting volatility in the stock market. To test this possibility, we introduce a stock price index and the call loan rate into a VAR incorporating both loans and money. The effect is to reduce greatly the influence of bank loans on real activity. The influence of money, however, remains robust.

The rest of the paper is organized as follows. Section 2 details the theory of transmission, according to the money and the credit views. We set out the Stiglitz transmission mechanism in the credit story and contrast it with the money story. We first discuss the money story in modern conditions with a central bank that engages in open market sales that reduce bank reserves and money supply, with contractionary effects on national income. Then we turn to the money story under a gold standard, subject to two sources of shocks, gold outflows and banking panics.

Section 3 reviews past attempts to assess the roles of money and credit in the transmission mechanism, and then turns to the empirical results of four VAR models of quarterly data that we present to test the two views. One model is a simple monetarist model. A second is the Calomiris-Hubbard version of a credit model. A third is a hybrid monetarist-credit model. A fourth is a hybrid Calomiris-Hubbard-monetarist model.

Section 4 examines the role of the stock and call loan markets. We describe the relation between the inverted pyramid of credit and the call loan market. Data from the Comptroller of the Currency's annual reports reveal the diverse pattern of loans secured by stock and other bank loans. We present a VAR incorporating stock market variables, money, and U.S. loans.

Section 5 summarizes the paper, drawing lessons for research strategy.

2. Money and Credit in the Transmission Mechanism: Theory

A considerable theoretical and empirical literature exists on whether the monetary system affects the real economy through the liability or the asset side of the banking system. For a useful survey, see Gertler (1988).

Emphasis on bank credit as an alternative or additional channel to money goes back to Adam Smith and the classical economists. In the nineteenth century, J. S. Mill discussed an independent influence of credit on the price level as evidence against the simple quantity theory of money. The real bills doctrine that dominateed both nineteenth and early twentieth century thinking stressed that bank lending based strictly on self-liquidating commercial bills would always be sufficient to finance economic aactivity. Keynes in The General Theory suggested the possibility of credit rationing. That suggestion led to the availability doctrine (Roosa, 1951), whereby the Federal Reserve through its open market operations would influence the availability of bank loans. It was assumed changes in bank deposits would be offset by substitution into nonmonetary assets. Similar views persisted based on the premise that monetary policy was impotent (the interest elasticity of money demand was high or alternatively there existed very close substitutes for deposits). Hence the only way the monetary authorities could affect spending was by influencing total credit (Radcliffe Committee Report, 1959; Commission on Money and Credit, 1961; Gurley and Shaw, 1955). Based on extensive empirical evidence showing a close connection between various credit aggregates and economic activity, B. Friedman (1981) is a modern proponent of these views.

In the past decade, Stiglitz and his co-authors (1981, 1987, 1990) and others have given a new impetus to the credit approach. Based on the theory of incomplete information and the seminal "lemons" article by Akerlof (1970), Stiglitz and Weiss (1981) have argued for a theory of "equilibrium credit rationing." In their view, unlike the auction markets which characterize many commodities, the market for loans is a customer market where factors other than price are important. Specifically, because of asymmetric information between lenders and borrowers, a rise in the loan rate, by encouraging adverse selection (a predominance of loan applicants with risky projects) and moral hazard (engaging in risky behavior after receiving a loan) on the part of borrowers, can increase the incidence of defaults and reduce the real return earned by the lenders. Under these circumstances, banks will both charge a "lemons premium" to highly qualified borrowers causing them to reduce their borrowing and will engage in credit rationing, restricting loans offered to marginal borrowers. With equilibrium credit rationing, loan rates will not rise to clear the loan market. The supply curve is backward bending. In a macro setting, this theory predicts that restrictive monetary policy will lead to a reduction in bank lending with little influence on interest rates. Extensions of this approach view commercial banks as important because they use their expertise to screen borrowers and hence reduce the information asymmetry. One device used is the posting of collateral. In this context, restrictive monetary policy, if it produces bankruptcy and declines in net worth because of debt deflations, will reduce the valuable credit intermediation network created by the banking system --- further reducing bank lending and economic activity (Bernanke, 1983).

With these views in mind, we trace the transmission of both monetary and real shocks according to the "money" and "credit" views. We initially focus on a modern setting, and then on the historic setting of the pre-Federal Reserve System and the classical gold standard.

A.The Modern Setting

We compare the two views of transmission, first, following an open market sale of government securities and second, following an unexpected decline in exports, an example of a real shock.

1.An Open Market Sale of Government Securities. In the simplest version of the money view, an open market sale reduces the reserves of the commercial banks (we neglect the distinction between borrowed and nonborrowed reserves). In the face of declining reserves (assuming no excess reserves), the banks sell investments and call in (do not renew) their loans. As a result deposits decline. The decline in deposits (the money supply) leads to a fall in expenditures, which in turn reduces output and the price level. Rising market interest rates as well as implicit rates connecting assets to service flows will be a key conduit connecting money supply to spending. This approach assumes that deposits and other financial assets are not close substitutes, whereas loans and other earning assets are.[1,2]

In the traditional credit view, the open market sale reduces reserves and leads to a decline in bank loans (presumably, because loans and investments are not close substitutes, the former declines more). As in the money view, deposits are reduced, but because of a high degree of substitution between transaction balances and near-monies, there is little effect from this source on spending. In the Stiglitz and Weiss approach, as the decline in lending threatens to raise interest rates, this encourages adverse selection and moral hazard, so that the banks reduce their lending further (they engage in credit rationing). If the contractionary policy leads to bankruptcies, a stock market crash or deflation (disinflation), then the decline in the net worth of firms also encourages adverse selection and moral hazard by borrowers. The reduction in the value of collateral can lead to further declines in bank loans. A measure of these determinants of equilibrium credit rationing is the spread between risky and riskless securities of the same maturity (Mishkin 1989).

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[1] The story can be complicated by distinguishing between certificates of deposit and other deposits, with CDs being close substitutes for marketable securities. In this case, as Fama (1985) and Romer and Romer (1990) have demonstrated, if the reserve requirements on CDs were the same as on demand deposits, the reduction in bank liabilities would have no effect on interest rates and bank loans would dominate in the transmission mechanism. Since reserve requirements on CDs are considerably lower than on demand deposits, this case is unlikely.

[2] According to Brunner and Meltzer (1976), loans and other assets (bonds) are not perfect substitutes. They construct a monetarist model including a credit market, which yields results qualitatively similar to those described here. The transmission of monetary changes in their analysis does not depend on the interest elasticities of the demand for money and expenditure. The relative interest elasticities that matter are the interest elasticities of the money and credit markets. Monetary policy affects expenditure by changing interest rates and asset prices, so the combined effects of the changes, not the separate effects, determines the response of expenditure.

It is assumed under both views that the central bank will act as a lender of last resort to prevent the onset of a banking panic. The two views differ, however, with respect to the empirical behavior of interest rates and loan aggregates at the business cycle peak. According to the money view, money growth decelerates during mid-expansion and is accompanied by a rise in interest rates that persists beyond the business cycle peak and well into the recession phase. According to the credit rationing view, interest rates do not exhibit this pattern because of the problems banks are said to confront should interest rates rise. According to the money view, the allocation of credit between loans and investments in bank portfolios has no effect on the aggregate of deposits. Banks expand their portfolios and deposits with the availability of reserves. According to the credit rationing view, banks withdraw from loan expansion when their attitude toward loan applicants hardens and that contracts the economy.

2. A Decline in Exports. In the face of a transitory real shock, such as a decline in exports and a consequent fall in income, according to the money view, the outcome depends on the actions of the central bank. In the absence of a shock to bank reserves, banks will hold excess reserves, and will lower interest rates. If demand for loans does not increase in response to the interest rate decline, banks will expand their portfolio of investments. A stable money supply and lower interest rates will eventually provide a stimulus to the economy.

In the credit view, a transitory real shock that lowers the demand for loans may be exacerbated if the degree of uncertainty is affected (Stiglitz, 1990). If uncertainty is increased, this will cause banks to reduce their lending further, because of adverse selection and moral hazard problems mentioned above. Unlike the money view, the credit view, as represented by Stiglitz (1990), provides no role for accommodating monetary policy to mitigate the effects of a real shock.

B. The National Banking Era

In the pre-Federal Reserve setting, two key institutional differences affected the transmission mechanism: the absence of a central bank and the classical gold standard. The first factor was important because an effective lender of last resort did not exist.[3] The importance of the second factor was that a gold outflow, induced typically either by a rise in Bank Rate by the Bank of England or by a dramatic harvest failure -- a real shock that led to a deficit in the current account -- reduced monetary gold reserves.

1. A Gold Outflow. When the Bank of England raised its discount rate, this led to a short-term capital outflow from the United States and a gold outflow that reduced the reserves of the commercial banks.[4] According to the money view, both loans and investments declined, pari passu with deposits, interest rates rose, and spending declined along with output and prices. A key difference from the modern setting could, however, arise. Not only was there no ready source of high-powered money to replace the loss of monetary reserves. In addition, if the external drain from the banking system was also accompanied by an internal drain, such as a seasonally-induced demand for reserves by country national banks, the possibility arose of a banking panic generated by a decline in the public's deposit-currency ratio as well as the banking

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[3] On a number of occasions, the clearing houses and the U.S. Treasury performed this role.

[4] Friedman and Schwartz (1963, chap. 3). See section 4 below for an elaboration of the institutional framework of the U.S. banking system in this period.

system's deposit-reserve ratio.[5] This could produce a further decline in the money supply. Resultant bank failures could lead to bankruptcies, reductions in firms' net worth, and further bank failures, as the value of bank assets declined. This process could continue unless some authority intervened as lender of last resort or the convertibility of deposits into currency was suspended.

In the credit view, the decline in bank reserves reduced loans (more than investments and more than deposits), as it would today, but the incipient rise in interest rates could lead to credit rationing because of adverse selection and moral hazard. This would be reflected in a rise of the interest rate spread. The fall in activity and the price level reduced the value of bank collateral, causing a further reduction in bank loans. If a banking panic ensued, this exacerbated the process, leading to a rise in the cost of intermediation. A stock market crash also would reduce the net worth and collateral of firms, in turn reducing bank lending.

2.A Harvest Failure. As in the modern setting, in the money view, a transitory real shock such as a harvest failure reduced output. If country banks withdrew reserve balances from their city correspondents, the national banking system contracted. Loans and the level of the money supply fell. A fortuitous short-term capital inflow from abroad could, however, cut short this process of decline. If the inflow did not occur, interest rates fell, leading to a gold outflow. The gold outflow reduced the money supply, output, and the price level until equilibrium was restored. If a banking panic ensued, further declines in the money supply occurred.

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[5] For alternative explanations of banking panics in this period, see Bordo (1989) and Calomiris and Gorton (1991).

In the credit view, the story does not differ as between the modern period and the national banking era. The real shock reduced the demand for loans and the level of interest rates. If uncertainty increased, bank lending would be reduced reflecting adverse selection and moral hazard. If bankruptcies, declines in net worth, and debt deflation ensued, then further declines in bank lending occurred. Finally, if the real shock caused a stock market crash, then equity rationing might follow, as declines in the net worths of firms made it harder for them to obtain external finance (Stiglitz and Jaffee, 1990).

3. Money versus Credit: Some Empirical Results

Before presenting our own empirical results, we review earlier ones by others. An early approach by B. Friedman (1981) compared correlations between bank loans (and other credit aggregates) and economic activity and those between various monetary aggregates and activity in post-World War II U.S., with the result that credit usually dominated. In contrast, King's (1986) Granger-causality tests and standard VARs led to the conclusion that money dominated credit.

These tests examine the reduced form predictive power of money and credit variables, which is not necessarily the same as their causal role. In particular, it is necessary to abstract from contemporaneous effects of output on financial variables. One approach was developed by Romer and Romer (1990), who ran a race between money and credit by identifying episodes in the post-World War II period when a contractionary monetary policy was adopted independent of the state of the real economy. Their univariate forecasting regressions lead to the conclusion that money is an active force in transmission, with bank lending a reflecting force.

Another approach is that of structural VARs, developed and first applied in this context by Bernanke (1986). Bernanke found that, when explicit allowance was made for contemporaneous interactions between output and credit and money, bank loans accounted for at least as much of the variance of output as did money. Calomiris and Hubbard (1988) apply the Bernanke (1986) method to the pre-1914 national banking era. We describe their approach below in reporting our adaptation of it to a structural VAR for credit.

Assessing the relative merits of money and credit explanations of real activity requires that one disentangle a complex set of interactions among economic variables. This task is complicated by the fact that the various schools of thought have different views about the structure of these interactions. In this section of the paper, we use a structural VAR approach to analyze a number of different models of the relationships among the variables of central concern to the money and credit views.

Structural VARs, as developed by Bernanke (1986) and Sims (1986), involve a strategy for identifying parameters in a simultaneous equation model, that preserves some of the intent of the original Cowles Commission approach[6], while remaining sensitive to Sims' (1980) criticism of the "incredible" identification assumptions it necessitated. The cost of this compromise is that the structural VAR approach requires the investigator to have great faith in the validity of all aspects of the model.

The structural and reduced forms of a linear simultaneous system can be expressed as

(1) $Y_t\Gamma + X_tB = V_t \qquad EV_tV'_t = \Sigma$

[6] See Cooley and LeRoy (1985) for a discussion.

(2) $Y_t\Gamma = X_t\Pi + U_t$

(3) $\Pi = -B\Gamma^{-1}$, $EU_tU'_t = \Omega = \Gamma\Sigma\Gamma'$

Here, Y_t and X_t are row vectors, respectively, of observations on the K endogenous and M exogenous or predetermined variables. The structural parameters are contained in the matrices Γ, B and Σ, whose respective dimensions are K*K, M*K and K*K, while Π and Ω are M*K and K*K matrices of reduced form coefficients that can be estimated consistently from OLS regression of Y on X.

Identification consists in placing sufficient restrictions on the structural coefficient matrices[7], that there is a unique solution to equations (3), given Π and Ω. The three prominent approaches to identification can be summarized as:

(a) Restrict Γ and B, and leave Σ unrestricted (Cowles).

(b) After ordering the endogenous variables in a suitable manner, make Γ triangular, Σ diagonal, and leave B unrestricted (standard VAR).

(c) Impose K(K-1) restrictions on Γ and Σ, and leave B unrestricted (structural VAR).

The rationale for the Cowles approach was that the structural errors contained the effects of variables not captured by the model, and since there could be no presumption that the same variables had been omitted from more than one equation, one would expect the elements of V_t to be correlated contemporaneously. This implied that a total of K(K-1) zero restrictions needed to be placed on the Γ and B matrices.

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[7] Aside from K restrictions on Γ that normalize to unity the coefficient of one endogenous variable per equation.

Sims (1980) criticized this approach, arguing that it was difficult to believe the exclusion restrictions typically used, especially in the light of rational expectations models that conditioned people's behavior, and therefore observable variables, on all available past data. He advanced the standard VAR approach, without claiming it represented structural relationships. However, several authors argued that little meaningful could be said unless a structural interpretation were placed on the triangular form of Γ used in Sims' approach, which, in turn, did not seem plausible (Cooley and LeRoy (1985), Jacobs, Leamer and Ward (1979), Bernanke (1986)).

The structural VAR approach adopts Sims' skepticism concerning restrictions on B, but sides with the Cowles approach in maintaining that restrictions on Γ are sensible. There are K(K-1) free elements in Γ, which is the number of restrictions required for identification. The less restrictions placed on Γ, the more must be imposed on Σ. Typically, the maximum of K(K-1)/2 restrictions are placed on Σ, making it diagonal.[8] This strains credibility from the Cowles viewpoint, since it does not allow for correlation among variables omitted from equations: it is tantamount to an extreme expression of faith in the specification of the model.

In identifying the models that follow, we use the diagonal-Σ structural VAR strategy. This, in turn, necessitates that K(K-1)/2 of the elements of Γ be zero. Since we are very far from believing any of these models to be the last word, we shall attempt to trace patterns that are consistent with the results of all the models.

In all, we present four models in this section. The first two

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[8] An exception is Bernanke (1986) who, in a six-variable system, permits one off-diagonal element of Σ to be non-zero.

specifications we estimate include only the variables considered relevant to the determination of real output by proponents of the money and credit views, respectively.[9] The drawback with these models is that neither allows for the effects of variables considered important by the other story: neither is sufficiently rich to distinguish the roles of the asset and liability sides of the banks' balance sheets. In order to compare the merits of the two stories, we need to nest the two models in a larger model. Unfortunately, such a system would be computationally intractable, and so we present a separate generalization for each model.

A. Monetarist Model

The first model, which we call the Monetarist model, involves five variables, the monetary base, M2, real GNP, the GNP deflator, and the commercial paper rate.[10] With the exception of interest rates, all variables are expressed in terms of quarterly rates of change although we continue to call these changes in M2, base etc. For brevity, we present the identification assumptions simultaneously with the estimation results. The top panel of Table 1 contains the estimates of the elements of that are not restricted to be zero accompanied by the sign of the (comparative static) effect predicted by the theory.[11]

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[9] All models are estimated using quarterly data spanning the period 1880.I - 1914.IV. All data series are described in the Appendix, along with their sources.

[10] We also ran the model with gold flows. The results are similar to those with the base, though less pronounced.

[11] Entries in the table are the negative of elements of Γ, and have the interpretation of the contemporaneous effect of the variable named at the top of the respective column on the row variable whose coefficient is normalized to unity. They can be interpreted in the same way as regression estimates.

(Insert Table 1 here)

The dependence of the base on the inflation rate and interest rates reflects the operation of the gold standard. Increases in the interest rate and decreases in the inflation rate are postulated to increase the base, via capital inflows. The money multiplier drives the dependence of the money supply on the base, while liquidity preference accounts for the presence of the interest rate. The presence of M2 in the output equation reflects demand shocks, and the interest rate and inflation rate are inserted to allow for the possibility of supply side, or real interest rate shocks. The interest rate is influenced by M2 and real output as a result of the demand for money. Finally, inflation is driven by shocks to the quantity of money.

As the table shows, three of the ten coefficients do not have the anticipated signs. Several factors may be involved here, besides the obvious possibility that the model is misspecified. First, the theory we are using to predict the signs of these interactions is comparative static in nature, and does not necessarily require that the predicted effects be contemporaneous. Second, even if the theory were to apply to contemporaneous relationships, the synchronization of the available data leaves much to be desired.[12] For both of these reasons, we believe it to be more appropriate to examine jointly the contemporaneous and lagged influence of one variable on another, by using impulse response functions.

Figure 1 shows the response of output to innovations in the base, M2 and the interest rate. Shocks to the <u>levels</u> of M2 and the base have positive but permanent effects on output. Innovations in the interest rate have

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[12] For example, output and prices are quarterly averages, while the financial variables are measured at the end of each quarter.

approximately a zero output effect on net, although the response is initially positive for four quarters.

(Insert Figure 1 here)

The relative importance of shocks assigned to each variable can be assessed from the decomposition of the variance of the forecast errors, which is shown in the lower panel of Table 1. Here the columns correspond to the sources of the shocks (i.e., which element of V is responsible), and the row names are those of the variable being predicted. The salient feature of these results is that 26.8% of the variance of output forecast errors is assigned to base and M2 innovations. It is also worth noting that two-thirds of the variability of the interest rate comes from the innovations to the base and the money supply, while innovations to the interest rate have a considerably smaller effect.

In summary, there is little in these results that would lead a monetarist to revise his or her views on the nature of the transmission mechanism.

B. Credit Model

Table 2 describes the results of estimating a model designed to capture the effects of variables important to the credit view. This model was developed by Calomiris and Hubbard (1989), and is described in detail in their paper. In their structural VAR, in addition to prices, output, and interest rates, they introduce three variables to capture the role of credit: real bank loans, a spread between risky and riskless assets of similar maturity, and the liabilities of business failures. These variables capture both traditional credit interpretations and the determinants of equilibrium credit rationing. They do not include money in their model on the assumption that the money supply was endogenous under the classical gold standard.[13]

(Insert Table 2 here)

The model focuses on the effects of the loan market on economic activity, and so relates the real volume of loans to the spread between interest rates on low- and high-grade loans[14], and the rate of business failures. Calomiris and Hubbard used a monthly series on loans extended at national banks in New York, Boston and Philadelphia, while we use total national bank loans for the entire United States. Similarly, our output variable is real GNP, while they used the monthly pig-iron series. In spite of these differences, in addition to the fact that their sample spanned the 1894-1909 period, the results from the two versions of the model are quite similar.[15]

As with the basic monetarist model, not all structural coefficients are of the anticipated signs, the most notable being the negative impact of the interest rate on output. The impulse response functions show a healthy impact of loan innovations on output, and also exhibit the initial positive response to interest rate shocks found in the monetarist model (Figure 2). The most striking feature of the results is the 35.9% of output forecast error variance explained by loan innovations. Calomiris and Hubbard found that only 10.6% of

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[13] As evidence for this position, they cite studies showing interest rate and price arbitrage between the U.S. and Britain, and unpublished evidence that gold shocks reversed themselves within a short period of time.

[14] Calomiris and Hubbard's spread variable was constructed from rates on different grades of commercial paper, which are only available for their 1894-1909 sample period. We used the spread between rates on low- and high-grade railroad bonds, constructed by Mishkin (1991).

[15] A minor difference between the two specifications is that we do not include the spread variable in the inflation equation, which aids the convergence of our estimation procedure. This interaction was not statistically significant in Calomiris and Hubbard's work.

this variance could be explained by real loan shocks in their monthly data. We will have occasion to return to this difference in section 4 below. In summary, the basic credit model, applied to the national banking era, does not turn up any evidence that would lead one to doubt it.

(Insert Figure 2 here)

C. Hybrid Monetarist Model

Table 3 describes the results of estimating a "hybrid monetarist model", that is, a generalization of the basic monetarist model to include variables that are important from the credit viewpoint. Thus, we add business failures and the spread variable to the five variables of the basic monetarist specification. In addition, we cast the model in real terms, since, from the credit viewpoint, it is real balance sheet variables that are important. Unfortunately, we are not able to add the loans variable to the basic monetarist model, because of the close relationship between movements in the quantity of loans on the one hand, and the base and money supply on the other. Of course, this difficulty dogs all tests of the relative merits of the two views, as noted by Blinder and Stiglitz (1983), and Brunner and Meltzer (1988). This omission is remedied in the fourth model, discussed below.

(Insert Table 3 here)

The identification restrictions in the top part of Table 3 are driven by those in the two basic models. A substantially higher proportion of the contemporaneous interactions have the wrong sign than in the basic monetarist model, the most egregious being the response of M2 to the base, and of real output to money. However, there is a strong positive response of output to M2 innovations after two quarters have elapsed (Figure 3). Money innovations appear to have a smaller permanent effect on the level of output, and the permanent effect of base innovations has disappeared. Similarly, the proportion of the output forecast error variance explained by money and base innovations is 25%, little changed from the 26.8% found in the basic monetarist model. We also note that the variables added to represent the credit story, the interest rate spread and the rate of business failures, together explain only 9.6% of the variability of real GNP, which approximately matches their performance in the basic credit model.

(Insert Figure 3 here)

D. Hybrid Credit Model

Table 4 describes the results of generalizing the basic credit model to include the effects of changes in the quantity of money. The delicate issue here is whether loans and money should be expressed in real or nominal terms. The credit view holds that it is the real quantity of loans that is important for real output, while the monetarist view focuses on the short run output effects of changes in the nominal quantity of money. The specification of Table 4 casts both variables in nominal terms, but allows for real effects to be consistently estimated by including the inflation rate in the output and loans equations.[16]

(Insert Table 4 here)

The responses of real GNP to nominal loans and money both die out after about three years, as Figure 4 shows. Loans exhibit a substantial permanent change in response to a money shock, but there is not a marked response of money to a loan shock. Similarly, the variance decompositions in the lower panel of Table 4 show that 26.3% of loan variability is accounted for by money

[16] We also ran the model using real loans and nominal money, and found that the deflator coefficient in the real loans equation was 0.94, suggesting that deflation of the loans series was inappropriate in this model.

shocks, while only 5.9% of money variability comes from shocks special to loans. This may, however, be a consequence of the inclusion of money in the loan equation, but excluding a contemporaneous effect of loans on the supply of money. For this reason, the model is to be understood as a monetarist generalization of the credit model.

(Insert Figure 4 here)

The variance decomposition also shows that the fraction of the forecast error variance of real output attributable to loan shocks declines dramatically, from 35.9% in the basic credit model, to 16%, when money is included. The contribution of money shocks to the forecast error variance of real output is 14.3%. These figures do not provide an exact comparison with the basic credit model, however, since there loans enter in real terms. To provide such a comparison, we recalculated the variance decomposition to assess the effect of real loan shocks on real output, leaving money in nominal terms. The results, which are shown in the addendum to Table 4, are little changed, although the influence of money shocks declines slightly, while that of real loan shocks is 2.5 percentage points larger than that of nominal loan shocks.

The central message of this "hybrid credit model" is that the channel of influence on output that operates through the money supply cannot be ignored. Of course, loan shocks still account for a respectable fraction of the variance of output forecast errors, even after money shocks have been allowed for, and this is perhaps a greater surprise to the monetarist camp than to the credit view. However, it is always possible that the loan variable is picking up shocks to the base, which is not included in this model.

The message of this section thus turns out to be generally negative as to the possibility of discriminating between the two schools of thought, using such aggregate data. The basic models both appear reasonably soothing to members of the associated school. The hybrid monetarist model leaves the money story intact when the interest rate spread and business failures are added, but credit proponents could argue that the base variable is accounting for the effects of loans. The hybrid credit model suggests that money effects are important in addition to those said to operate through the asset side of the banks' balance sheets, but it is not a plank of the credit platform to say that money does not matter at all. The close comovement between loans, money and the base also clouds the interpretation here: monetarists could argue that the incremental explanatory power of the loans variable is doing service for base shocks, that are mixed with money demand shocks in the monetary aggregate variable.

It therefore appears that other data must be consulted, if we are ultimately to be able to assess the relative merits of the two views of the transmission mechanism. We offer a first step in this direction in the next section of the paper, by examining the composition of loans.

4. The Role of the Stock Market and Call Loan Market in the Institutional Framework, 1880-1914.

The results of the VARs in the preceding section, if taken at face value, suggest that both bank loans and money are important in the transmission mechanism. However, the institutional structure of the national banking era directs attention to the fundamental reason for the importance of bank loans in this period -- the intimate connection between the stock market and the national banking system established by the inverted pyramid of credit and the New York call loan market. Disturbances to the stock market translated themselves into the call loan market, which in turn had a dramatic impact on total bank loans in New York City and in the rest of the country. We now develop these themes.

A key feature of the regulations that defined the institutional structure of the national banking system was the imposition of different reserve requirements on three separate classes of national banks. Specifically, the Act of 1874 required country banks to hold 15 percent against their deposits, three fifths of which, or 9 percent, could be held as bankers' balances with correspondent national banks in reserve cities (with populations greater than 50,000) or in central reserve cities (New York and, after 1887, also Chicago and St. Louis). These balances earned up to 2 percent. The remaining two-fifths of required reserves were to be held in lawful money (U.S. notes, specie, gold and clearing-house certificates). Reserve city national banks were required to hold 25 percent of their deposits in reserves, half of which had to be held in lawful money, the other half available to be held as bankers' balances in central reserve city national banks. Central reserve city national banks were required to hold 25 percent of their deposits in lawful money.[17] Country and reserve city banks kept excess reserves far above the required levels in the form of bankers' balances in central reserve cities. These funds were a form of secondary reserves. The reserve structure of the national banking system has been described as an inverted pyramid, whereby most of the nation's reserves ended up as bankers'

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[17] Although Chicago and St. Louis were important regional centers, New York held the lion's share of bankers' balances. National banks in central reserve cities also held substantial correspondent balances of state banks, private banks, and trust companies.

balances in the central reserve cities, but especially in New York.[18]

Most of the reserves held as bankers' balances in New York national banks were invested in the call loan market. Call loans were demand loans secured by stock traded on the New York Stock Exchange and also by U.S. and other bonds. Most of the loans were made to brokers who would then consign the stock serving as collateral to the banks. The commercial banks considered call loans the most liquid form of investment, since they could be called at any time. The New York national banks dominated the call loan market, with between a third and a half of their loan portfolios in call loans during the period we cover (Myers, 1935, p. 290). Close to 75 percent of bankers' balances in New York were held in call loans between 1880 and 1904, the amount to be expected if the New York banks held the required 25 percent reserve requirement against those balances. In addition, country and reserve city national banks and state commercial, savings, and trust companies invested directly in the call loan market (using their central reserve city correspondents as intermediaries) whenever the call loan rate rose significantly above the 2 percent earned on bankers' balances. Thus an inverse relationship existed between the call loan rate and bankers' balances in New York City and a direct one between the call loan rate and country bank excess reserves invested directly in the call loan market (Myers, 1935, p. 290; James, 1978, p. 304).

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[18] The inverted pyramid was a natural outgrowth of the extensive correspondent network developed before the Civil War (James, 1978, chap.4; Myers, 1935). In the unit banking system that arose earlier in the century, holding balances with city correspondents represented a valuable way in which a country bank could gain access to an interregional clearing mechanism (obtain domestic exchange and clear out-of-town checks), obtain additional sources of credit (by interbank loans and rediscounts, although rarely extended in this period), and earn interest on excess reserves. The city banks on their part had access to the interior and secured compensation for their services to the country banks. The national banks thus extended an existing framework.

The inverted pyramid as well as the correspondent balance arrangement and its intimate connection to the call loan market are widely regarded as key elements in financial crises that periodically punctuated the era (Sprague, 1910; Myers, 1935). All the major banking panics of the period (1873, 1884, 1893, 1907) were marked by withdrawals of bankers' balances (especially those representing excess reserves) by the country and reserve city banks from the New York banks. The decline in bankers' balances in turn put pressure on the call loan market, causing call loan rates to rise and stock prices to fall -- possibly inducing a stock market crash. The decline in New York bank reserves could on occasion be so severe as to precipitate a panic, which could only be stopped by the restriction of convertibility of deposits into currency.

The evidence is mixed on whether the combined incidence of stock market crashes and banking panics during the national banking era reflects causation from the banking system or vice versa (Sylla et al., 1990). Although there were twice as many crashes as there were panics, all of the major banking panics also occurred close to stock market crashes. On a number of occasions, syndicates of prominent financial institutions were able to reverse the pressure on the call loan market (1899, 1901) (Myers, 1935, p. 286). On other occasions, as the pressure spread to the New York banks, panic was averted by the issue of clearing-house certificates by the New York Clearing House and/or by Treasury intervention (1884, 1890). However, on four occasions, this intervention was insufficient to prevent panic. Only a restriction of convertibility of deposits into currency sufficed. Thus the institutional features of the period suggest that it would be of interest to examine the composition of loans in New York City national banks and in the rest of the country.

Bank loans can be divided into demand and time loans. They were secured by different types of collateral: stocks and bonds, merchandise, and receivables. The latter two categories of loans were typically issued on the real bills principle that they would be self-liquidating.[19]

Of the categories of assets just noted, presumably credit rationing would refer to loans secured primarily by merchandise, since discounts and call loan rates were determined in active national markets. The balance sheets of the New York City national banks had similar categories to that of the country national banks, but the composition was quite different, reflecting the fact that New York City banks held no excess reserves.

Using data from the Annual Reports of the Comptroller of the Currency, we show in Figures 5 and 6 for one call date annually (usually in September), 1880-1914, two categories of bank loans as well as total bank loans for New York City and for all national banks. The two categories are loans secured by stocks and other loans.[20]

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[19] Other earning assets of the national banks were discounts and investments. Discounts were usually not secured by collateral, and differed from loans in that the interest charge was collected in advance. Discounts consisted primarily of commercial paper, either in the form of trade acceptances or lenders acceptances. Commercial paper bore either two names or one name. The latter were promissory notes that eclipsed the former by the end of the period. These instruments usually traded in an active national market, and the commercial paper rate fluctuated widely, reflecting changing conditions in the money market. Investments consisted of eligible U.S. securities required to back the note issue and other U.S. securities held as a form of secondary reserves.

[20] For 1880-88, the Comptroller showed four categories of loans:
(1) loans on U.S. bonds on demand;
(2) loans on other stocks, bonds, etc. on demand;
(3) loans on single-name paper without other security;
(4) all other loans.

From 1891 to 1914, the Comptroller showed five categories:
(1) loans on demand paper with one or more individual or firm names;
(2) loans on demand, secured by stocks, bonds, and other securities;
(3) loans on time, paper with two or more individual or firm names;

(Insert Figures 5 and 6 here)

The pattern that emerges from these figures is quite striking. New York City loans secured by stock are highly volatile, exhibiting sharp declines in the panic years 1884, 1893, and 1907. Other New York City loans by contrast are distinctly stable, with a mild upward trend, and the movement of total New York City loans reflects that of loans secured by stock.

For the U.S. as a whole, the pattern of loans secured by stock is much less volatile than for New York City, but declines in the panic years can be discerned. Other loans have a stable upward trend. While total U.S. loans pick up some of the volatility of New York City loans, they are considerably more stable.[21]

The stable pattern of other loans compared to loans secured by stock in New York City and, to a lesser extent, a similar difference in the composition of loans in the U.S. as a whole, in country banks. and in the U.S.

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(4) loans on time, single-name paper (person or firm) without other security; (5) loans on time, secured by stocks, bonds, and other personal securities, or on mortgages or other real estate securities.

For each of the years 1889 and 1890, the Comptroller showed different categories, not readily comparable to those of the preceding and subsequent periods, and they are consequently omitted from the figures.

The first category of loans that we show in Figure 5 -- loans secured by stocks -- consists for 1880-88 of categories (1) and (2), and for 1891-1914 of categories (2) and (5). The second category in Figure 5 -- other loans -- consists for 1880-88 of categories (3) and (4), for 1891-1914, of categories (1), (3), and (4).

We also compared demand loans secured by stock (i.e., call loans) -- category (2) -- to the rest. The pictures are similar to those presented here.

We also drew similar figures for country banks and total U.S. minus New York City. However, to save space we discuss but do not present the former, and the pattern of the latter, which includes country banks, reserve city banks, and central reserve cities other than New York, can be inferred from the figures we present.

[21] For country banks, loans secured by stock were also more volatile than other loans, but the difference between the two categories was not as marked as for New York City. Results are similar for the U.S. minus New York City.

minus New York City, suggest that whatever procyclical influence is exhibited by loans in New York City and for the U.S. as a whole can be explained by the behavior of the call loan market. On the face of it, this leaves little room for an independent influence on output variability of credit rationing. To demonstrate the link between the stock market and loans secured by stock, we plot in Figure 7 annual data in natural logs of New York City loans secured by stock and the Wilson, Sylla, and Jones stock price index. Figure 8 makes a similar comparison between U.S. loans secured by stock and the stock price index. As can readily be seen in Figure 7, volatility in the stock price index is reflected in the New York City stock loan series. The relationship is somewhat less transparent in Figure 8 for U.S. loans secured by stock.

(Insert Figures 7 and 8 here)

One inference that can be drawn from Figures 7 and 8 is that the significant results obtained for bank loans and other credit variables in the VARs reported in section 3 reflect stock market disturbances, where the principal stocks traded were railway stocks. These disturbances in turn could be reflecting earlier or contemporaneous monetary shocks, as Sprague (1910) argued, or future output shocks, as Schwert (1990) has proposed. It is a mistake, however, to argue, as does De Long (1990), that the waves of railroad construction in the late nineteenth century were independent of financial markets, on the ground that "There was no central bank to mistakenly squeeze off economic activity by letting the money supply grow too slowly" (p.29). The stock market reflected banking panics and concerns about the stability of the gold standard in the U.S. in 1890-97. External finance that the stock market provided either advanced or retarded railroad construction.

It appears from this discussion that the principal source of volatility in the series of total loans is the category of loans collateraled by stock, whose effects are not the subject of the credit story. The collateral for these loans was publicly priced, and not in any way idiosyncratic to the individual loan contract. Nor do the characteristics of the borrower of such a loan enter into the pricing and terms of the loan contract in any obvious way. Instead, it is the business loans represented by "other loans" that more faithfully relate to the credit view. This is so even if loans collateraled by stock were not used for stock purchases but, as money is fungible, were applied to business use.

Ideally, instead of the aggregate loans series used in the estimation exercise of the preceding section, it would be desirable to rerun it with data on other loans. Unfortunately, quarterly data on disaggregated categories of loans are not available for this period. Instead, we have formulated a structural VAR model, which includes in addition to the quarterly growth of aggregate loans, the quarterly change in stock prices, and the call loan rate. The latter variables are proxies for the pattern of stock market loans, and so their inclusion should go some way toward "filtering" the stock market loans from the series of total loans.

The complete model, which also includes real GNP growth, real M2 growth, and the interest rate spread, is shown in Table 5. The call loan rate is, in effect, serving both as an instrument for stock market loans, and as a proxy for the commercial paper rate. The exclusion of inflation and the rate of business failures is explained by the need to limit the size of the model. The results of the preceding section suggest that the omission of these two variables is of little consequence.

(Insert Table 5 here)

As Figure 9 shows, the response of output to real money shocks does not wash out in the long run, while the output response to loan innovations is more muted and transitory. The variance decomposition shows that 15.7 percent of the real loan forecast error variance is accounted for by stock price and call loan rate innovations. While direct comparisons cannot be made rigorously between models that are not nested, it is nevertheless instructive to use the basic credit model of section 3 as a benchmark. In that model, 84.5 percent of loan variance comes from loan innovations; with the inclusion of money and the proxies for stock market loans, this proportion falls to 52.2 percent.[22] There is also a marked strengthening of the link between loans and the spread; 19.1 percent of loan variability comes from spread innovations, and 30.3 percent of spread variability comes from loan innovations in the stock market model. In contrast, these proportions are 4.4 percent and 8.8 percent, respectively, in the basic credit model. These results are consistent with the discussion above of the significance of stock market loans; the loans variable needs to be purged of the effects of stock market loans in order to extract the essence of the credit interpretation.

The bottom line is surely the proportion of output forecast error variance explained by loan innovations, which is 9.2 percent in this model, significantly lower than the 35.9 percent registered in the basic credit model, and the 16.0 percent in the hybrid credit model. It is also of interest to note that, when the stock market model is run with loans by New York City banks (as noted above, with a far greater proportion of their loan volume in the call loan market than was the case for total U.S. loans), the contribution

[22] Note that this also happens in the hybrid credit model, when money alone is included.

of loan innovations to the output variance forecast error drops to 4.4 percent.[23]

In summary, as one would expect from examination of the breakdown of loans into their various categories, loans other than stock market loans are not closely related to output fluctuations during the national banking period. In contrast, the contribution of money to output variability is consistently in the range of 12-18 percent, and the combined contribution of money and the base is about 25%.

5. Conclusion

A growing theoretical literature of the past decade assigns a major role to credit rationing by banks, defined as a reduction in bank lending with little change in interest rates, in influencing the course of the real economy. The theory, elaborated in the context of existing banking and monetary arrangements, is far more developed than empirical verification of its propositions. The most advanced efforts at empirical verification in current circumstances apply the method of structural VARs to a limited number of variables designed to show that credit variables account for a preponderance of output forecast error variance. Our point of departure is the application of the method by Calomiris and Hubbard to the national banking period.

We broaden the inquiry to encompass not only credit but also money variables, and apply the structural VAR methodology to assess the relative merits of money and credit explanations of real activity during the national banking period.Implementing this approach requires identification assumptions

[23] In this specification, the spread and loans variables once again explain minimal proportions of each other's forecast error variance.

to be made concerning the contemporaneous interactions among variables. Since this approach also implies that the resulting system of simultaneous equations contains no substantive misspecification, it is well to test the robustness of the conclusions drawn from any one model, by changing the identification assumptions. Experience with the models used in this paper counsels that one place stock in those conclusions that are consistent with all models.

The salient feature of the estimation results is that the explanatory power of money and the base is moderate and robust to changes in that specification of the underlying model. Similarly, we repeatedly fail to find a sizeable output effect of the spread and business failures variables. Last, the effect of loan variability on output fluctuations is highly sensitive to changes in specification, and declines dramatically when money is introduced into the model, and stock market loans are controlled for.

These results motivate the conclusion that there is little support during the national banking era for the "credit" view of the transmission mechanism: that the asset side of bank's balance sheets is a significant determinant of output fluctuations. This inference, drawn from the variance decomposition of our structural VAR exercises, is supported by direct examination of the course of "other loans" (which we take to represent business loans) over the national banking period. Other loans exhibit little, if any, volatility, and so they are not to be expected to explain output fluctuations.

Our findings raise a number of issues that cannot be addressed within the confines of the present study. We have not examined whether interest rates flatten out instead of continuing to rise as output growth reaches a peak, which is a critical implication of the credit story. The VAR methodology is limited to an examination of short run interactions among macroeconomic time series. The case of the equilibrium credit rationing story is microeconomic in nature, and our data provide little that can directly address the question whether banks, beyond a certain point refrain from lending, irrespective of their reserve positions.

Similarly, we find striking the lack of fluctuation in "other loans", a series that seems to grow with GNP. This may reflect an extreme form of customer relations between lenders and borrowers, or it may be a consequence of the relative ease of acquiring loans in a growing economy whose banking sector more than quadrupled in number over the period of our study. It appears that these issues would most fruitfully be addressed by a study of banks' historical records.

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Appendix:Data Sources

Annual Series:

U.S. and New York City Loan Classification for one call date (usually September). U.S. Comptroller of the Currency, Annual Report, 1880-1914.

Quarterly Series:

GNP, real and nominal; GNP deflator. Balke and Gordon (1986), Appendix Table 2, pp. 790-793.

U.S. loans. NBER Business Cycle tape, series 14,15, call dates interpolated to 3d month of the quarter.

New York City loans. NBER Business Cycle tape, series 14,20, call dates interpolated to 3d month of the quarter.

M2. Friedman and Schwartz (1970), Table 2, pp. 61-66.

Base. Friedman and Schwartz (1970), Table 21, pp. 346-350; Table 26, pp. 396-397, call dates interpolated to 3d month of quarter.

Net gold flows. NBER Business Cycle tape, series 14,112, monthly, every third month.

Commercial paper rates in New York City. Macaulay (1938), Appendix Table 10, pp. A147-A156, monthly, every third month.

Call loan rates at the New York Stock Exchange. NBER Business Cycle tape, series 13,01, monthly, every third month.

Spread. Unpublished quarterly data from Mishkin underlying his (1991) paper.

Liabilities of business failures. NBER Business Cycle tape, series 9,32, monthly, every third month

Stock price index. Wilson, Sylla, and Jones (1990).

Table 1

MONETARIST MODEL

INTERACTIONS AMONG CONTEMPORANEOUS VARIABLES[1]

Equation	Base[2]	M2	Real GNP	Comm. Paper	Deflator
Base				1.077 + (.498)	.118 - (.021)
M2	.43 + (.264)[3]			0.886 - (.469)	
Real GNP		.876 + (2.51)		0.531 - (3.49)	.017 + (0.02)
Comm. paper		-.818 - (.633)	-.192 - (.833)		
GNP Deflator		.246 + (.038)			

VARIANCE DECOMPOSITION
(Percent)

Equation	Base	M2	Source of Innovation Real GNP	Comm. Paper	Inflation
Base	64.5	12.1	2.9	16.5	3.9
M2	30.1	30.7	6.9	24.5	7.8
Real GNP	8.5	18.3	52.2	12.1	8.9
Comm. paper	35.8	32.0	4.8	18.8	8.8
Inflation	11.0	2.9	2.2	4.0	80.0

[1]The entries in the table are the negative of the respective elements of Γ. For example, the entry .43 means that the coefficient of the contemporaneous effect of Base growth on M2 growth is .43. The '+' sign to the right of the coefficient signifies that its expected sign is positive.

[2]All variables except those involving interest rates are percentage rates of change.

[3]Standard errors are in parentheses.

Table 2

CREDIT MODEL

INTERACTIONS AMONG CONTEMPORANEOUS VARIABLES[1]

Equation	Real Loans[2]	Comm. Paper	Spread	Deflator	Real GNP	Business Failures
Real Loans			1.55 - (4.64)			.364 - (.90)
Comm. paper	-.187 - (.037)[3]					
Spread		.031 + (.006)		-.001 - (.003)		.032 + (.016)
GNP Deflator		-.071 + (.19)				.871 - (.544)
Real GNP	.453 + (.083)	.37 - (.23)	-2.13 - (2.76)	.38 + (.100)		-.246 - (.541)
Bus. Failures		.165 + (.031)				

VARIANCE DECOMPOSITION
(Percent)

	Source of Innovation					
Equation	Real Loans[2]	Comm. Paper	Spread	Deflator	Real GNP	Business Failures
Real Loans	82.2	7.9	5.8	2.1	0.7	1.2
Comm. paper	35.8	35.5	5.5	18.0	1.7	3.6
Spread	12.2	13.0	69.1	2.2	1.4	2.2
GNP Deflator	10.7	4.5	1.9	76.2	2.7	3.9
Real GNP	35.9	3.4	3.3	16.8	37.2	3.2
Bus. failures	8.5	12.3	0.7	6.1	0.4	71.9

[1,2,3] See Table 1 for notes.

Table 3

HYBRID MONETARIST MODEL

INTERACTIONS AMONG CONTEMPORANEOUS VARIABLES[1]

Equation	Real Base[2]	Real M2	Real GNP	Comm. Paper	Deflator	Bus. Failures	Spread
Real Base				-3.24 $^{+}$ (2.81)	-1.25 $^{-}$ (1.03)		
Real M2	-2.66 $^{+}$ (6.88)[3]			2.33 $^{-}$ (8.0)		.271 $^{-}$ (.7)	.100 $^{-}$ (.27)
Real GNP		-.012 $^{+}$ (.24)		-.358 $^{-}$ (.28)	.150 $^{+}$ (.18)	-.071 $^{-}$ (.06)	-.01 $^{-}$ (.03)
Comm. paper	.514 $^{-}$ (.13)	-.827 $^{-}$ (.29)	.149 $^{-}$ (.11)				
GNP Deflator		-.848 $^{+}$ (.08)				-.054 $^{-}$ (.03)	-.023 $^{-}$ (.02)
Bus. failures				1.29 $^{+}$ (.34)			
Spread				2.733 $^{+}$ (.67)	-.017 $^{-}$ (.54)	.429 $^{+}$ (.17)	

VARIANCE DECOMPOSITION
(Percent)

	Source of Innovation						
Equation	Real Base	Real M2	Real GNP	Comm. Paper	Deflator	Bus. Failures	Spread
Real Base	13.6	73.1	1.5	2.3	4.3	3.2	1.9
Real M2	4.4	48.2	5.8	17.9	10.4	1.9	11.3
Real GNP	12.3	12.7	52.2	4.2	8.9	4.1	5.5
Comm. paper	32.4	24.6	5.4	8.7	10.9	5.4	12.5
GNP Deflator	2.3	48.7	3.0	21.0	18.2	3.3	3.5
Bus. failures	8.9	12.6	0.8	5.3	4.4	66.8	1.1
Spread	10.4	4.2	0.5	3.0	4.8	3.4	73.7

[1]See Table 1 for notes.

Table 4

HYBRID CREDIT MODEL

CONTEMPORANEOUS VARIABLES

Equation	Loans	Comm. Paper	Spread	Deflator	Real GNP	Business Failures	M2
Loans			-1.35 $^-$ (2.95)	.302 $^+$ (.09)		.053 $^-$ (.06)	.58 $^+$ (.16)
Comm. paper	-.184 $^-$ (.04)						
Spread		.0328 $^+$ (.01)		-.0124 $^-$ (.01)		.0024 $^+$ (.002)	
GNP Deflator		.0169 $^+$ (.54)	11.11 $^+$ (16.6)			-.089 $^-$ (.07)	.433 $^+$ (.18)
Read GNP	.437 (.09)	.402 $^-$ (.22)	-3.04 $^-$ (2.72)	-.0717 $^+$ (.08)		-.0209 $^-$ (.05)	-.038 $^+$ (.16)
Bus. failures		.136 $^+$ (.03)					
M2		-.236 $^-$ (.11)				-.0749 $^+$ (.03)	

VARIANCE DECOMPOSITION

Equation	Loans	Comm. Paper	Spread	Deflator	Real GNP	Business Failures	M2
Loans	49.6	5.4	6.4	10.3	1.5	0.5	14.4
Comm. paper	16.2	41.7	9.3	7.7	2.9	3.0	19.1
Spread	9.6	9.9	57.1	10.8	1.2	2.9	8.5
Inflation	0.9	4.1	9.5	70.4	2.7	3.8	8.6
Read GNP	16.0	5.2	7.0	7.5	47.1	2.8	14.3
Bus. failures	3.6	8.2	0.8	5.0	0.5	76.0	5.8
M2	5.9	6.9	18.3	6.5	2.1	3.2	57.3
Addendum: Model Using Real Loans							
Real output	16.0	5.2	7.0	7.5	47.1	2.8	14.3

Table 5

STOCK MARKET MODEL

CONTEMPORANEOUS VARIABLES[1]

Equation	Real Loans[2]	Stock Price	Real GNP	Real M2	Spread	Call Rate
Real Loans		.15 +		-.063 +	24.8 -	-.20 -
Stock price			.70 +			
Real GNP	.317 +			-.158 +	.17 -	.683 -
Real M2	.564 +					-.028 -
Spread	-.019 -	-.003 -				.003 +
Call rate		.029 +				

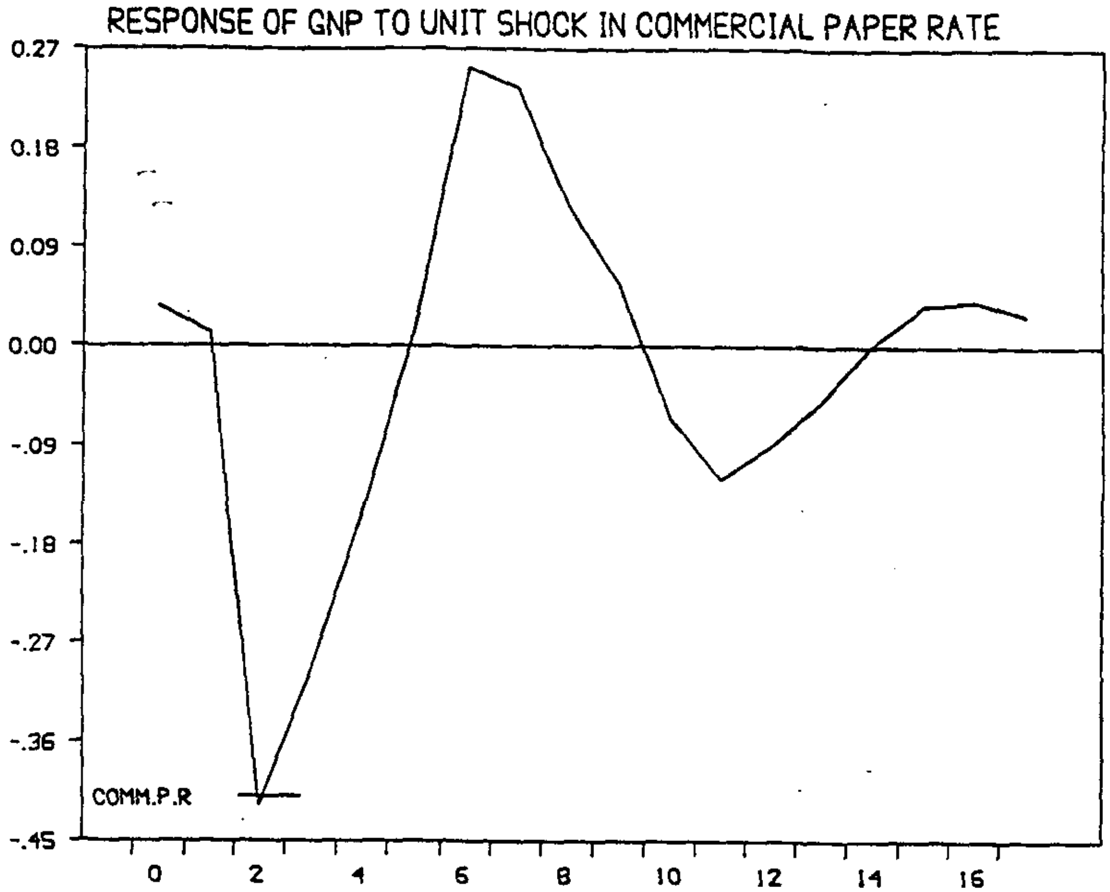
VARIANCE DECOMPOSITION
(Percent)

		Source of Innovation				
Equation	Real Loans	Stock Price	Real GNP	Real M2	Spread	Call Rate
Real Loans	52.2	9.5	1.6	11.3	19.1	6.2
Stock price	4.9	70.3	5.8	11.4	2.5	5.0
Real GNP	9.2	14.0	54.1	16.8	1.7	4.1
Real M2	30.6	6.8	5.4	43.0	10.4	3.7
Spread	30.3	24.8	2.6	3.2	36.2	2.8
Call rate	6.3	12.3	2.2	8.2	2.7	66.3
Addendum: Model Using Real NY Loans						
Real GNP	4.5	13.1	57.0	16.0	4.2	5.1

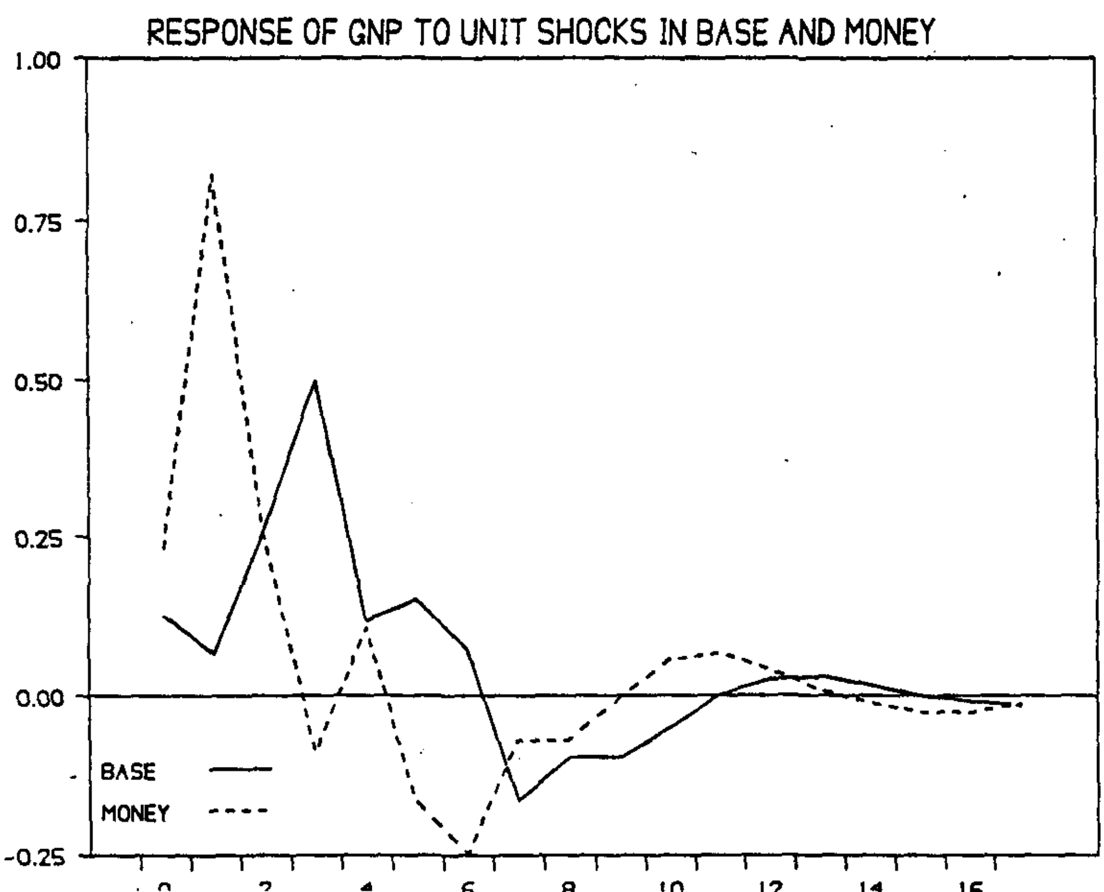
[1,2] See Table 1.

[3] While a number of starting values converged to those reported in the Table, which corresponded to the maximum found for the likelihood function, numerical computation of standard errors proved infeasible, as it was not possible to invert the Hessian.

Figure 1

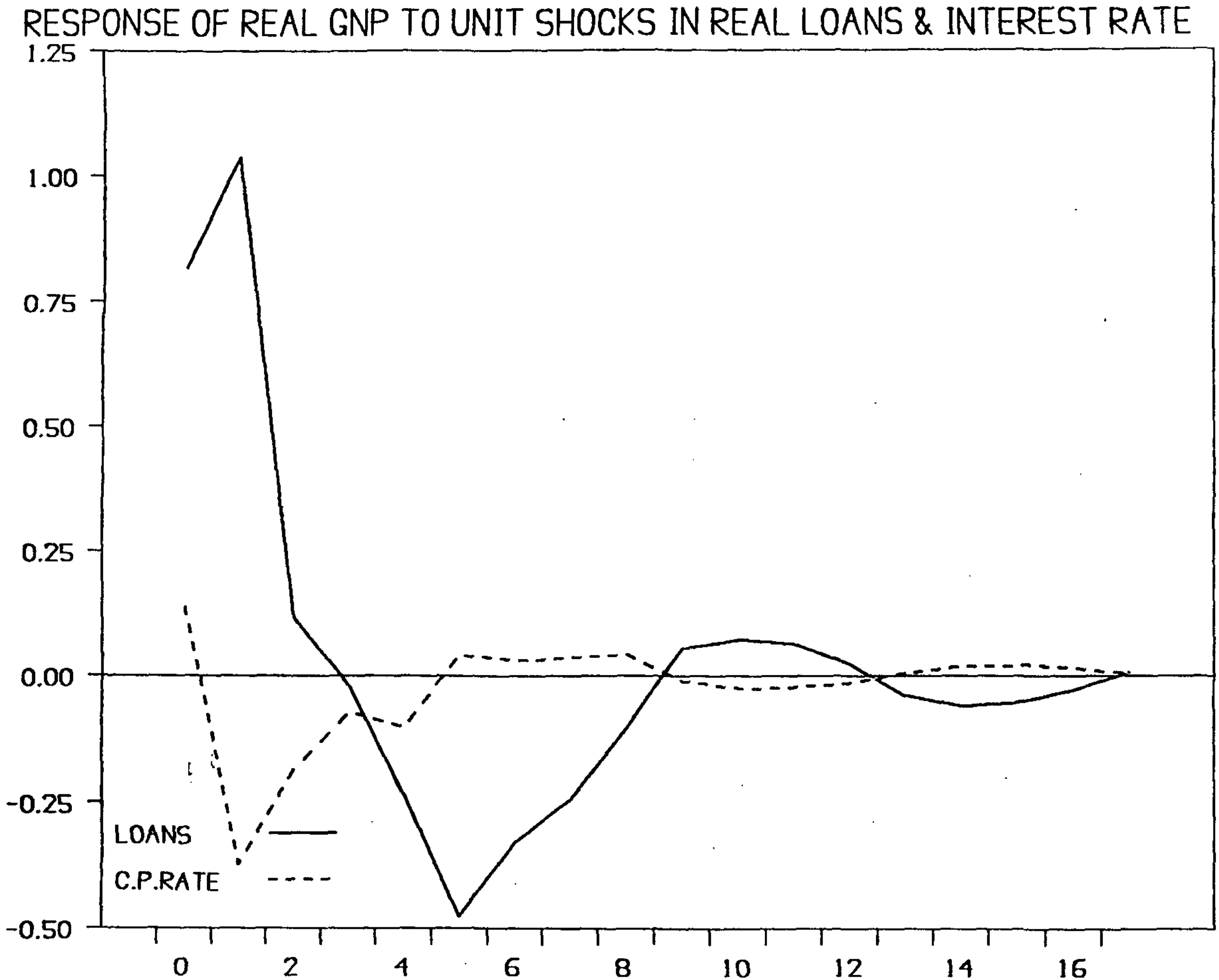


RESPONSE OF GNP TO UNIT SHOCK IN COMMERCIAL PAPER RATE
0.27
0.18
0.09
0.00
-.09
-.18
-.27
-.36
-.45
COMM.P.R
0
2
4
6
8
10
12
14
16



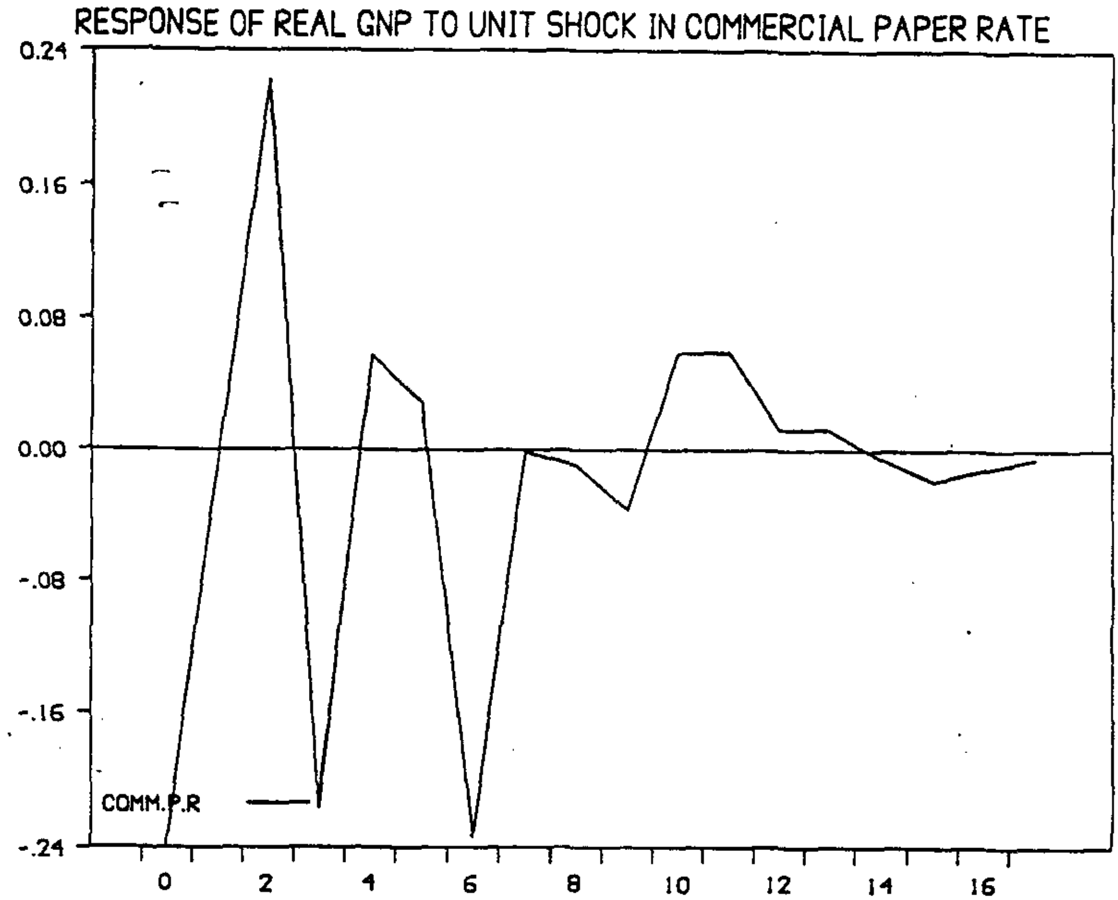
RESPONSE OF GNP TO UNIT SHOCKS IN BASE AND MONEY
1.00
0.75
0.50
0.25
0.00
-0.25
BASE
MONEY

Figure 2



RESPONSE OF REAL GNP TO UNIT SHOCKS IN REAL LOANS & INTEREST RATE
1.25
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
0
2
4
6
8
10
12
14
16
LOANS
C.P.RATE

Figure 3


RESPONSE OF REAL GNP TO UNIT SHOCK IN COMMERCIAL PAPER RATE
0.24
0.16
0.08
0.00
-.08
-.16
-.24
COMM.P.R
0
2
4
6
8
10
12
14
16

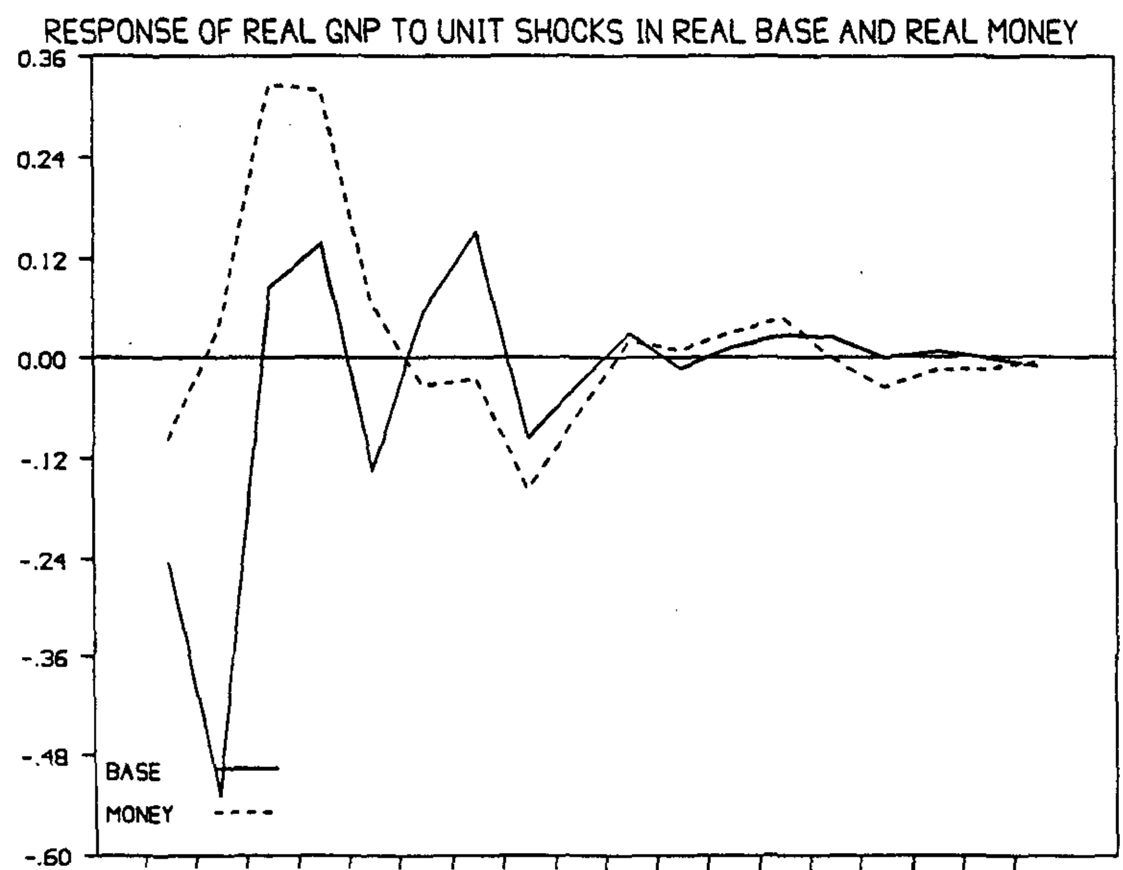
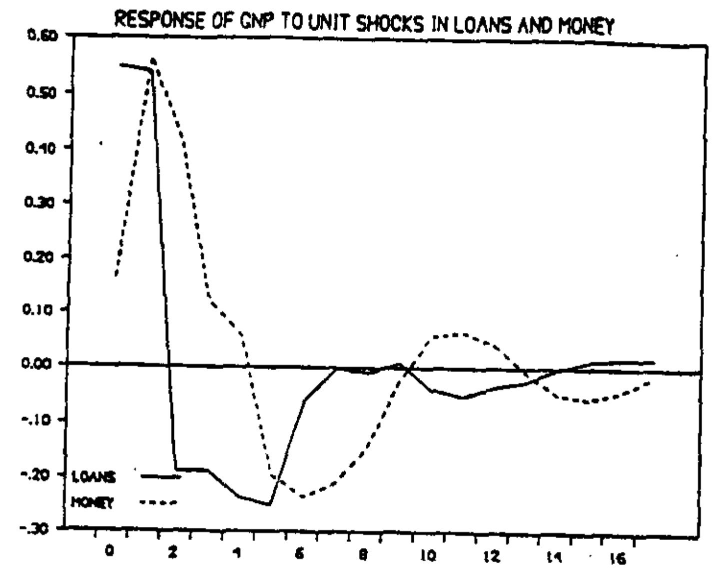
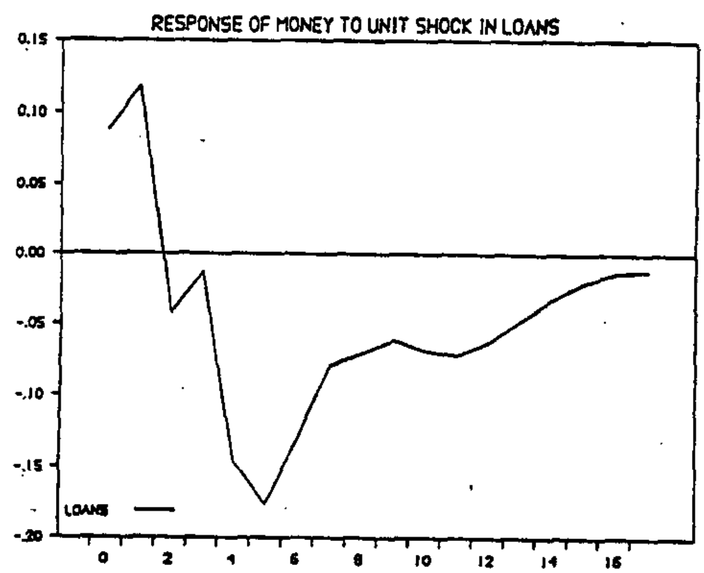

RESPONSE OF REAL GNP TO UNIT SHOCKS IN REAL BASE AND REAL MONEY
0.36
0.24
0.12
0.00
-.12
-.24
-.36
-.48
-.60
BASE
MONEY

Figure 4


RESPONSE OF GNP TO UNIT SHOCKS IN LOANS AND MONEY
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-.10
-.20
-.30
LOANS
MONEY
0
2
4
6
8
10
12
14
16


RESPONSE OF MONEY TO UNIT SHOCK IN LOANS
0.15
0.10
0.05
0.00
-.05
-.10
-.15
-.20
LOANS
0
2
4
6
8
10
12
14
16

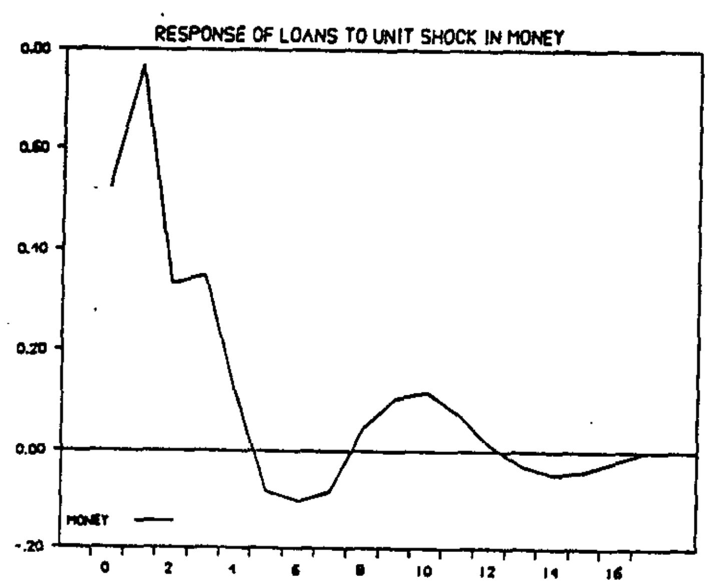

RESPONSE OF LOANS TO UNIT SHOCK IN MONEY
0.60
0.40
0.20
0.00
-.20
MONEY
0
2
4
6
8
10
12
14
16

Figure 5

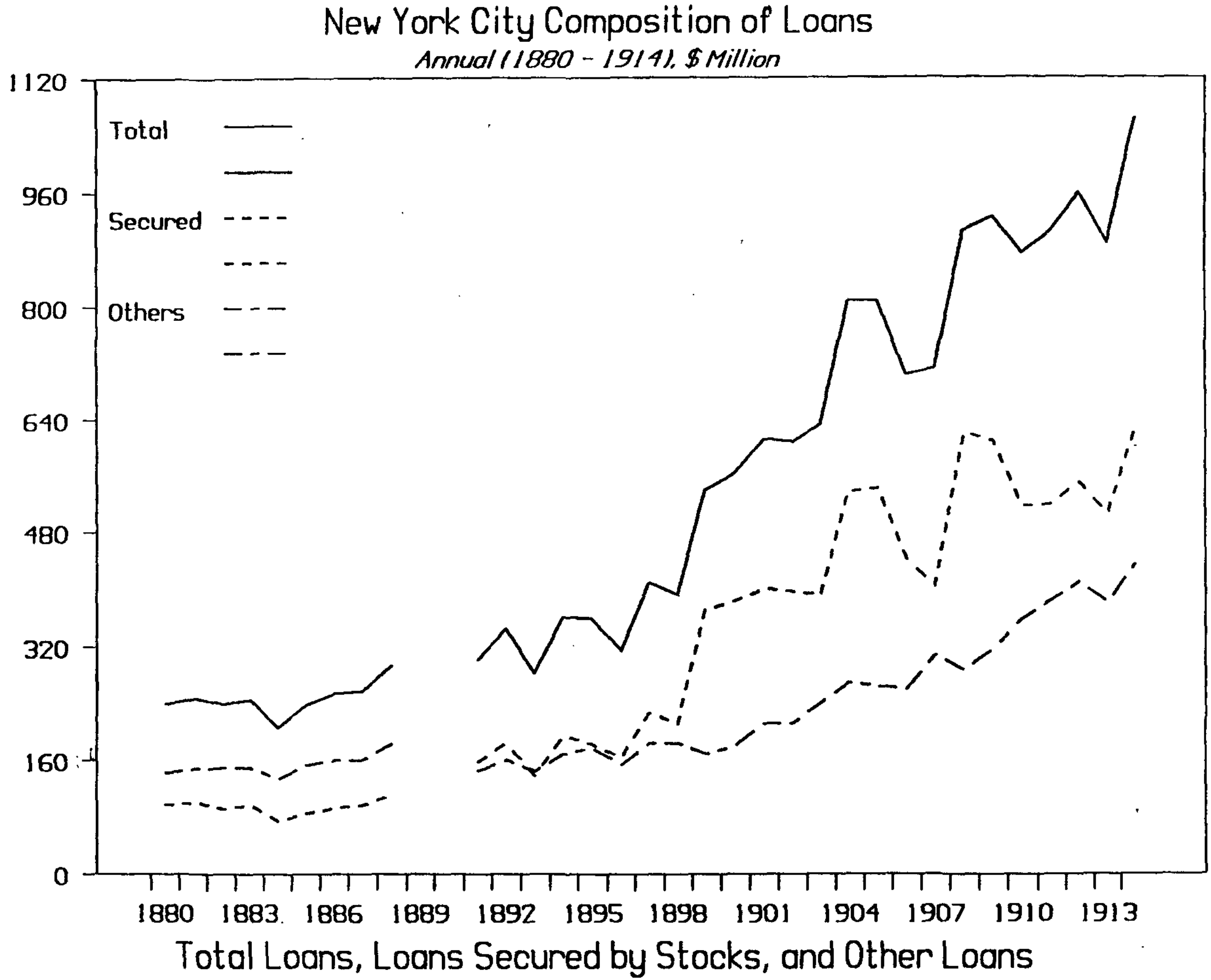

New York City Composition of Loans
Annual (1880 - 1914), $ Million
1120
960
800
640
480
320
160
0
Total
Secured
Others
1880
1883
1886
1889
1892
1895
1898
1901
1904
1907
1910
1913
Total Loans, Loans Secured by Stocks, and Other Loans

Figure 6

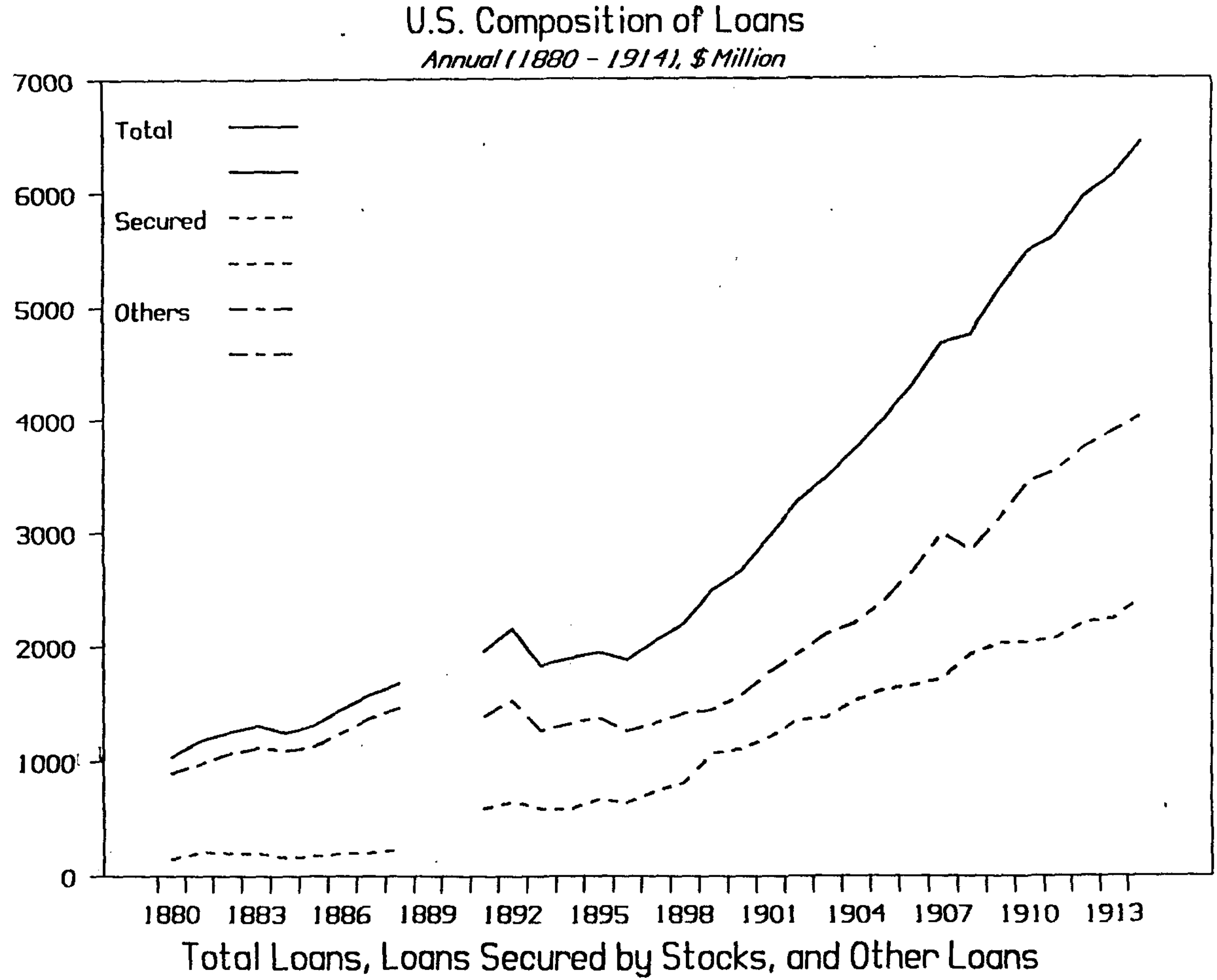

U.S. Composition of Loans
Annual (1880 - 1914), $ Million
7000
6000
5000
4000
3000
2000
1000
0
Total
Secured
Others
1880
1883
1886
1889
1892
1895
1898
1901
1904
1907
1910
1913
Total Loans, Loans Secured by Stocks, and Other Loans

Figure 7

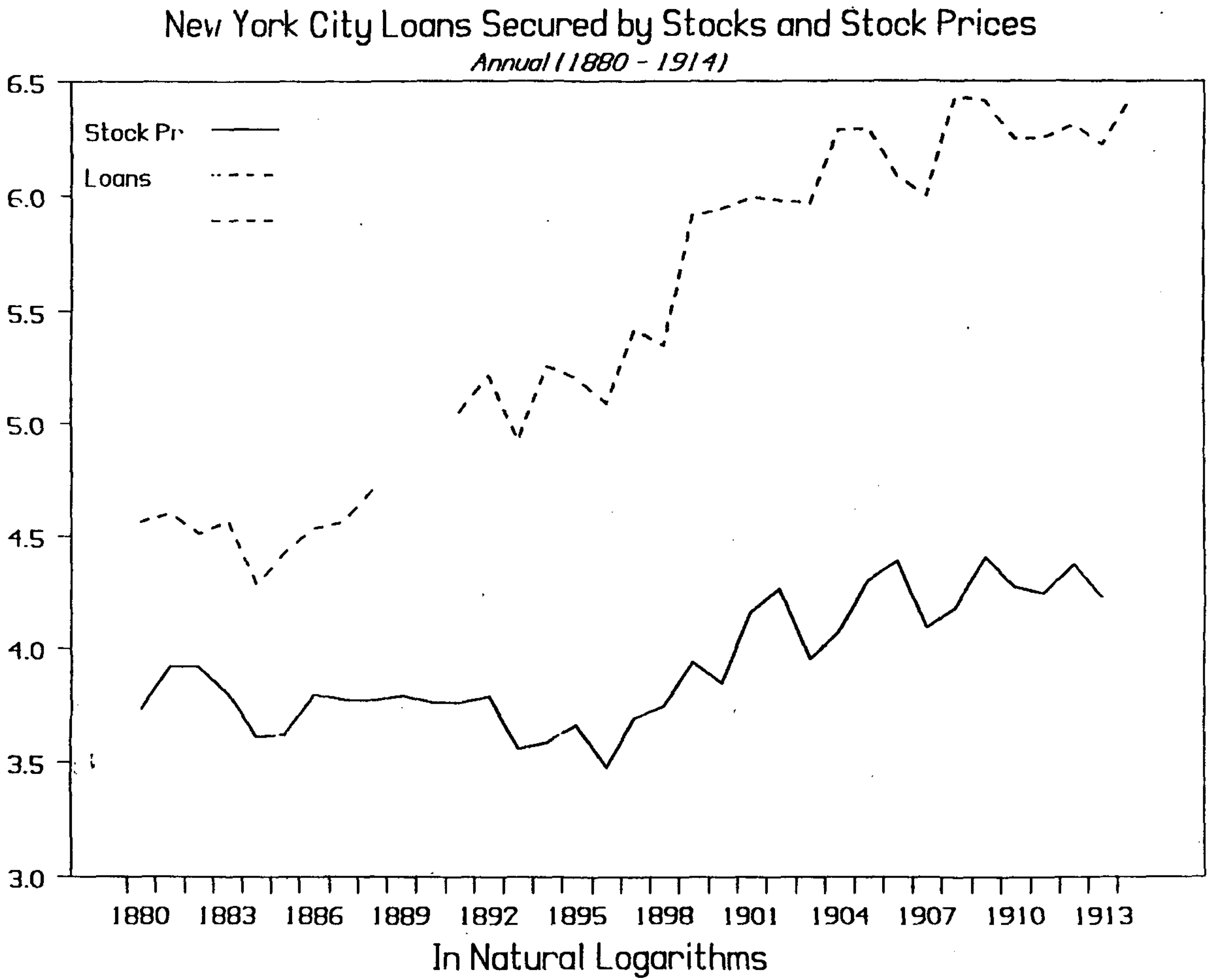
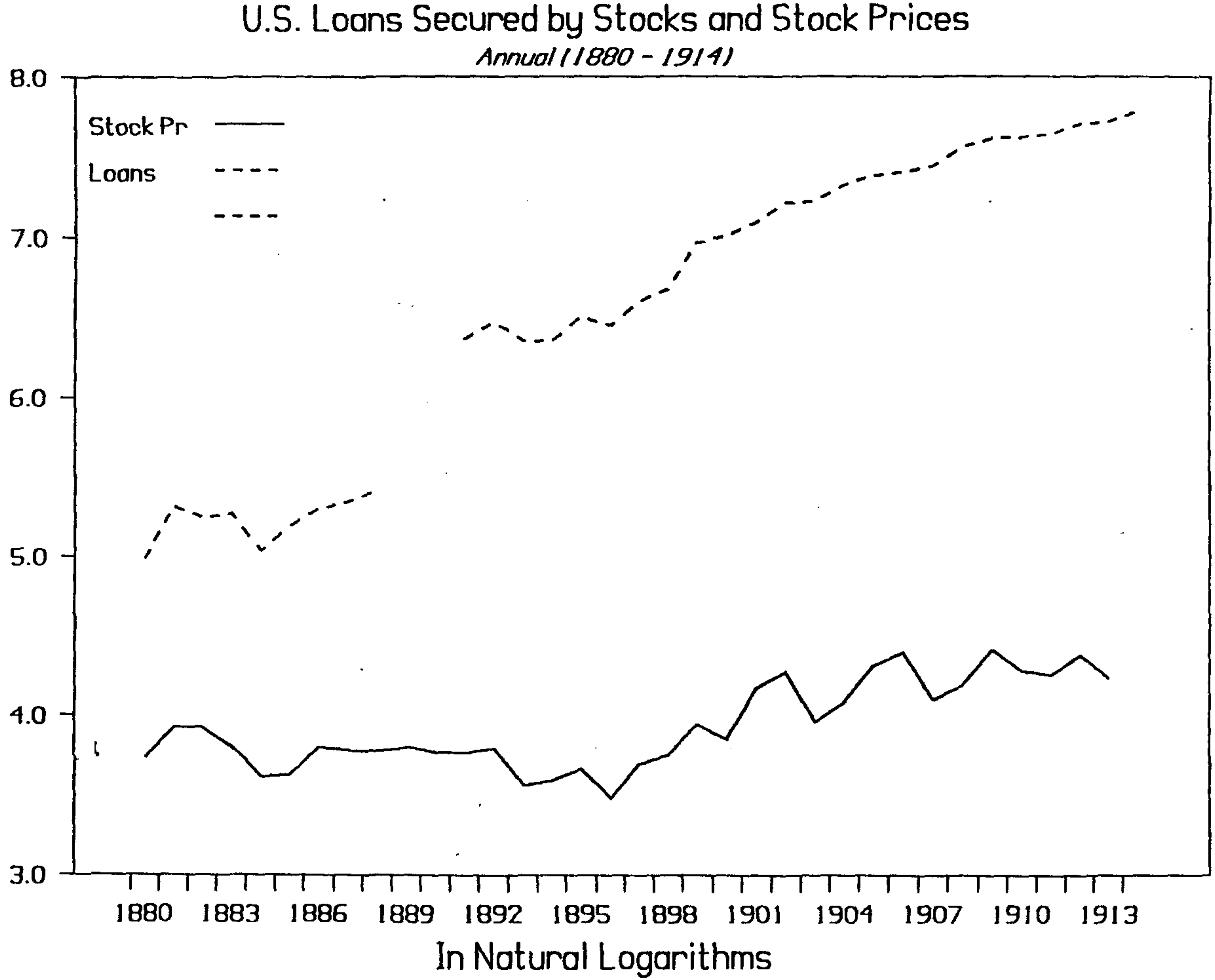
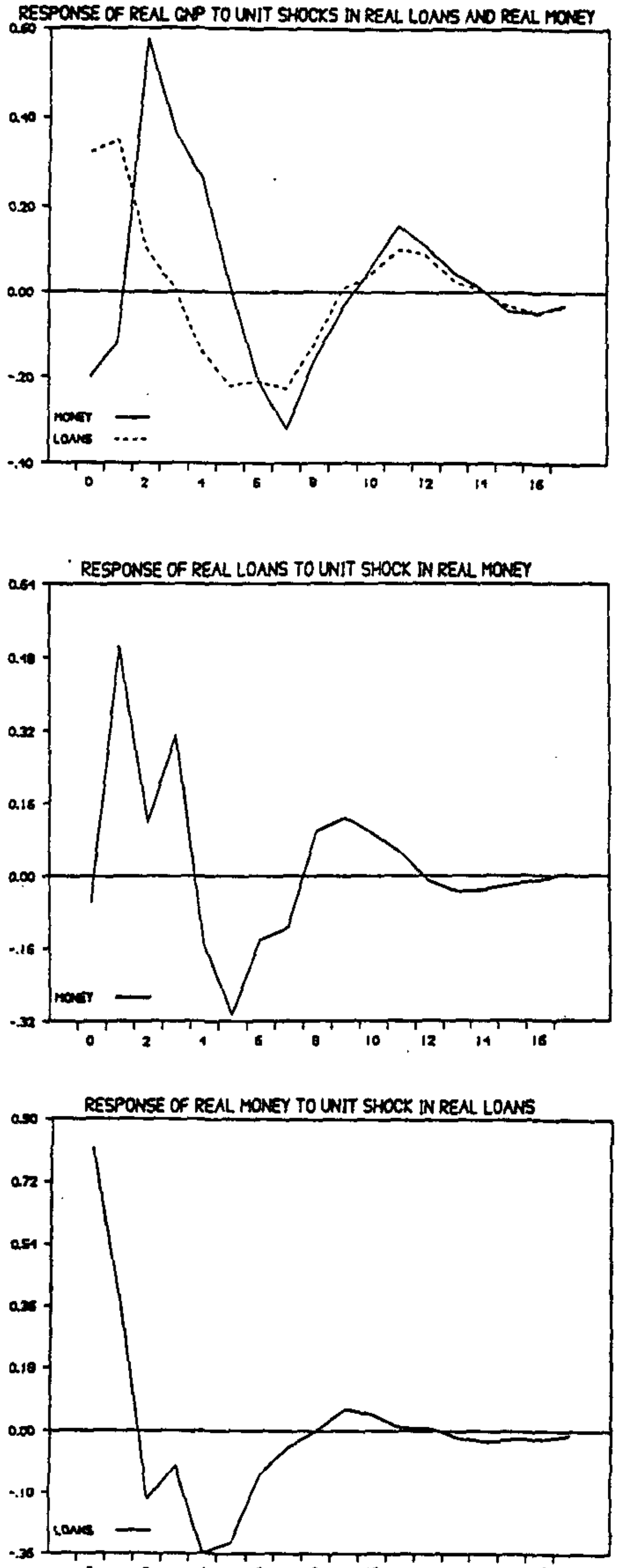

New York City Loans Secured by Stocks and Stock Prices
Annual (1880 - 1914)
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
Stock Pr
Loans
1880
1883
1886
1889
1892
1895
1898
1901
1904
1907
1910
1913
In Natural Logarithms

Figure 8



U.S. Loans Secured by Stocks and Stock Prices
Annual (1880 - 1914)
8.0
7.0
6.0
5.0
4.0
3.0
Stock Pr
Loans
1880
1883
1886
1889
1892
1895
1898
1901
1904
1907
1910
1913
In Natural Logarithms

Figure 9


RESPONSE OF REAL GNP TO UNIT SHOCKS IN REAL LOANS AND REAL MONEY
MONEY
LOANS
RESPONSE OF REAL LOANS TO UNIT SHOCK IN REAL MONEY
MONEY
RESPONSE OF REAL MONEY TO UNIT SHOCK IN REAL LOANS
LOANS