On the Role of Credit Rationing in the Monetary Transmision Mechanism: Some Evidence*

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Abstract

This paper analizes the response of the credit standards policy carried by US banks to a monetary shock. This variable is arguably the best available proxy of the credit rationing present in the economy at the aggregate level. Results show that after a contractionary monetary policy shock, the net number of banks tightening the standards policy increase by near two percent. This result seems to be robust to alternative identifiable monetary shocks and different specifications. Although this work identifies that standards policy reacts to monetary shocks, how relevant is this rationing effect for the dynamics of the economy is an issue that needs to be more deeply study.

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1 Introduction

In the last 20 years, the literature has documented the short run effects of monetary shocks. Empirical research and theoretical characterizations have concluded that after a contractionary monetary policy shock, aggregate output, employment and profits fall, short term interest rates rise, and the aggregate price level responds very slowly (an extensive survey on the empirical literature can be found in Christiano, Eichenbaum and Evans (1998), whereas theoretical references are surveyed by Christiano, Eichenbaum and Evans (1997,2005) and Gali (2002), among others). The mechanisms delivering these results are however still being subject of study.

At least two main channels that can produce these effects have been identified by the literature. For instance, Gertler and Gilchrist (1993) make a distinction between the money view (also called traditional Keynesian) and the credit view. The first one is based on the idea the supply and demand for money determines the short term interest rate, which (if inflation does not adjust automatically) affects on investments and output. The credit view focus on financial imperfections limiting the ability of some borrowers to obtain funds. This produces a real effect through either affecting the aggregate demand (if consumers are affected) or the supply of goods (if producers are affected). It is important to realize that these two views not necessarily conflict with each other, and both produce the same qualitative effects after a monetary shock.

Inside the credit channel, two different effects have been characterized by previous works, both based in the external finance premium concept. Under the presence of asymmetric information, there is a gap between the price of external funds and internal funds (the finance premium). A contractionary monetary policy can then affect this premium by two different ways. On one hand, a direct effect is produced because this wedge is bigger given the higher cost of external financing (this effect has also been named the balance-sheet effect). An indirect effect is also present as the value of the collateral that firms use to obtain external financing is reduced by the rise on the interest rate.

These two effects have been studied empirically by Gertler and Gilchrist (1992, 1993), Bernanke and Blinder (1992), Christiano, Eichenbaum and Evans (1996) and Bernanke and Gertler (1995), among others. The evidence presented on these papers focus on the effect of monetary shocks on different measures of loans; emphasizing the fact that these effects seem to be bigger when small borrowers are analyzed.

Theoretical characterizations of the credit channel have been developed in Bernanke, Gertler and Gilchrist (1996, 1999), where the concept of financial accelerator was introduced. The idea behind this concept is that financial imperfections provide a propagation mechanism that enlarges the basic money effect; as the results of model characterizations and simulations show.

According to this literature, the role of credit rationing seems not to be important in this discussion. For example, after describing the two effects included in the credit channel view, Gertler and Gilchrist (1993) comment:

> "Despite popular conception, nothing in the story hinges on credit rationing. The bank loan market may clear by price. The reduced quantity of available bank credit owing to open market sale may raise the bank loan rate relative to the open market lending rate. The gap in the rates may persist due to the segmentation of the markets." [pag. 46]

Another example can be found in the work by Bernanke, Gertler and Gilchrist (1999). The structure for the asymmetric information problem that they assume (a costly state verification problem in which lenders must pay an auditing cost in order to observe the realized return) allows them to analyze situations with credit rationing. They choose however not to study this case in order to simplify the analysis, making no further comments on this issue.

Is not clear *a priori* why credit rationing should play no role in this discussion. Consider the case of a loan officer which just realized that a negative monetary shock had hit the economy. This is basically translated into a reduction on the amount of available funds for loans. Under this situation, this officer has to decide between two polar decisions (or a combination of both). One alternative is to raise the rate for current clients. The other is to maintain the same rate but to reduce the amount of serving clients. The first alternative is consistent with the credit channels described before, whereas the second one is related with credit rationing. It is reasonable to expect that what we observe is a combination of these two situations. However, the second alternative has apparently been neglected by the previous literature.

The presence of credit rationing creates non trivial effects. At first glance, someone can argue that both effects (rise on the interest rate or rationing) generates the same results: both translates in less credit for firms, reducing the aggregate production capacity; and this is what matters for the propagation of the shock. However, the consequence of credit rationing is not simply less production. For instance, the adverse selection argument made by Stiglitz and Weiss (1981, 1983), among others, imply that credit rationing change the pool of firms that end up producing in the economy. In particular, less efficient firms are the ones that are financed. Therefore, the effect is not the same than the one produced after a rise in the interest rate.

Probably one of the reasons for the apparent lack of discussion on the rationing issue is the difficulty to bring these theories to the data. Credit rationing is a fact that economists generally tend to accept, as theoretical models have successfully shown that this possibility can arise as an equilibrium result (for an enlightening discussion on these theories, see Freixas and Rochet (1997)). Empirical identification of this phenomenon is however a difficult task to achieve, basically because it cannot be observed directly from the data. Several empirical studies have been conducted, most of them based on micro evidence at a firm level. Examples of this literature are Petersen and Rajan (1994), Schiantarelli (1996), and Streb et al. (2002).

Even harder is the task of identifying credit rationing at a macro level. Nevertheless, in a recent work, Lown and Morgan (2002) have explored the role played by the variable 'credit standards' in the monetary mechanism[1]. This variable is produced by Senior Loan Officer Opinion Survey on Bank Lending Practices (conducted quarterly by the Federal Reserve Board) and accounts for the net percentage of domestic banks reporting tightened standards (over the previous quarter) for approving commercial and industrial (C&I) loans applications. Figure 1 plots the series of credit standards and Table 1 presents descriptive statistics[2].

Using an identification strategy similar in spirit to the recursive approach in Christiano, Eichenbaum and Evans (1998), Lown and Morgan (2002) show that the number of banks tightening their loan acceptance policy increases by 1% after a monetary shock[3]. Although their goal is not to identify a credit rationing channel, this variable is probably the best proxy that can be found for the rationing policy conducted by banks. Furthermore, the evidence presented in that paper is a first signal that the standards policy is indeed affected by a monetary shock.

The first step in a research agenda aimed to characterize the role of credit rationing in the monetary mechanism should be then to study how standards respond to a monetary shock. The goal of this paper is to produce a robust analysis of this reaction. We evaluate the dynamic responses of standards using the recursiveness assumption as explained by Christiano, Eichenbaum and Evans (1998). Several different ways to implement these assumptions were used, and results were subject to robustness checks with different model specifications.

The main finding is that a monetary shock significantly increases the net number of banks tightening the standards policy increase by near two percent. Also, the monetary shock can explain near ten percent of the forecast error of standards for long horizons, with values between five and fourteen percent depending on the specification.

While these results identify that the credit standards policy carried by banks is indeed affected for a monetary shock, the importance of this effect still needs to be addressed; both theoretical and empirically.

The remaining of the paper is organized as follows. Section 2 describes the recursiveness assumption and how it can be used to identify the effects of a monetary shock in a VAR context. Section 3 describes the results of the analysis, as well as several robustness checks of these results. Finally, Section 4 presents conclusions and suggests directions for future research.

2 Identification Strategy

The identification assumptions used in this analysis follow the recursive approach of Christiano, Eichenbaum and Evans (1998). The idea of this approach starts with the assumption that the federal reserve follows a monetary policy rule of the form

$$PI_t = f(\Omega_t) + \sigma_s \varepsilon_t^s,$$

[1] For a full description of this variable see the work by Lown, Morgan and Rohatgi (2000).

[2] As can be seen, this series present missing observations for the period 1984:1 to 1990:1, when the question was dropped from the survey. We address this issue latter in the text.

[3] The order of the variables and the forecast error decomposition analysis used in that paper can however be criticized under the glance of the different approaches used in the literature to identify monetary shock.

where PI_t denotes the policy instrument used by the monetary authority. The linear function f represents feedback rule to the elements of the information available at time t (collected in the information set Ω_t). The random variable $\sigma_s \varepsilon_t^s$ is the monetary policy shock; where ε_t^s is assumed to have a unit variance and σ_s is the standard deviation of the monetary shock.

The key identification assumption in the recursive approach is that a subset of the variables included in the information set Ω_t are orthogonal to the policy shock at time t. This basically translates in some variables in Ω_t being realized before the monetary shock (and then orthogonal to ε_t at time t) and the rest being determined after the monetary shock (hence, orthogonal to ε_t at time $t-1$) . Therefore, Ω_t can contain current and lagged values of the variables realized before ε_t, but only lagged values of the variables that are affected contemporaneously by ε_t.

Denote by X_{1t} the collection of k_1 variables whose contemporaneous values appear in Ω_t, and let X_{2t} contain the k_2 variables which only appear with lags in Ω_t. Defining the vector $Z_t = (X_{1t}\ PI_t\ X_{2t})'$, then the $k_1 + 1$ shock of the vector ε_t in the following structural VAR is the monetary shock

$$A_0 Z_t = A_1 Z_{t-1} + ... + A_p Z_{t-p} + \varepsilon_t.$$

Without further restrictions, the parameters in A_0 cannot be identified by a reduced form VAR estimation of:

$$Z_t = B_1 Z_{t-1} + ... + A_p Z_{t-p} + e_t,$$

with $E\left(e_t e_t'\right) = V$. Therefore, we cannot perform any interesting analysis like impulse responses and forecast error decomposition; unless we make additional assumptions.

One usual restriction imposed by the literature is to assume $E\left(\varepsilon_t \varepsilon_t'\right) = D$, a diagonal matrix[4]. However, this restriction is not enough.

The discussed recursive identification assumption allows to add the restrictions needed to achieve identification. In particular, it implies that the matrix A_0 has the following form

$$A_0 = \begin{bmatrix} \underset{(k_1 x k_1)}{a_{11}} & \underset{(k_1 x 1)}{0} & \underset{(k_1 x k_2)}{0} \\ \underset{(1 x k_1)}{a_{21}} & \underset{(1 x 1)}{a_{22}} & \underset{(1 x k_2)}{0} \\ \underset{(k_2 x k_1)}{a_{31}} & \underset{(k_2 x 1)}{a_{32}} & \underset{(k_2 x k_2)}{a_{33}} \end{bmatrix},$$

where in parentheses the dimensions of each matrix are denoted[5]. In addition, this matrix should satisfy $A_0^{-1}\left(A_0^{-1}\right)' = V$

Three important facts are highlighted by Christiano, Eichenbaum and Evans (1998) in terms of what can and cannot be identified using this approach:

(i) There is a nonempty family of matrices A_0, and each of the members is consistent with the conditions listed above. In addition, one of these matrices is lower triangular.

(ii) Despite the fact that A_0 is not unique, each of the possible matrices in this set delivers the same dynamic response function of the elements of Z_t to the monetary shock. However, this is not necessarily true for the other shocks in the structural VAR.

(iii) The dynamic response of the variables in Z_t to the $k_1 + 1$ shock is invariant to the ordering of variables in the vectors X_{1t} and X_{2t}.

These results, in particular, imply that only the monetary shock is identified. Therefore, without further assumptions we can only attempt to describe impulse responses to this shock, as well as forecast error decomposition only due to the monetary shock.

[4] Given that we just want to identify one shock in the system, we can assume without loss of generality that D is the identity matrix.

[5] Given the assumption $D = I$, the element $a_{22} = 1/\sigma_e$.

3 Results

This section describes the main findings, and it is organized as follows. First, we describe the three alternatives implemented by Christiano, Eichenbaum and Evans (1998), and how to modify them in order to include the credit market. Second, we present the results based in the baseline model, as well as several robustness checks used in the literature to analyze the effect of including or excluding some problematic variables. Third, we address the problem of estimating using a fractionated sample. Finally, we discuss whether there is a change in the behavior of credit standards before and after several structural breaks identified by the literature.

3.1 Implementation Alternatives

In the previous section we described how to identify a monetary policy shock for a given policy instrument, and many variables can in principle be used to describe it. Christiano, Eichenbaum and Evans (1998) motivate and explore three alternatives: the federal funds rate (FF), the nonborrowed reserves (NBR), and nonborrowed reserves over total reserves (NBR/TR). The first two are implemented in that work by assuming that Ω_t includes current and four lagged values of Y_t, P_t and $PCOM_t$, as well as four lagged values of FF_t, NBR_t, TR_t and M_t; and measuring PI_t by either FF_t or NBR_t. These variables stand for the log of real GDP, the log of the implicit GDP deflator, the JOC-ERCI industrial commodity price index[6], the federal funds rate, the log of nonborrowed reserves plus extended credit, the log of total reserves, and the log of M1, respectively. The NBR/TR specification is implemented by measuring PI_t as NBR_t and assuming that Ω_t includes the current value of TR_t.

In order to study the responses of standards to monetary shocks we need to augment this specification. However, it is not enough just to include standards in the information set Ω_t. Because standards can respond to characteristics of the loan market, we need also to include variables that can account for the dynamics on this market. We are then going to include in the basic specification the variables $LOANS_t$, $LRATE_t$ and S_t, which denote C&I loans in domestic commercial banks, an interest rate for loans, and the net percentage of lenders tightening C&I standards, respectively. For the loans interest rate we are going to use either the prime rate or the C&I loans rate[7].

One important issue is the assumption on whether current values of these variables should be included in Ω_t or not. It is reasonable to believe that the credit market respond immediately to changes in monetary policy instruments as interest rates and reserves. This approach was used, among others, by Christiano, Eichenbaum and Evans (1996), Gertler and Gilchrist (1993), and Bernanke and Mark Gertler (1995). Therefore, the current value of these variables is not included on Ω_t[8].

3.2 The Response of Credit Standards

We compute a VAR with four lags for different specifications. As we commented in the introduction, the series for credit standards have missing values from 1984:1 to 1990:1, because the question was dropped from the survey in these years. We then proceed by pooling the observations in a quarterly sample that includes data form periods 1967:1 to 1983:4 and 1990:2 to 2002:4. In the next sub section we discuss how this can affect the results.

Figure 2 shows the impulse response of credit standards for the different specifications analyzed. We focus the analysis on theses effects because results for the other variables are similar to the ones documented by previous literature. Nevertheless, Figures 3 to 10 report the responses of other selected variables in the model.

In the first two panels of Figure 2, the responses of the complete model including all the variables previously described are shown[9]. The point estimate for the initial response is between 0.7 and 1 percent. For the FF

[6] This index is produced by the Journal of Commerce - Economic Cycle Research Institute.

[7] In fact, the variable C&I loan rate is available since 1982:2. Hence, for the first sub sample we always use the prime rate. The C&I loan rate is conceptually the most relevant rate given that both standards and loans are related to this type of loans; however we have no data for the early years. Responses considering only prime rate were also computed to control for the fact that we are using different series.

[8] This is one important difference with respect to the work by Lown and Morgan (2002). In that paper, the ordering of the variables assumed is such that the current value of loans is included in Ω_t.

[9] Confidence bands were computed by a Boostrap procedure; by randomly drawing, with replacement, from the set of the residual errors from the VAR(4) estimation. With this procedure, 500 series of fitted residuals were obtained, each of them

and NBR shocks however, this response seems not to be significant, whereas for the NBR/TR shock the confidence bands lie above zero. These results would imply that roughly 1% of banks (on net) will tight their standards requirement with respect to previous period after a monetary shock. The results are similar for both loans rates alternatives.

Looking at the variables included in the complete model, M1 is a variable that is arguably the less important as a control variable for identifying the effects on standards. We can see on Figure 1 that the responses are almost the same when M1 is excluded; although point estimates are slightly bigger.

The argument for including PCOM in this type of analysis is to get ride of the so called prize puzzle[10]. However, this puzzling behavior is present here even in the presence of this variable. Figure 1 then also shows the results when both M1 and PCOM are excluded. For this case, the response of standards to both a FF and a NBR/TR shock is significantly positive. The point estimate is above two percent. In this case the tightening cumulates for near five quarters on average for the cases where the initial response is significant.

Finally, we exclude loans from the model. The initial responses are all significant in this case, with the exception of a FF shock when the C&I loan rate is used. The point estimate is near two percent.

A different approach to see how credit standards are affected by the monetary shock is to compute the percentage of the forecast error of standards associated with the monetary shock. These are reported in Table 2. For the model that excludes M1, the contribution to monetary shock is very different depending on the type shock. In the first period, when the C&I loan rate is used, the NBR/TR shock account for near five percent of the forecast error, whereas the FF shock just account for roughly two percent and the NBR shock for less than half percent. After 36 quarters, these shocks can explain between 3.3% and 7.2% of the forecast error of the standards. When we use the prime rate, the contribution seems to be smaller for short horizons but larger in longer periods.

When the model excludes both M1 and PCOM, the contribution of the FF shock is higher that the previous case (near 3 percent in short horizons and close to 4 percent after 36 quarters). This difference is also present for the NBR/TR shock; however results are similar for the NBR shock.

The conclusion of this analysis is that a contractionary monetary shock drives standards up by two percent on average. Also, this shock can account for between five and ten percent of the forecast error of standards for long horizons, but the contribution is smaller for shorter terms.

Finally, Figures 3 to 10 show that both measures of the loan rates significantly increase after a monetary shock for all specifications. This remarks our comment in the introduction that what actually happens after a monetary shock is a combination of both increases in the interest rates for loans and in the standards requirements.

3.3 Addressing the Discontinuity in the Sample

As mentioned before, the fact that there is no data available for standards between 1984:1 and 1990:1 leave us with the alternative to work with a discontinuous sample. Nevertheless, how this issue affects the results described in the previous section must be analyzed.

Although we have a discontinuity in the series of standards, a full sample for all the other variables is available. One alternative is then to exclude the standards from the analysis, and to compute the impulse responses for the discontinuous sample and for the full sample. If the responses are similar, the noise introduced by the cut in the sample should not be very relevant.

Figure 11 shows the responses in the model that excludes credit standards and M1 for the discontinuous sample, and Figure 12 the ones for the same model computed with the full sample. Results seem to be qualitatively similar. The decrease on output after the shock is apparently deeper in the full sample. Prices have similar, non significant responses, both for the deflator and the commodity price. The response of the federal fund rate has almost identical magnitude. The effect on loans is also similar; however the significance is higher for the full sample case. Finally, the measure of the loan rate reacts quantitatively in the same way for both samples[11].

used to construct a new set of series using the estimated parameters. For each set of new series, the impulse responses were recalculated, and then the 2.5% lowest and 97.5% highest were selected to compute the 95% confidence bands.

[10] This puzzle describes the empirical result that a contractionary monetary shock drive prices up instead of down as expected. See Rabanal (2004) for a review of this literature.

[11] The case with the C&I loan rate is not reported as results are not different from the ones presented here.

Another alternative is to try to estimate the missing values in credit standards. We regress credit standards in a constant and current and two lagged values of the log of GDP, the federal funds rate and the prime rate using the available sample[12]. With this coefficients, we estimate credit standards by using the actual values of the regressors for 1984:1 and 1990:1. Figure 13 reports the response of standards for the model without M1 and Pcom. As we can see, results are almost the same than the ones estimated with the discontinuous sample[13].

After this two checks, although in principle pooling the data seems not to be a good idea, we can be more confident on the results described in the previous sub section.

3.4 Structural Breaks and Credit Standards

Two breaks in the behavior of macroeconomic variables have been identified by the literature. On one side, Clarida, Gali and Gertler (2000) describe how the policy carried by the Fed has significantly changed starting in the Volker period in 1979. Basically, the interest rate seems to be more accommodative to changes in expected inflation since that period, in relation with the previous administrations. The other one was denominated 'The Great Moderation', described by Kim and Nelson (1999) and McConnell and Perez-Quiros (2000) among others. This episode makes reference to the decline in the volatility of several macroeconomic aggregates since the early 80's.

Given that our sample has a discontinuity, we can analyze how the response of the standards has changed after these breaks by studying the two continuous sub samples. These results are shown in Figure 14. The responses for the first sub sample are similar to the results found for the entire sample; although they seems not to be significant in contrast to what we found for the full sample. In the second sub sample, the point estimates are qualitatively different: standards drop after a monetary shock. These result are however not significant either.

If we just concentrate the analysis in the point estimates, the responses are qualitatively different. However, it is no clear why this apparent change should happen. One possible explanation came from the financial accelerator theory. The reduction in the variance will reduce the information asymmetries, and this could imply that banks need not to adjust the standards that much when they face a monetary shock. However, if it is also true that the federal funds rate is accommodative to expected inflation, the relevant real rate at which assets and projects are discounted will definitely increase after an increase in the federal funds rate. This will reduce the value of potential collaterals used for loans, and then it is reasonable to believe that standards policies are going to be tightened. However, these conjectures could not even be relevant given the significance of these results.

4 Conclusions

This paper analyzes what is the dynamic response credit standards after a monetary shock. By using several alternatives to identify these shock with a recursiveness assumption, results show that after the shock the net number of banks tightening the standards policy increase by near two percent. Also, the monetary shock can explain almost ten percent of the forecast error of standards for long horizons, with values between five and fourteen percent depending on the specification.

This results are however not completely robust, although the reaction of standards is significant in the most reasonable specification analyzed. The issue of the missing observations needs also to be more deeply analyzed; in particular the alternative that predicts the missing values.

As mentioned in the introduction, this work is a first step on a research agenda aimed to describe the role that credit rationing plays in the transmission of monetary shocks. This issue seems to be neglected by the previous literature, without a detailed and rigorous explanation.

[12] Although this method is probably the best way to proceed when we have missing values, we don't report the mains results using this alternative because we are using regressor that we also use latter to estimate the VAR. What must be done is to find other variables (not included in the VAR) correlated with credit standards to predict the missing values. This is left for future research.

[13] It is worth to mention that for the other specifications, the responses to both FF and NBR/TR shocks are always significant. Again, we don't want to base our analysis using this method for the reasons described before; but these results are encouraging in obtaining significant responses when we estimate the missing values.

Although the results presented here are evidence that the standards for loan approvals is indeed affected by the monetary shock, we have no theoretical or empirical explanations on how important is the effect. One on side, an increment of two percent in the banks reporting tightening standards seems to be an small effect. In addition, the explanation of the credit channel literature could have a more important role, given that the loan rate increase by near 70 basis points after the shock. On the other side, if we consider that the median of credit standards is seven percent (and near five since 1990) these results are apparently more relevant. In either case, the current literature cannot address this issue because it has no answer to the question on how important is for the economy a tight in the standards.

Several improvements must be produced in order to have an answer for this question. First, a model that meaningfully includes credit rationing must be developed. For instance, the financial accelerator model can be modified to include credit rationing. However, the informational asymmetry assumed there (a costly state verification problem) will produce an irrelevant rationing, because in this is case it will be true that rationing is just less production.

Another important issue that requires a better description is what type of credits are the ones that are rationed. The theoretical literature that has analyzed the credit channel assumes that firms (or entrepreneurs) need loans to finance capital investments. However, other part of the literature have assumed that firms needs to borrow in advance to finance wages bills. Examples of this alternative assumption are Christiano and Eichenbaum (1992) and Christiano, Eichenbaum and Evans (1997), using it to describe the liquidity effect; and, more recently, Christiano, Eichenbaum and Evans (2005) and Rabanal (2004) when analyzing the cost channel. The credit rationing argument can be justified in both situations. The aggregate dynamic effect of a denial of a loan for a long term investment is however not necessarily the same than the one for financing operations in the short run.

Finally, to develop a model that contains all these features is not only relevant to understand how the transmission mechanism works, but also to address the empirical relevance of each channel. As mentioned before, all these channels can coexist at the same time and, more importantly, all of them imply the same effects that a monetary shock have on the relevant aggregates. Therefore, it seems to be very difficult to evaluate the relative relevance of each of them by using a structural VAR approach. The appropriate way to produce counterfactual analysis under these conditions is in the context of the model. Importantly, the model should be estimated in such a way that results obtained with the model are empirically relevant.

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Table 1
Changes in Credit Standards for C&I loans. Descriptive Statistics.

Period	Mean	Median	Standard Deviation	Minimum	Maximum
1967:1 to 1984:4	12.13	7.35	18.66	-30.83	76.61
1990:2 to 2002:4	11.22	5.25	21.81	-19.45	59.70
1967:1 to 2002:4	11.74	7.02	19.99	-30.83	76.61

Table 2
Forecast error of standards due to the monetary shock
(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)

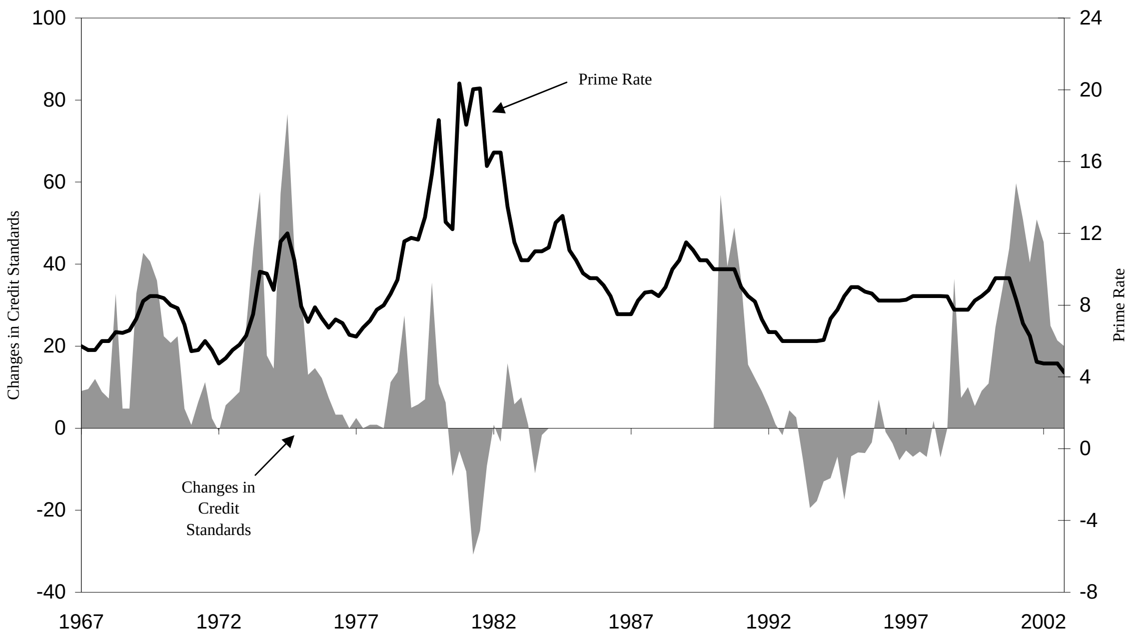
Horizon	Shock		
	FF	NBR	NBR/TR
Model Without M1 / C&I loan rate			
1	1.57	0.47	4.84
4	0.97	2.18	8.99
8	1.15	2.20	7.96
12	1.02	1.97	7.70
16	1.51	2.69	6.71
36	3.38	5.94	7.23
Model Without M1 / prime rate			
1	1.85	0.27	4.03
4	1.39	1.45	8.00
8	1.30	2.04	9.43
12	1.12	2.26	10.00
16	1.30	2.41	8.75
36	2.83	5.69	8.92
Model Without M1and Pcom / C&I loan rate			
1	2.97	0.25	4.31
4	3.15	0.71	13.95
8	4.15	1.45	11.80
12	4.96	1.87	13.23
16	4.64	1.95	13.22
36	4.23	5.72	12.83
Model Without M1and Pcom / prime rate			
1	2.73	0.14	3.10
4	2.32	0.30	9.84
8	2.60	2.49	8.23
12	3.73	2.77	11.38
16	3.76	2.51	11.94
36	3.54	7.08	10.94

Table 3
Forecast error of standards due to the monetary shock
(Different Sumbsamples)

Horizon	Shock		
	FF	NBR	NBR/TR
1967:1 to 1983:4			
1	6.40	3.40	1.50
4	3.42	10.19	6.82
8	2.91	7.98	6.50
12	3.15	9.21	5.42
36	7.55	8.24	8.25
1990:2 to 2002:4			
1	19.98	1.52	37.80
4	14.75	13.48	18.85
8	19.66	11.98	22.37
12	15.03	13.79	15.69
36	7.65	12.31	8.86

Note: Computations are based on the model without M1 and Pcom.

Figure 1. Changes C&I Credit Standards and the Prime Rate

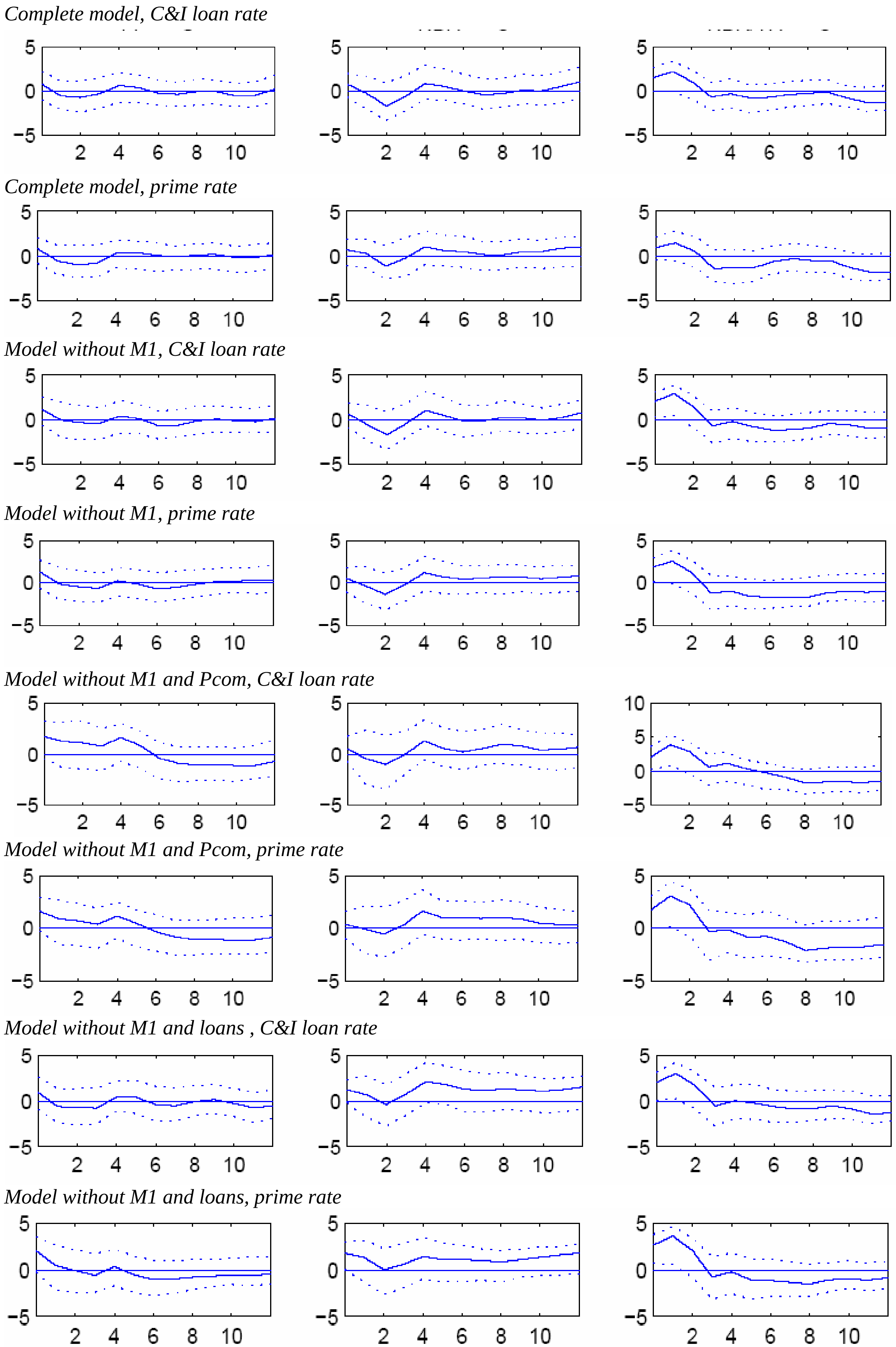


Note: Standards are not available between 1984:1 and 1990:1

Figure 2. Impulse-responses of standards for different model specifications

(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)

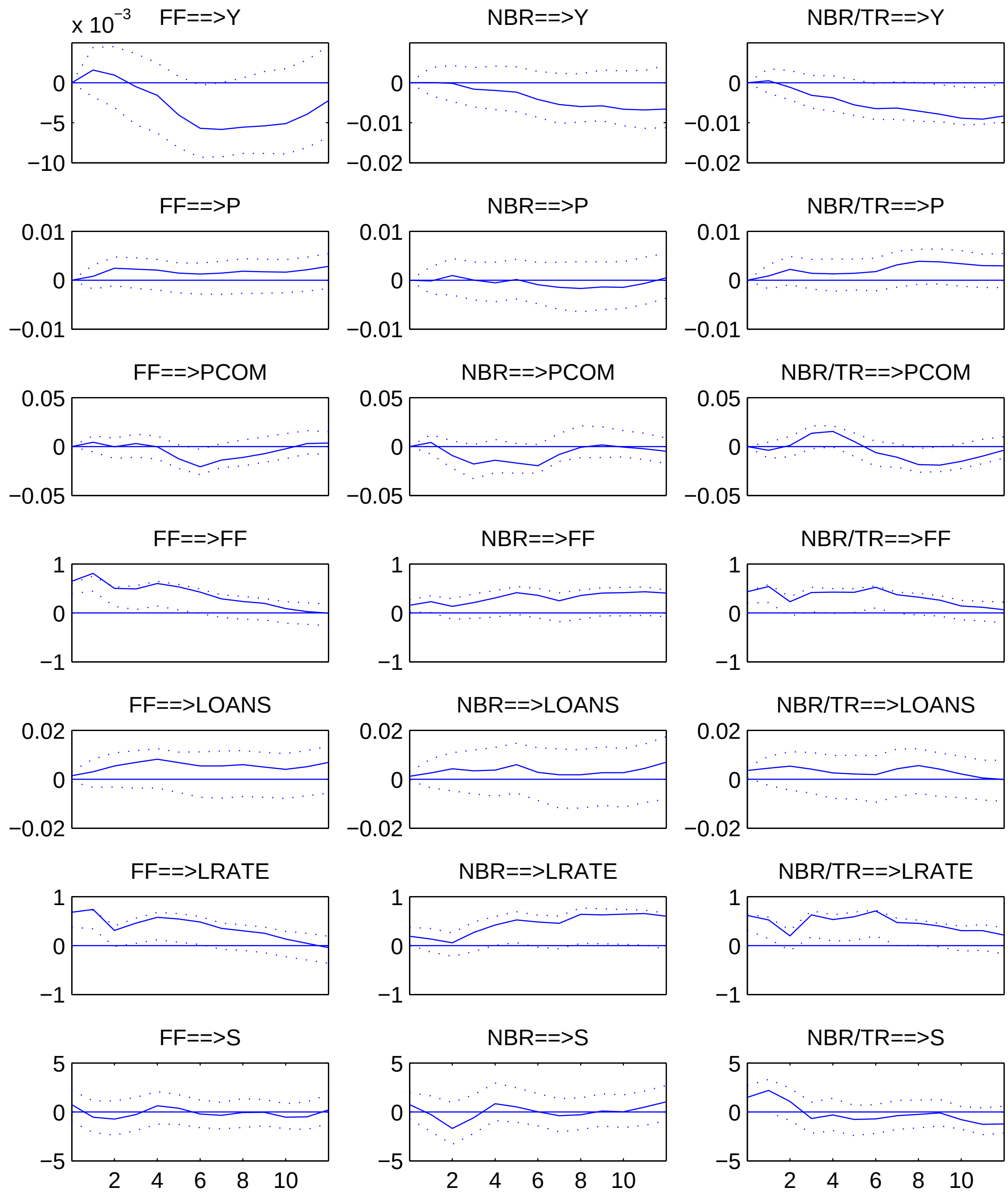
FF Shock | NBR Shock | NBR/TR Shock



Note: Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

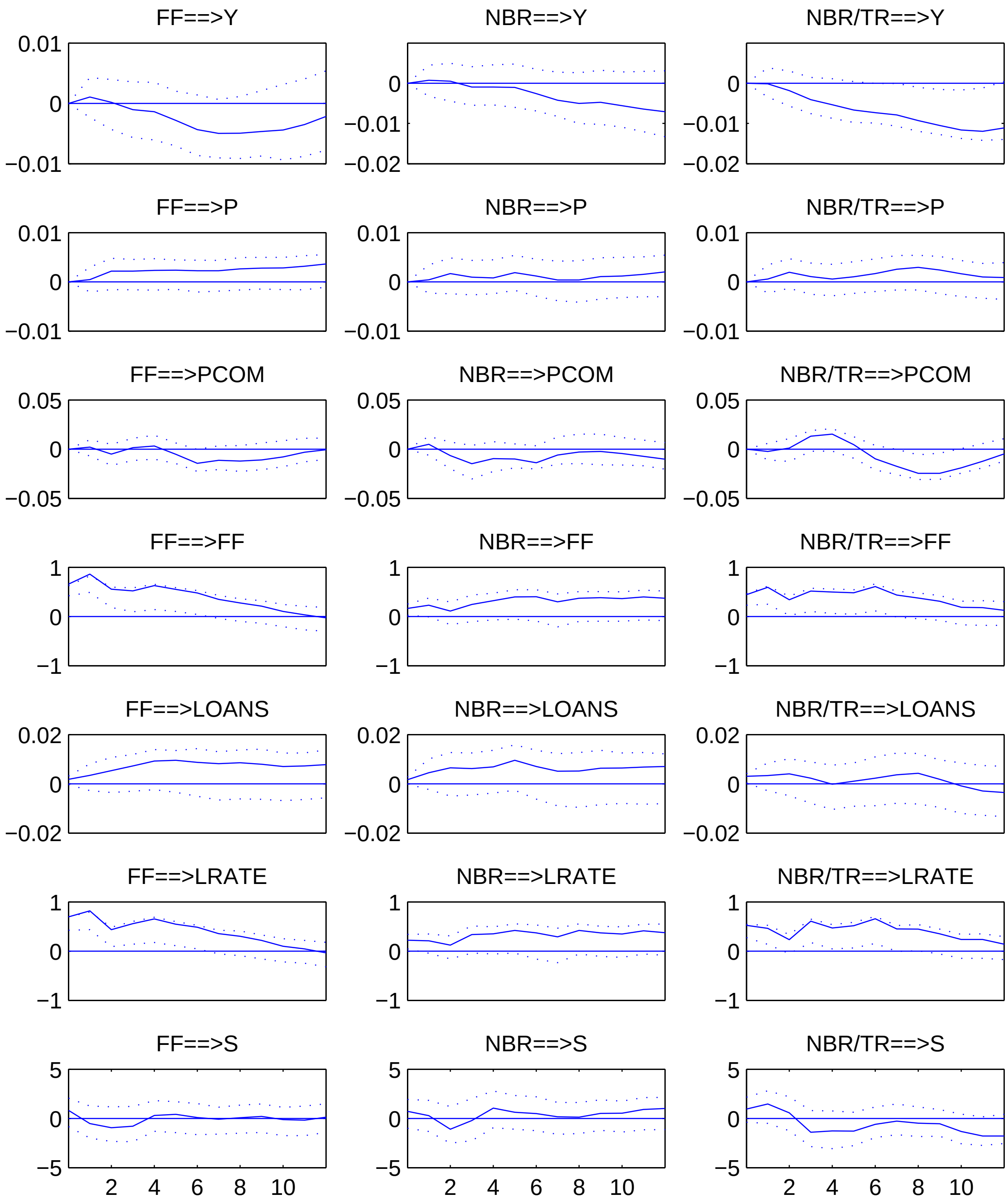
Figure 3. Selected Responses for Complete Model, with C&I loans rate

(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



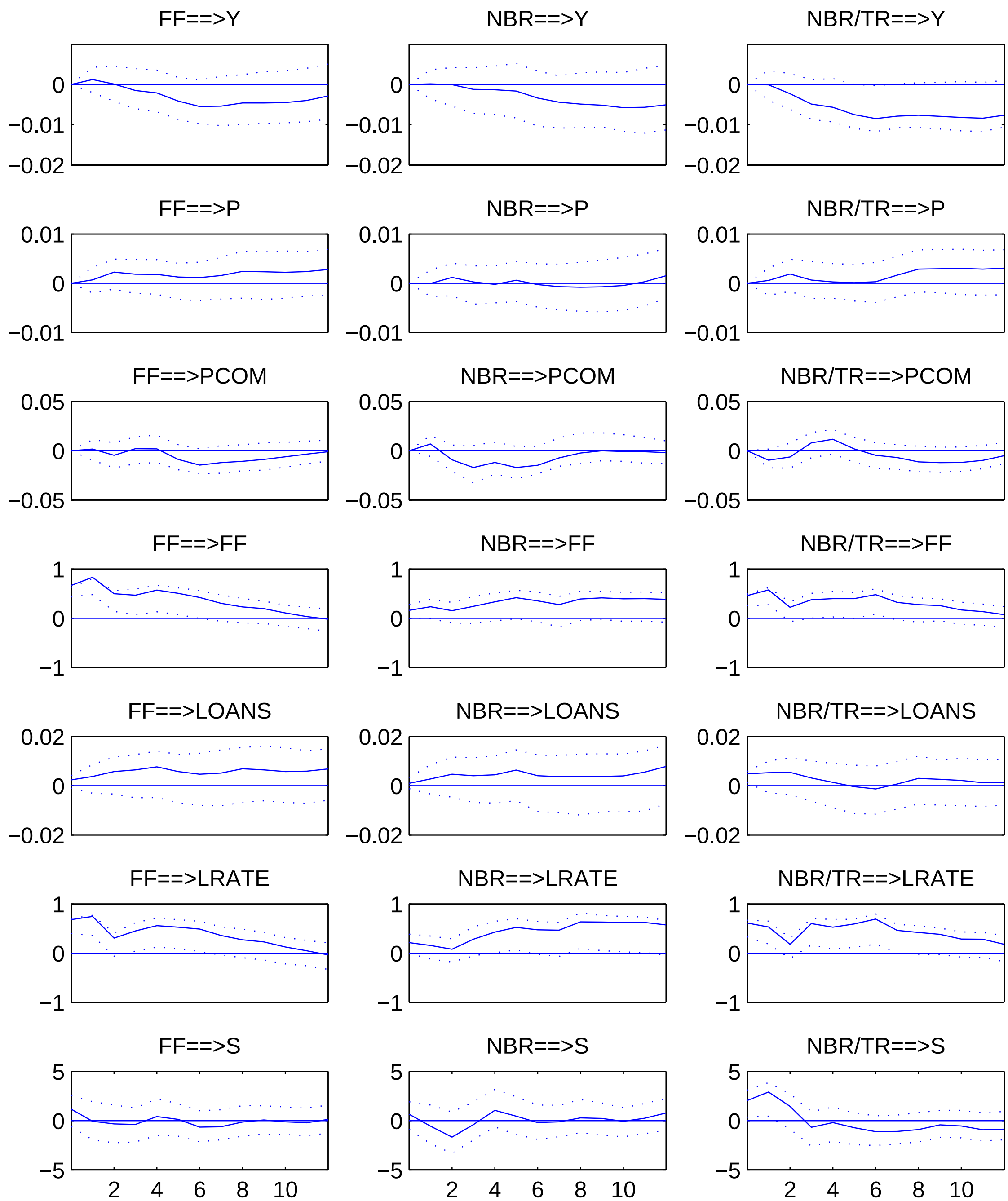
Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

Figure 4. Selected Responses for Complete Model, with Prime rate
(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



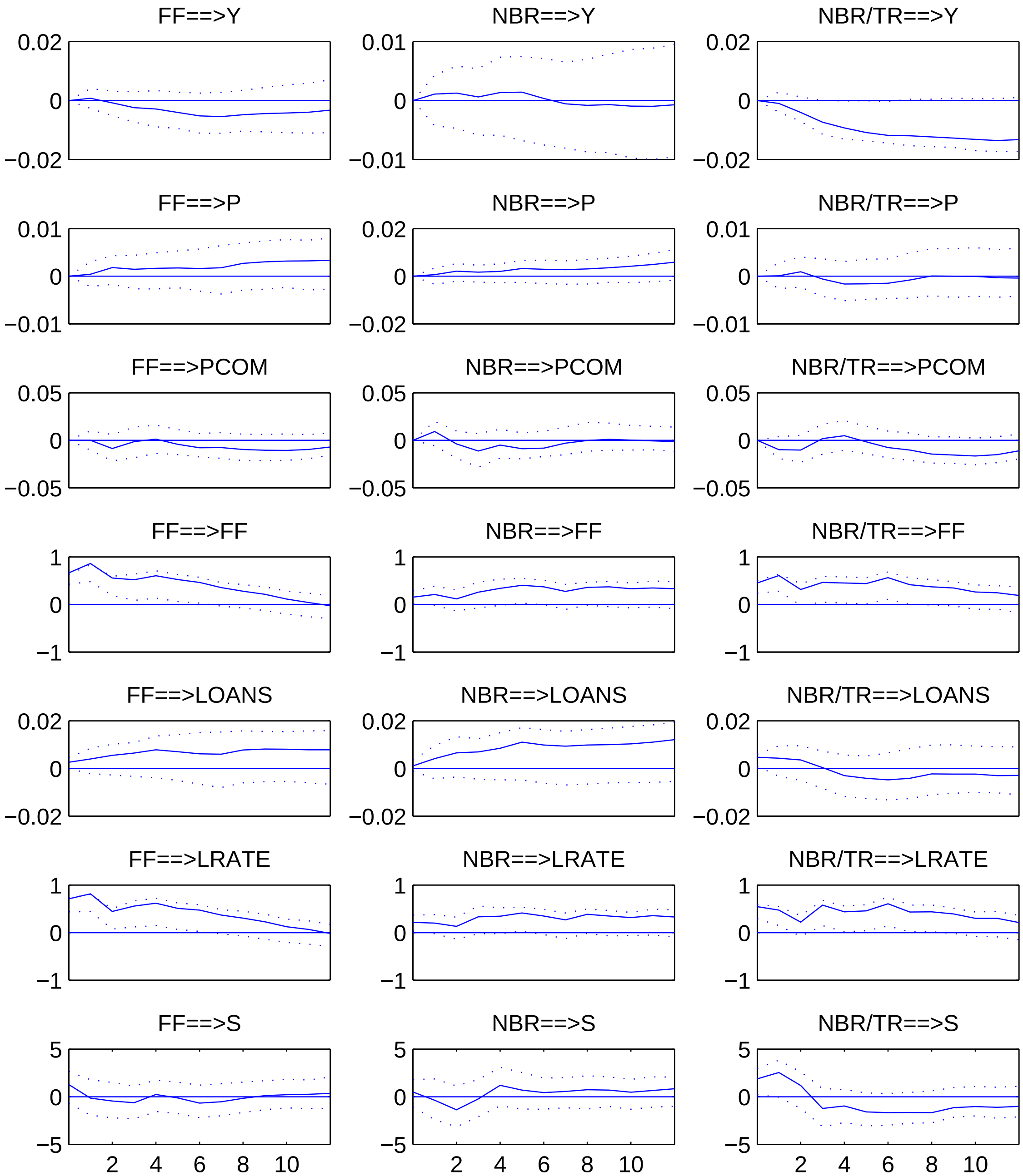
Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

Figure 5. Selected Responses for Model without M1, with C&I loans rate
(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



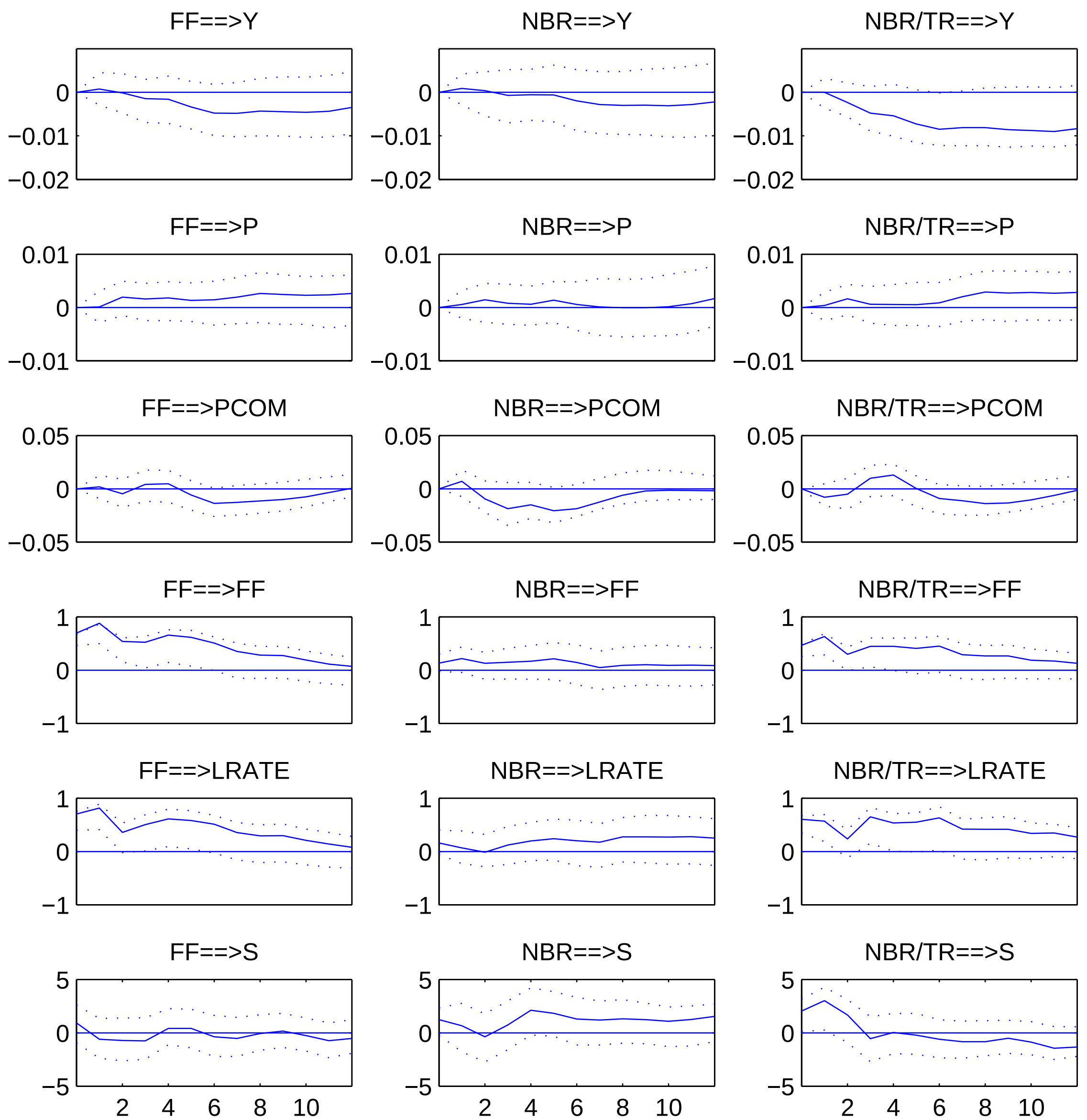
Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

Figure 6. Selected Responses for Model without M1, with Prime rate
(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



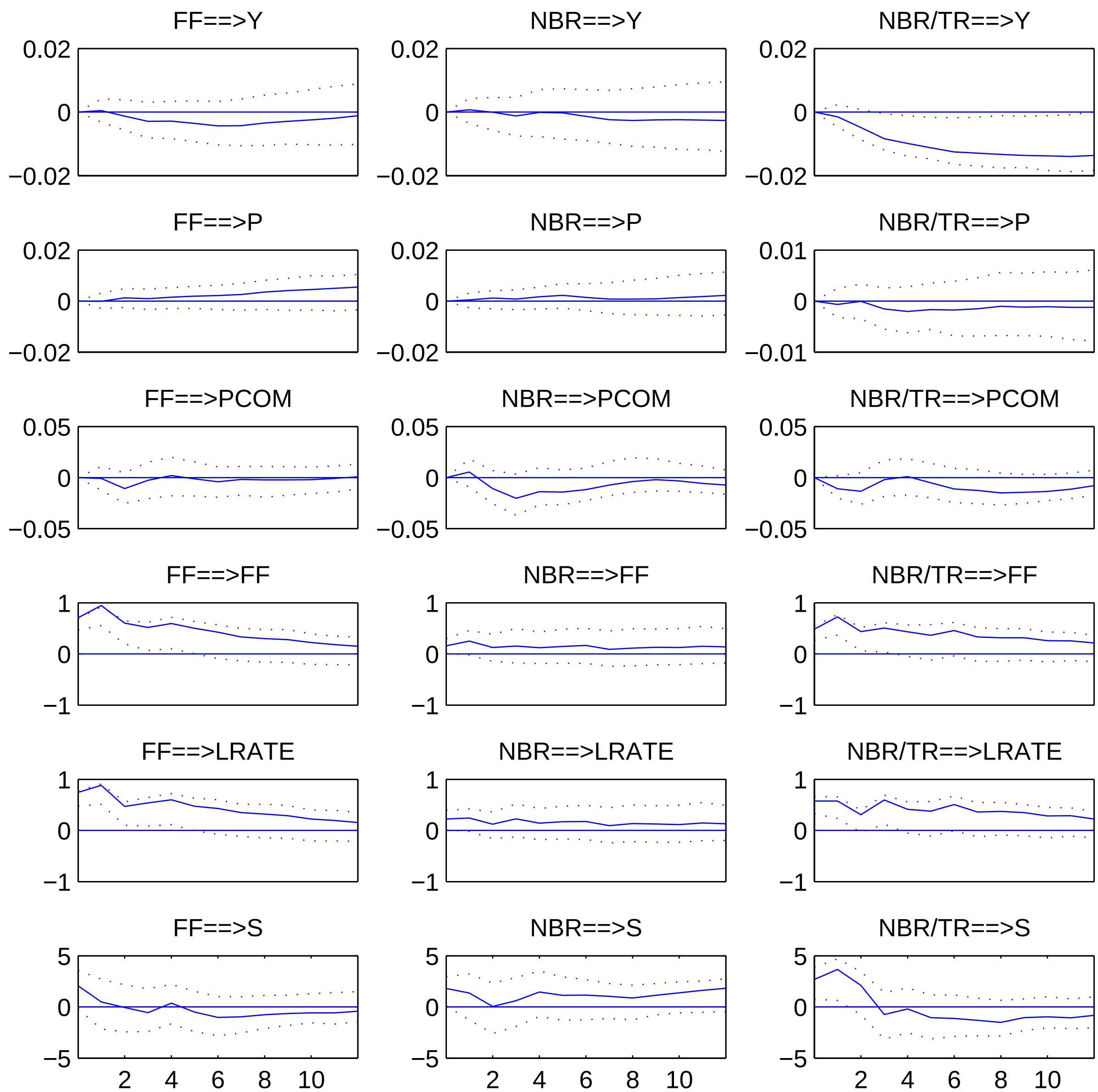
Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

Figure 7. Selected Responses for Model without M1 and Loans, with C&I loans rate
(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

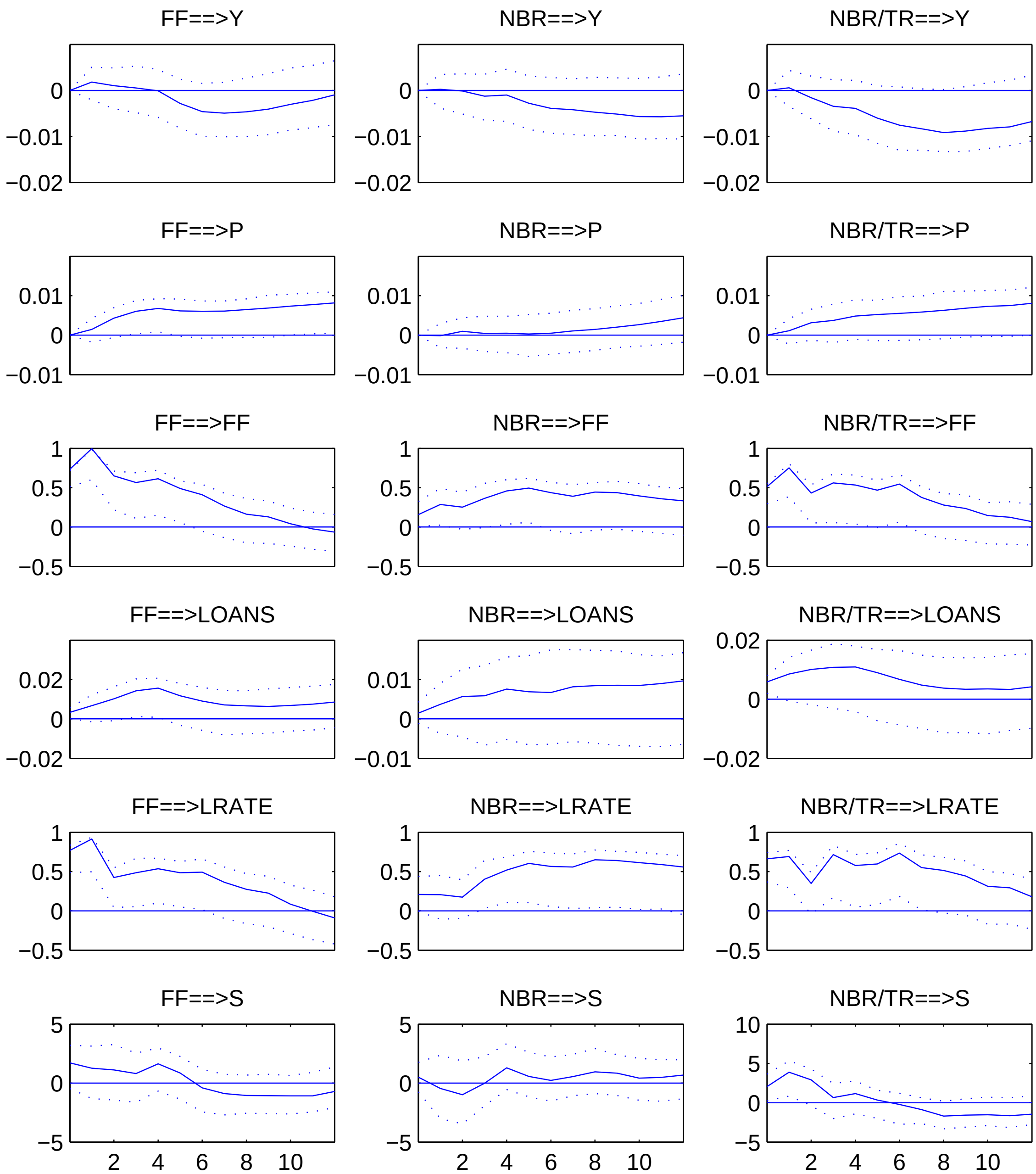
Figure 8. Selected Responses for Model without M1 and Loans, with prime rate
(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

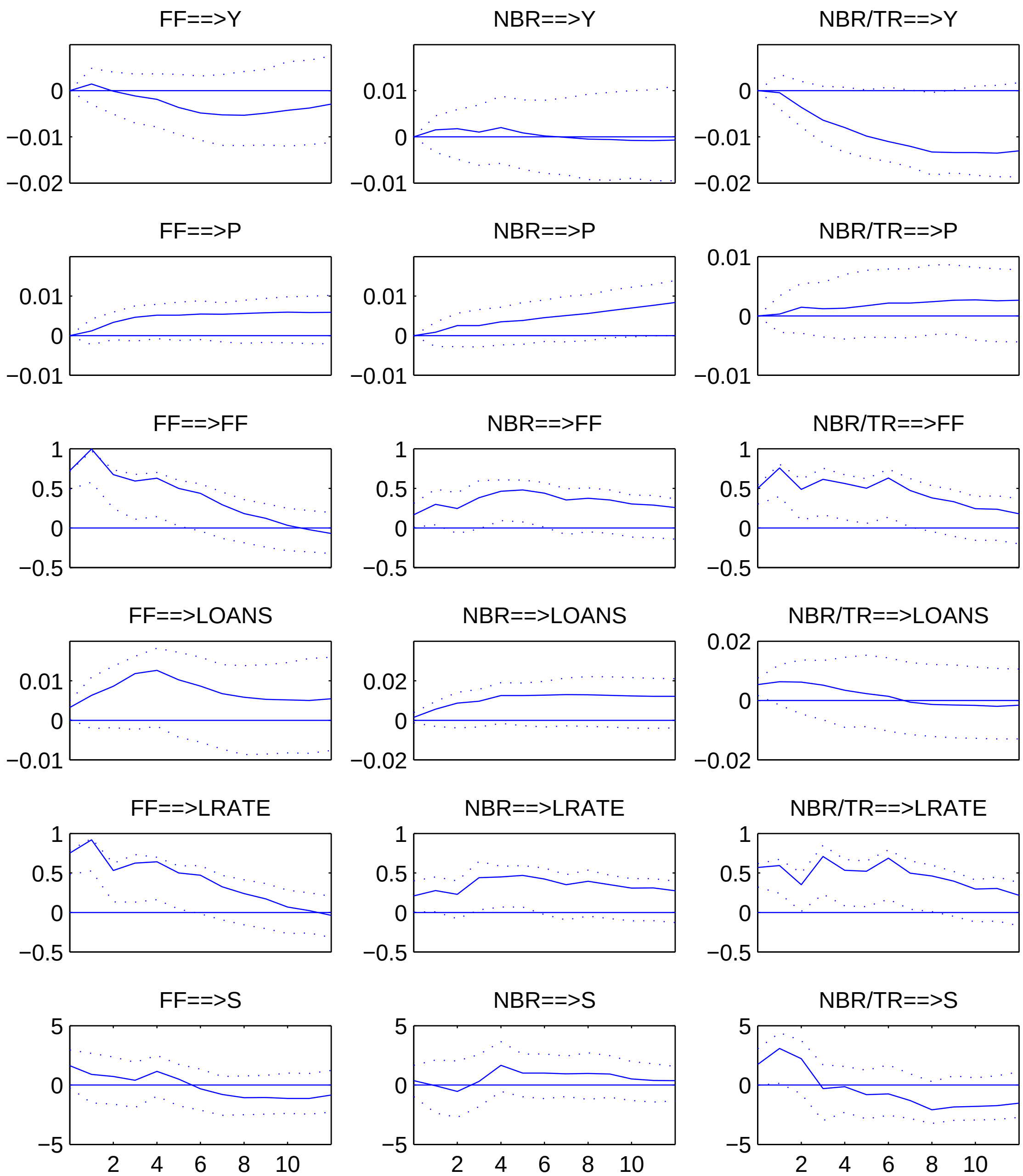
Figure 9. Selected Responses for Model without M1 and Pcom, with C&I loans rate

(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



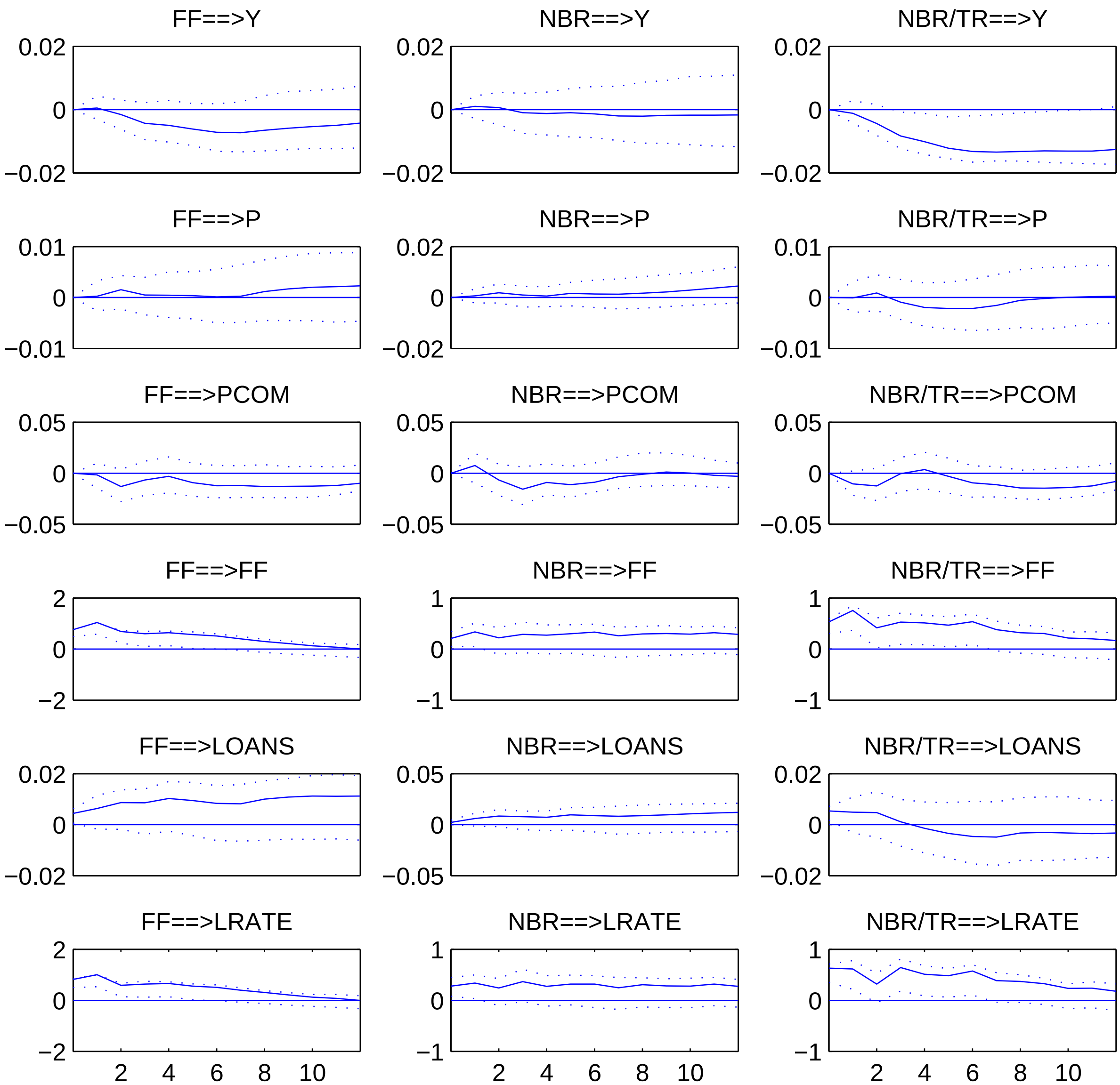
Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

Figure 10. Selected Responses for Model without M1 and Pcom, with Prime rate
(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



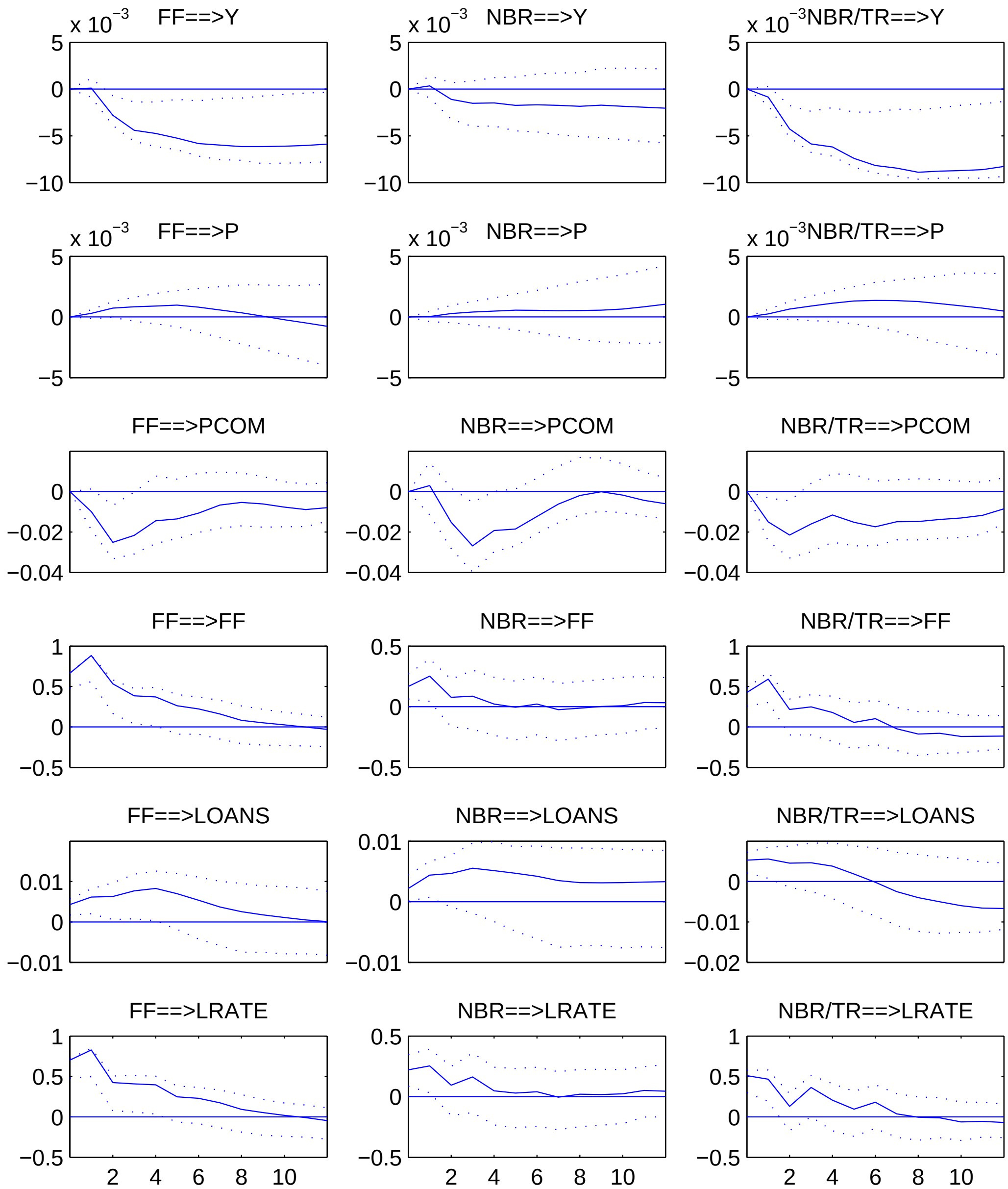
Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

Figure 11. Selected Responses for Model without Standards and M1, with Prime rate
(Sample 1967:1 to 1983:4 and 1990:2 to 2002:4)



Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

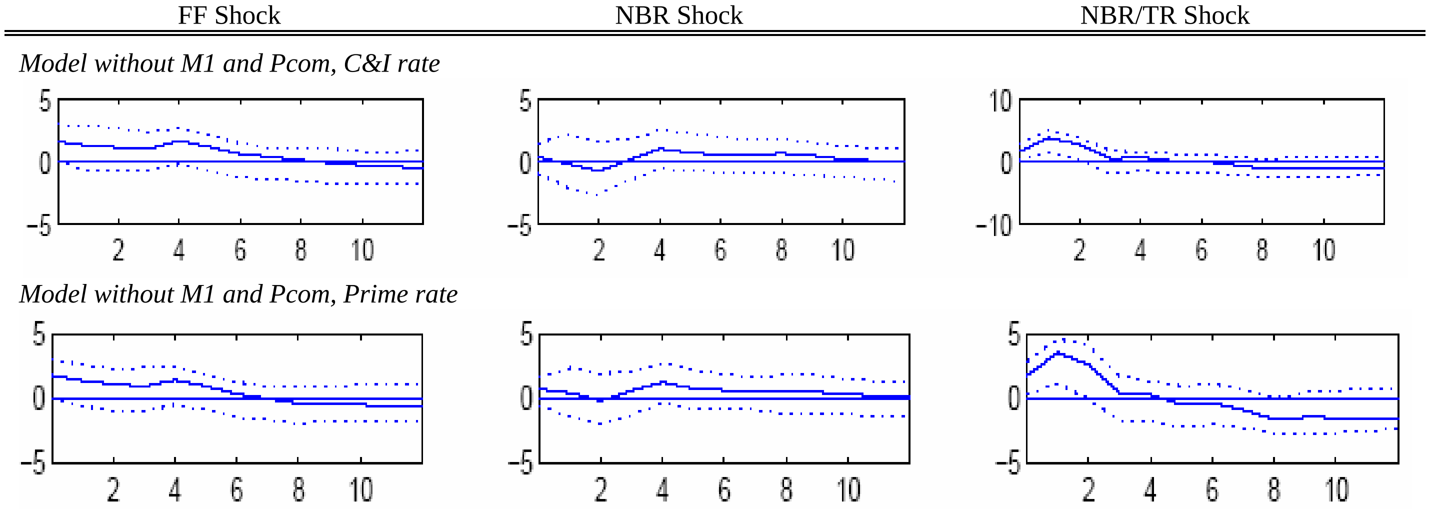
Figure 12. Selected Responses for Model without Standards and M1, with Prime rate
(Sample 1967:1 to 2002:4)



Note: These IRF were computed with the CEE identification strategy. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

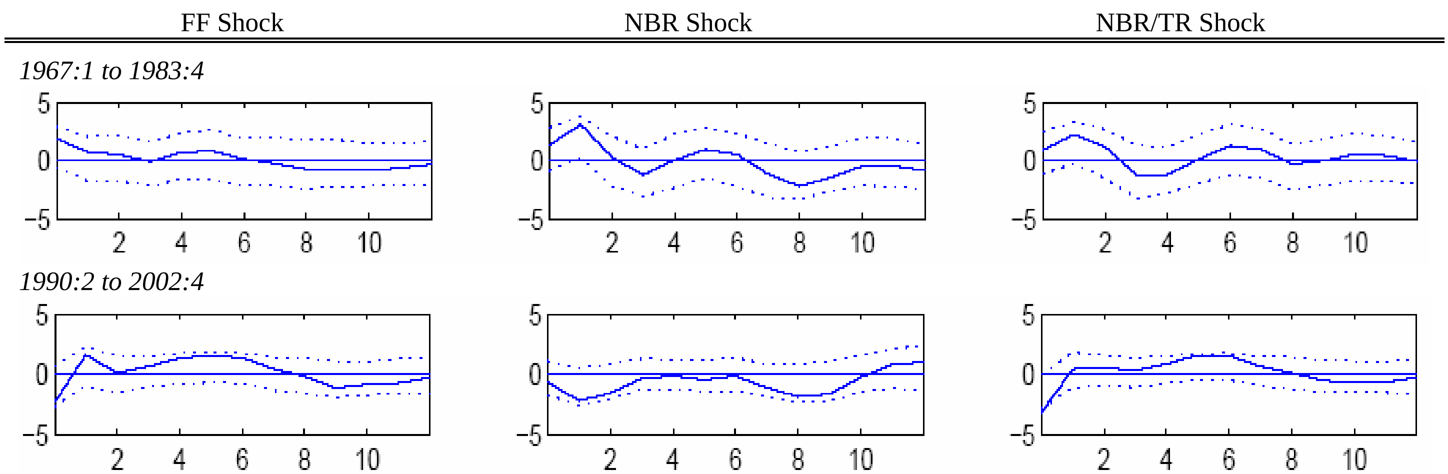
Figure 13. Impulse-responses of standards when missing values are estimated

(Sample 1967:1 to 2002:4)



Note: These IRF were computed with the model that excludes both M1 and Pcom. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.

Figure 14. Impulse-responses of standards for different sub samples



Note: These IRF were computed with the model that excludes both M1 and Pcom. Dotted lines are 95% confidence bands using the Boostrap method explained in the text.