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Aspects of the Monetary Transmission Mechanism under Exchange Rate Targeting: The Case of France

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Abstract

This paper examines monetary transmission in France using the vector autoregression methodology. Interest rates are decomposed into external and domestic components, and a nonrecursive contemporaneous structure is used to identify the system. Innovations in the external component are found to have a significant impact on economic activity, while innovations in the domestic premium have a statistically negligible effect, suggesting that interest rate hikes in defense of the franc may have had a smaller impact on the economy than usually thought. The paper also discusses some implications of Economic and Monetary Union and provides evidence concerning the importance of the credit channel in France.

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Contents

In contrast with most of the literature on the monetary transmission mechanism, which focuses on a domestic short-term interest rate as the policy instrument, this paper examines separately the impact of the anchor currency interest rate and of the domestic premium on economic activity in France. In addition to being motivated by theoretical reasons, such a decomposition attempts to capture the framework within which French monetary policy is conducted. Similar considerations motivate the use of specifications of a vector autoregression model allowing contemporaneous changes in the exchange rate and in long-term interest rates to affect the interest rate differential.

An increase in the German component of the French short-term interest rate is estimated to have a strong dampening effect on output, while the corresponding effect of an increase in the premium is negligible. This suggests that episodes of a widening of interest rate differentials to defend the franc had a smaller effect on activity than is often supposed.

Among the channels usually considered as important for the transmission of monetary policy, the money channel is estimated to play an insignificant role, while the credit channel is found to be important. This appears to reflect certain features of the French economy, notably the limited role of commercial paper, the importance of small enterprises, and banking capitalization.

Because the impact of Economic and Monetary Union (EMU) on the transmission mechanism can be analyzed in terms of the elimination of the interest rate premium, the small estimated impact of the premium suggests that EMU would entail only marginal changes in the monetary transmission mechanism in France. In contrast, variations in short-term interest rates in the EMU area are likely to exert a significant influence on activity in France.

I. INTRODUCTION

This paper attempts to characterize the main patterns of the monetary transmission mechanism in France. Specifically, we are primarily interested in investigating the patterns according to which changes in the monetary authorities' policy instruments affect the ultimate macroeconomic variables (nominal and real) of interest, as well as the principal channels through which these effects operate. While the primary focus is on the effects of variables that are closely controlled by the monetary authorities, we also address the impact of autonomous shocks to other, intermediate, transmission variables.

Recent years have witnessed a revival of interest in the monetary transmission mechanism. This renewed interest reflects both analytical and methodological considerations. On the methodological front, progress with vector autoregression (VAR) techniques, especially since the early 1980s, has provided an important impetus for research on the transmission mechanism. The attractiveness of this methodology mainly stems from its simplicity and the need to impose relatively few restrictions to achieve parameter identification. This can be achieved at no apparent cost in terms of predictive power relative to large-scale reduced-form simultaneous equations macroeconometric models that had been the standard in the past. At the same time, the methodology also sidesteps some (albeit by no means all) of the criticism levied against this earlier family of models. The VAR methodology appears particularly well suited to the study of the monetary transmission mechanism. It can provide a good picture of the impact of monetary policy variables on prices and economic activity by specifying in a quite unrestricted fashion the intermediate channels though which this effect is transmitted.

From an analytical standpoint, it is by now widely recognized that significant gaps remain as regards the economics profession's understanding of the precise nature of the channels by which monetary impulses are transmitted throughout the economy; indeed, the monetary transmission has recently been referred to as a "black box."[2] Thus, while close correlations between monetary variables and nominal GDP have been well established at least since the work of Friedman and Schwartz (1963), it is equally well recognized that such empirical regularities are consistent with Keynesian or monetarist models in which causality runs from money to nominal income as well as with models in which monetary variables have no impact on nominal income. Moreover, even to the extent that models under which monetary variables can affect aggregate demand do receive empirical validation, a number of important aspects of this link remain unresolved; prominent among these is the theoretical and empirical debate over the "money" versus the "credit" views of the monetary transmission mechanism. Investigation of these aspects, in addition to their analytical interest, has obvious policy relevance.

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[2]Bernanke and Gertler (1995).

Following the pioneering applications of the VAR methodology to the study of the monetary transmission mechanism for the case of the U.S. economy, the methodology has more recently been employed extensively in studying monetary transmission in a number of European countries. In addition to the analytical and methodological considerations described above, this trend also had important European-specific motivations. In particular, developments in the European Monetary System (EMS) and the prospect of European Monetary Union (EMU) probably provided a major impetus for the study of monetary transmission in most EU countries. Thus, from a backward-looking perspective, the EMS crises of 1992-93 have rendered this line of research particularly topical, as an investigation of an economy's sensitivity to interest rate changes can provide important insight as to the monetary authorities' ability (and willingness) to support their currency's bilateral parity vis-à-vis the Deutsche mark (DM) in the face of a speculative attack. Turning to the future, it may be hoped that a better understanding of the monetary transmission mechanism can provide some indication of the impact of EMU on the economies of prospective members.

This paper employs variants of the VAR methodology to gain insight into the main patters of monetary transmission in France. While it shares a number of features with other recent work on the subject, it also deviates from this work in several respects. First, empirical work on the transmission mechanism for the case of France, as for other EU countries, has typically focused on a short-term domestic interest rate as the monetary policy instrument, very much in line with VAR models on the transmission mechanism for the U.S. economy. While such a choice would indeed appear natural for a relatively closed economy whose monetary authorities do not target the exchange rate, it appears less appropriate for a smaller and much more open economy where a central aspect of monetary policy is supporting an exchange rate parity. This paper therefore examines separately the impact of changes in the short-term interest rate of the anchor currency and, respectively, the French-German interest rate differential. Separate examination of the impact of the two components of the interest rate appears justified on the following grounds: there are good theoretical reasons to postulate that the two components may affect the economy quite differently; such a decomposition would appear to better capture the context in which French monetary policy has been conducted; and it provides a convenient perspective from which to inquire about the likely impact of EMU.

Second, most implementations of VAR models assume a recursive structure in the transmission mechanism. In the case of France, the main shortcoming of imposing a recursive contemporaneous structure would appear to relate to the implied restrictions on the response of the monetary policy instrument to other variables. Specifically, it would not allow short-term interest rates to be immediately affected by changes in the exchange rate. Such a formulation would appear unrealistic, given the context in which French monetary policy has been conducted over the period under consideration. To address this problem, a "structural" VAR, which departs from the strict recursive structure is implemented.

Finally, under the hypothesis that monetary policy does have an effect on real variables (i.e., changes in nominal variables did not simply reflect shocks in the production

possibilities of the economy as in real-growth models), the paper attempts to assess the importance of credit in the transmission mechanism.

The estimation results presented in this paper suggest that the decomposition of the French interest rate into a German rate and a domestic premium component is indeed fruitful. An important conclusion is that the two interest rate components affect certain key variables (both ultimate target variables and intermediate transmission variables) quite differently. This difference is particularly striking with regard to real activity: while the German component of the French short-term interest rate turns out to have had a significant impact on real GDP, the estimation results fail to indicate a similar impact from the short-term interest differential.[3] These effects do not seem to be the artifact of imposing a specific recursive structure to shocks. Instead, they are robust to both relaxing this hypothesis, as well to imposing alternative recursive structures. Finally, simulations suggest that in France credit has an important role in the transmission of monetary policy.

The plan of the paper is as follows: Section II outlines the standard unrestricted VAR methodology and provides a brief summary of the literature. Section III provides a discussion of the main channels through which monetary policy is usually thought to be transmitted, with a particular emphasis on the "money" and "credit" channels. Section IV discusses the estimation results from a VAR system that employs the French short-term interest rate as the policy instrument, in line with most of the literature. Section V makes the case for a separate investigation of the impact of the German rate and the domestic premium component of the French short-term interest rate. Section VI discusses the estimation results from a standard unrestricted VAR that allows each of these components to affect the variables of the system differently; the results are then utilized to formulate some conjectures regarding monetary transmission under EMU. Section VII discusses the estimation results of a "structural" VAR system that is not based on the traditional Choleski decomposition. Section VIII examines the relative strength of the "money" and "credit" channels of monetary transmission. Section IX concludes.

II. The VAR Methodology and a Survey of the Literature

Empirical investigation of the monetary transmission mechanism typically attempts to describe how changes in certain key variables, whether policy instruments or intermediate transmission variables, affect the nominal and real variables that constitute the ultimate targets of the monetary authorities. Since the application of the unrestricted VAR methodology to the study of monetary transmission in the United States by Sims (1980, 1981, 1982), and its

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[3]These results reflect the historical behavior of the interest differential, where shocks last for just a few months. Simulations reflecting a somewhat different stochastic process, indicate that a sustained increase in the short-term interest differential would have a significant impact on output.

further refinement by Litterman and Weiss (1984), unrestricted VAR models have become a standard empirical tool in this area.

In addition to their relative simplicity, the attractiveness of VAR models stems from a number of econometric advantages. First, compared to reduced-form simultaneous equation models, VAR models impose few *a priori* restrictions, such as exclusion of potential explanatory variables or restrictions on the lag structure, to achieve identification. Since economic theory is rarely so well-defined as to suggest strong exogeneity assumptions (indeed in practice competing models suggest very different exclusion restrictions), the rather "atheoretical" approach of VAR models has the advantage of allowing the historical data to "tell their own story." Second, the richness and unrestricted nature of the lag structure in VAR models provide a good safeguard against a host of econometric problems—notably spurious correlation and cointegration problems.

Third, despite this richer lag structure, the smaller number of variables typically employed by VAR models allows their efficient estimation over much shorter periods. This could carry important advantages for the study of the transmission mechanism, as it could render the estimation results more reliable for forecasting in situations where the underlying economic structure has changed substantially in the past. For the specific case of monetary transmission in France, reliance on typical large-scale macroeconometric models would necessarily entail recourse to a sample that included part of the pre-EMS period.

Fourth, unrestricted VAR models investigate the impact of policy by examining the effect of a shock to the innovation of a policy variable, rather than its forecastable component. This contrasts with the approach in large-scale reduced-form models, where policy variables are usually treated as exogenous: in such models, a policy shock is typically defined as a change of a particular magnitude and duration. By explicitly focusing on the innovation component of the policy variable, as opposed to its expected component implied by the monetary authorities' reaction function (as captured by the variables of the model), the VAR methodology can more easily accommodate the possibility that the two components of the policy variables may have a quite different impact on prices and output, a conjecture which has received some empirical support.[4] Finally, VAR models allow not only the estimation of point estimations of the effects of innovations in monetary policy, but also of confidence intervals around these estimates, permitting a better assessment of the likely effect of these innovations.

In essence, unrestricted VAR models attempt to explain a set of variables in terms of the lags of all the variables under consideration. For the specific case of the monetary transmission mechanism, suppose that Y_t is a k x 1 vector of economic variables (policy instruments, intermediate targets or other transmission variables, final targets), observed at

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[4]See, for example, Barro (1977) and Barro (1978).

time t, whose joint behavior is of interest. It is postulated that the behavior of Y_t is governed by the following model:

$$Y_t = \sum_{0}^{n} B_i Y_{t-i} + Au_t \qquad (1)$$

where B_i is an unrestricted k x k matrix of coefficients, u_t is a vector of serially uncorrelated disturbances, and $E(u_t u_t')$ is a diagonal matrix. It is the unrestricted nature of matrix B_i which is the main source of the methodology's attractiveness. In typical VAR models, A is usually constrained to be an identity matrix.

Estimation of the system described in (1) is relatively straightforward. This system of equations can be solved, expressing each contemporaneous variable as a function only of the lags of the variables under consideration. Thus, a reduced form of (1) can be written as follows:

$$Y_t = \sum_{1}^{n} C_i Y_{t-i} + y_t \qquad (2)$$

where $C_i = (1-B_0)^{-1} B_i$, and y_t is a serially uncorrelated vector of residuals. The vector y_t, the error term of the reduced-form equations, in turn satisfies:

$$y_t = B_0 y_t + Au_t \qquad (3)$$

As a first step, the reduced form system (2) can be efficiently estimated by unrestricted ordinary least squares, obtaining the estimated coefficients of matrix C. These parameters, however, are not of special interest in themselves, and are typically not even presented. Instead, these parameter estimates are utilized to construct estimates of y_t, the vector of residuals or innovations.

A VAR model seeks to study the impact of changes in the elements of the vector of innovations y_t on all the variables of the system. However, to achieve this, one typically utilizes a vector of orthogonal components of the estimated elements of y_t, i.e., a vector whose elements are uncorrelated to each other, rather than the estimated vector y_t itself. There are a number of advantages in using the orthogonal components of y_t over the, in general non-orthogonal, estimated vector. From an econometric viewpoint, because orthogonalized innovations are by definition uncorrelated, it is very straightforward to compute the variances of linear combinations of them. More fundamentally, to the extent that a variable has historically tended to move together with other variables, it would be rather misleading to talk about a shock to this variable in isolation; orthogonalization takes such co-movement into account. Once a vector of orthogonal components of y_t has been constructed, one can compute the so-called impulse response functions, which summarize the impact of a

shock to the (orthogonal component of) each variable under consideration on all other variables of the system, including itself, over a specified period of time, thus capturing the essence of the transmission of monetary impulses across the economy.

The particular way to achieve this (non-unique) orthogonal decomposition of vector y_t is a crucial non-trivial aspect of the methodology; indeed, the particular identification restrictions imposed constitute the main feature distinguishing different variants of the VAR approach. The most common method to achieve the orthogonalization of y_t, and the one employed in the bulk of this paper, is based on the Choleski decomposition, and in essence amounts to assuming that the matrix B_0 is lower triangular, thus imposing a strictly recursive contemporaneous structure to the system.[5]

Put more simply, this essentially entails placing the variables under consideration in a particular order, with the innovation to the first (almost always a policy variable) assumed not to be affected contemporaneously by the innovation to any of the other variables, the innovation to the second assumed to be affected contemporaneously only by the innovation to the first, and so on. Therefore, results obviously depend on the choice of the ordering of the variables, and some sensitivity analysis involving altering this ordering is often pursued. It should be pointed out, however, that, given our focus on the impact of the policy instrument variable on the economy, and to the extent that there are good reasons for placing this variable at the top of the ordering,[6] the results are not sensitive to the ordering chosen for the remaining variables. On the other hand, the assumed recursive structure itself could conceivably cause problems, which can, however, in general be addressed by extensions of the standard VAR.[7]

Following the application of unrestricted VAR models to the study of monetary transmission in the United States, the methodology has more recently been applied to a number of European countries.[8] Recent VAR-based studies of the monetary transmission

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[5]See, for instance, Hamilton (1994), for an explanation of the relationship between the B_0 matrix and the Choleski decomposition.

[6]A typical justification for this is that, while changes in the policy variable are easily observed and can be expected to have a contemporaneous impact on the behavior of economic agents, information lags concerning the evolution of other variables that the monetary authorities may be monitoring precludes systematic within-the-period response of the policy variable.

[7]See Blanchard and Watson (1984), Bernanke (1986), and Sims (1986). A particular application of these extensions is pursued in Section VII.

[8]See, for instance, Dale and Haldane (1993) on the U.K., Escriva and Haldane (1994) on Spain, and Boeschoten, van Els and Bikker (1994) and Garretsen and Swank (1994) on the

(continued...)

mechanism for the case of France include Sims (1992), BIS (1995), and Barran, Coudert and Mojon (1996).

Sims (1992) attempts an international comparison of the monetary transmission mechanism in the G-7 countries. For the case of France, he estimates a six-variable VAR consisting, in that order, of the call rate (as the monetary policy instrument), the French franc/SDR exchange rate, a commodity price index, M1 money supply, the consumer price index, and industrial production, seasonally adjusted. Monthly data were used, and the model was estimated over a very large sample, ranging from 1965 to 1990. The author identifies a discernible impact of the policy variable on both prices and real activity. Thus, a positive shock to the short-term interest rate is estimated to have a depressing impact on industrial production, with the effect materializing almost immediately in the wake of the shock and persisting over an expanse of 48 months. However, the estimated effect is rather small compared with the results for the other G-7 countries considered in the paper.[9] The estimated impact on prices is rather surprising. An increase in the short-term interest rate is estimated to result in a rise of the CPI above its baseline path, with the effect persisting almost throughout the 48 month simulation period. Moreover, this effect is in sharp contrast to the estimated effect for the other G-7 countries: whereas some of them do experience an increase in prices in the wake of the interest rate increase, the effect is nowhere as persistent, and in fact consumer prices start to decline beyond a certain point, eventually falling beyond their baseline path.[10]

Baran, Coudert and Mojon (1996) attempt a similar international comparison, though their focus is on EU countries. The authors estimate a five variable model including a short-term money market rate, the bilateral DM exchange rate, the consumer price index, real GDP, and a world export price index. They employ quarterly data and estimate the model over the period 1976-94. The estimation results for France are only in part consistent with Sims (1992). Thus, a positive shock to the short-term interest rate is estimated to result in a moderate depressing effect on output; however, the effect becomes statistically insignificant midway though the simulation horizon. On the other hand, an increase in short-term rates is estimated to have a small (but statistically significant) depressing effect on prices, almost throughout the simulation horizon. This latter conclusion is thus in contrast to the results of Sims (1992) described above.

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[8](...continued)
Netherlands.

[9]Interpretation of the results is rendered more difficult by the fact that confidence intervals around the impulse response functions are not provided.

[10]Another particularly puzzling result in Sims (1992) is that changes in the French short-term rate appear to have a substantial impact on the world commodity price index.

III. MONETARY TRANSMISSION CHANNELS

The channels through which a tightening of monetary policy, via an increase in interest rates, exerts its impact on the economy have generated considerable theoretical and empirical debate. Until recently, the dominant view held that monetary policy operated mainly through its impact on monetary aggregates. More recently, however, an independent role for bank credit has been explored; greater attention has also been devoted to financial market prices as capturing important aspects of monetary transmission.

The theoretical formulation underpinning the **money** channel of monetary transmission relies on a two-asset model, in which money and bonds are viewed as imperfect substitutes.[11] Put rather simply, the transmission mechanism according to the money view works as follows. A tightening of monetary policy via an increase in the central bank's official rates leads to a decrease in commercial bank reserves, and hence reduces the ability of the banking system to issue deposits.[12] This also implies that net bond holdings of banks must fall as well. Hence, the household sector must hold less money and more bonds. Under sluggish price adjustment, households will also find themselves holding lower money balances in real terms as well relative to the level they consider desirable, and asset market equilibrium would require an increase in real market interest rates. This, in turn can have real effects on investment and spending on consumer durables, and ultimately on the aggregate level of economic activity; the more sluggish the price adjustment the larger will be the likely effect on economic activity.

On the other hand, transmission via a **credit** channel formally entails an extension of the menu of assets to three, by including bank loans as an imperfect substitute to bonds both on the liability side of firms' balance sheets and on the asset side of the balance sheet of banks.[13]

To gain insight on how the credit channel can operate independently of the money channel in such a setting, it may be useful to imagine for a moment that money and bonds are perfect substitutes. In that case, households would be indifferent to the composition of their

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[11]Apart from this two-asset feature, the "money" channel is consistent with a wide variety of theoretical formulations. For instance, it is consistent with the textbook IS/LM model as well as with the dynamic equilibrium/cash in advance models of Rotemberg (1984), Grossman and Weiss (1983) and Lucas (1990).

[12]Because this effect operates at the margin, it is valid even when reserve requirements are low (as in France).

[13]See, for example, Bernanke and Blinder (1988, 1992) and Bernanke and Gertler (1995) for original formulations of such models. Kashyap and Stein (1993) provide a good theoretical survey.

asset portfolio, and hence would be perfectly willing to hold the lower amount of money and higher amount of bonds that a monetary tightening entails. Accordingly, there would be no need for market interest rates to adjust, and monetary policy would have no impact via the money channel. However, monetary policy can still have an effect via the credit channel, to the extent that the decrease in reserves brought about by the monetary tightening induces banks to cut back the supply of loans. In that case, the cost of loans relative to bonds will rise, and those firms that rely primarily on bank lending (say, because they do not have access to bond markets) may cut back investment, thus depressing aggregate economic activity.

It is worthwhile to inquire under what conditions the credit channel can be expected to play an important role in monetary transmission. In the first place, it must be the case that bank loans and bonds must be imperfect substitutes as sources of firm financing, so that not all firms are able to offset a decline in the supply of loans by simply issuing more bonds to the household sector. This presumption is typically justified on the grounds of asymmetric information and/or moral hazard arguments.[14] In the presence of these problems, lending without monitoring of the borrower by the lender can involve substantial deadweight costs, so that it is worthwhile to devote some resources to such monitoring. At the same time, free rider problems would suggest that it may be optimal to delegate this monitoring to a specialized group of intermediaries, namely banks. Thus, bank loans are "special," in the sense that the expertise acquired by banks in the process of evaluating and screening applicants and in monitoring loan performance renders bank lending particularly important for firms who find it difficult or impossible to finance their operations via bond issues in the open market.

A second important prerequisite for the relevance of the credit channel is that banks must view bonds and loans as imperfect substitutes in their asset portfolios, so that they do not respond to a monetary tightening by running down their bond holdings to keep loan supply unchanged. This second presumption is usually justified on the basis of a "precautionary" motive for holding bonds.[15] Specifically, at any point in time, a bank can be viewed as facing the possibility of random depositor withdrawals. In such a setting, a bank can be expected to hold a certain minimum level of liquid securities that would enable it to accommodate such withdrawals while still meeting reserve requirements. These considerations, and taking into account the relative returns on loans and bonds, would imply an optimal portfolio composition, which suggests that in general banks would not be indifferent to their relative holdings of bonds and loans. The existence of risk-based minimum capital requirements (under which the risk weight on loans is higher than that on bonds) would tend to bolster the argument that bonds and loans are not perfect substitutes in banks' portfolios, to the extent that, at least for some banks, these requirements are binding.

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[14]These features of the market for bank loans were first analyzed in Blinder and Stiglitz (1983).

[15]See, for example, Bernanke and Gertler (1987).

Finally, a strand of the literature has also favored modeling the monetary transmission mechanism as taking place primarily via financial market prices, rather than via quantities.[16] From an empirical viewpoint, this approach has been partly motivated by the rather well-documented tendencies of money demand functions to display instability since the early 1980s, in turn reflecting the extensive capital flow liberalization and financial innovation that have been taking place during the last two decades. This may pose problems for the implementation of a VAR model that include monetary and credit aggregates as important transmission variables. Accordingly, this family of models specifies market interest rates of different maturities, as well as the exchange rate, as capturing the essence of the transmission of a monetary policy shock to prices and economic activity. For economies that display a large degree of openness to international trade, the exchange rate channel is thus often considered to be among the most important components of the monetary transmission mechanism. The relevant effect in this case is quite straightforward. A monetary policy tightening, via an increase in the central bank's official intervention rates, would tend to lead to a nominal appreciation of the currency. To the extent that price adjustment is sluggish, this will entail a real appreciation, thus reducing aggregate demand for domestically produced goods and services.

IV. Preliminary Estimation Results: The Impact of the French Interest Rate

On the basis of the considerations outlined in the previous section, but also in line with previous literature on the subject, we consider a VAR model that includes both financial market prices and quantities as intermediate transmission variables. Specifically, the model consists of a monetary policy instrument variable, four intermediate transmission variables (the nominal effective exchange rate, a credit aggregate, a long-term bond yield, and a money aggregate), and two target variables (consumer prices and a real activity variable).[17] For each variable, a 12-lag structure was imposed.

The model was estimated using monthly data over the period 1983-95. The sample period chosen covers only part of the period of the franc's participation in the exchange rate mechanism (ERM) of the EMS. Specifically, it deliberately includes only the period of the hard currency policy, and excludes the period of experiments with reflationary policies in the early 1980s. Since the hardening of the exchange rate policy at the beginning of our sample period could be viewed as a fundamental change in the setting for macroeconomic policy,

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[16]For a VAR model of the monetary transmission along these lines, see, for example, Taylor (1993).

[17] All variables are included as logs, with the exception of the interest rate variables which are entered as a percent. A list of symbols, as well as a description of the variables and data source, is provided in the Data Appendix.

empirical results based on the more recent sample can be expected to provide a more reliable basis for the study of the impact of monetary policy in the current context, relative to those based on a sample that covered the entire EMS (or even included part of the pre-EMS) period.

An important question concerns the choice of the variable to serve as a proxy for the monetary policy instrument. A natural choice would obviously be one of the Banque de France official intervention rates. However, given the changes over time in the monetary authorities' intermediate targets, as well as the nature and function of the central bank's lending facilities themselves, it is difficult to identify a single official rate that could accurately be described as the key policy instrument throughout the period under consideration. Accordingly, and in line with other research in this area, a short-term money market rate was chosen as the closest proxy for the policy instrument.[18]

Chart 1 presents the impulse response functions for each of the variables of the VAR, along with confidence intervals (of 2 standard errors) around the estimated impulse responses. As described in Section II, the impulse response functions trace out how the impact of a shock to the innovation in each variable is propagated through the system, taking into account the interdependencies with all other variables implied by the model. For the purposes of this paper, a shock was defined as a 1 percent increase in the innovation of each variable (a 1 percentage point increase in the case of interest rates). The confidence intervals are computed using a Monte Carlo procedure, because, although a VAR is efficiently estimated using ordinary least squares, confidence intervals for the impulse-response functions are difficult to estimate using analytical tools.[19]

A first conclusion that emerges from the impulse response functions of Chart 1 is that the impact of a change in short-term interest rates on activity is weak. Thus, while the point estimates of the relevant impulse response function do suggest some depressing effect of a rise in short-term interest rates on activity, the effect turns statistically insignificant some 4 months after the policy shock (implying a rather small cumulative loss in output). This is all the more striking, in view of the fact that the positive shock to the short-term interest rate is estimated to persist for 9 months. While the point estimates of the impulse response function appear reasonably close to the results obtained by Sims (1992) and Barran, Coudert and

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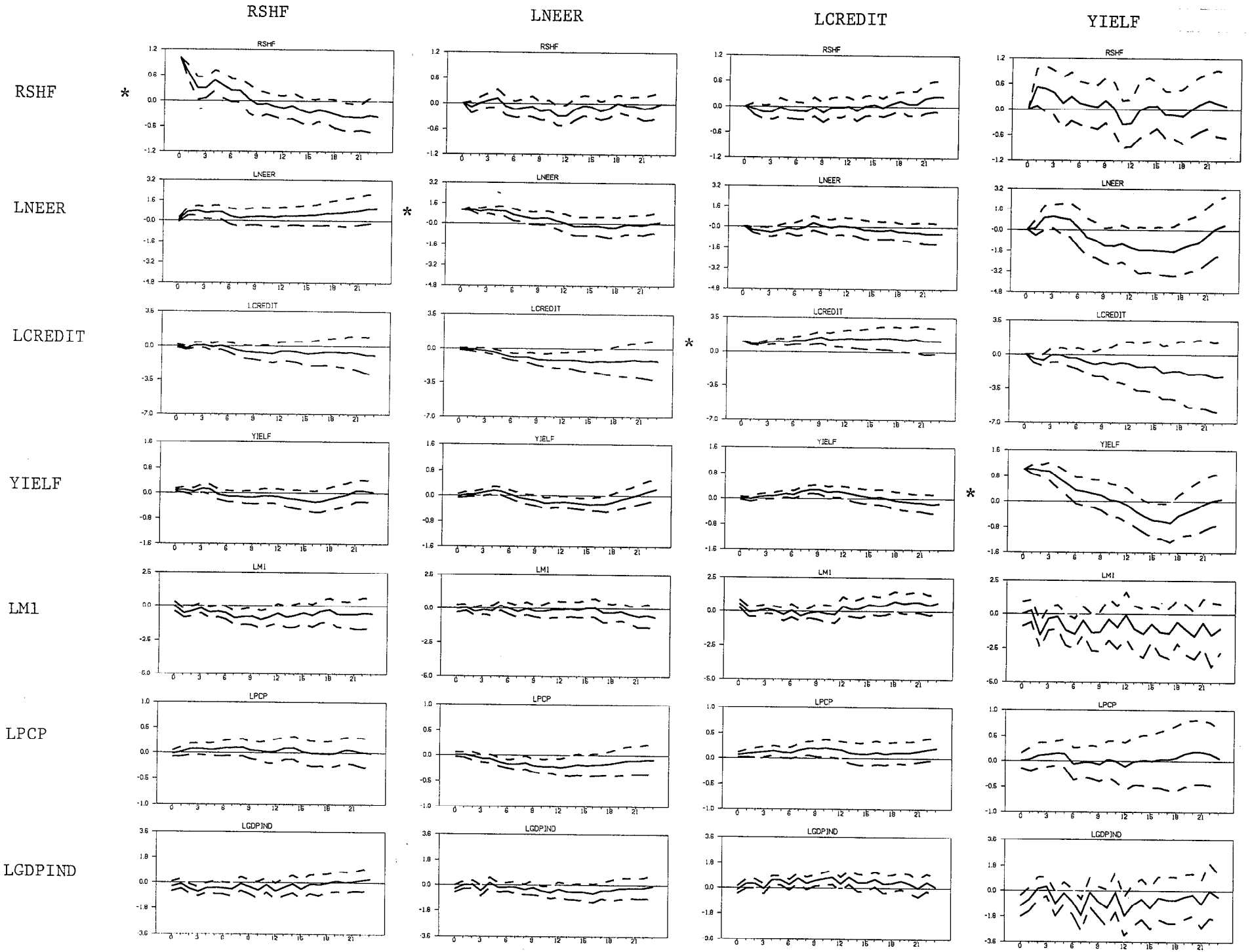
[18]There is strong evidence that the Banque de France official rates essentially drive money market rates, in particular overnight rates.

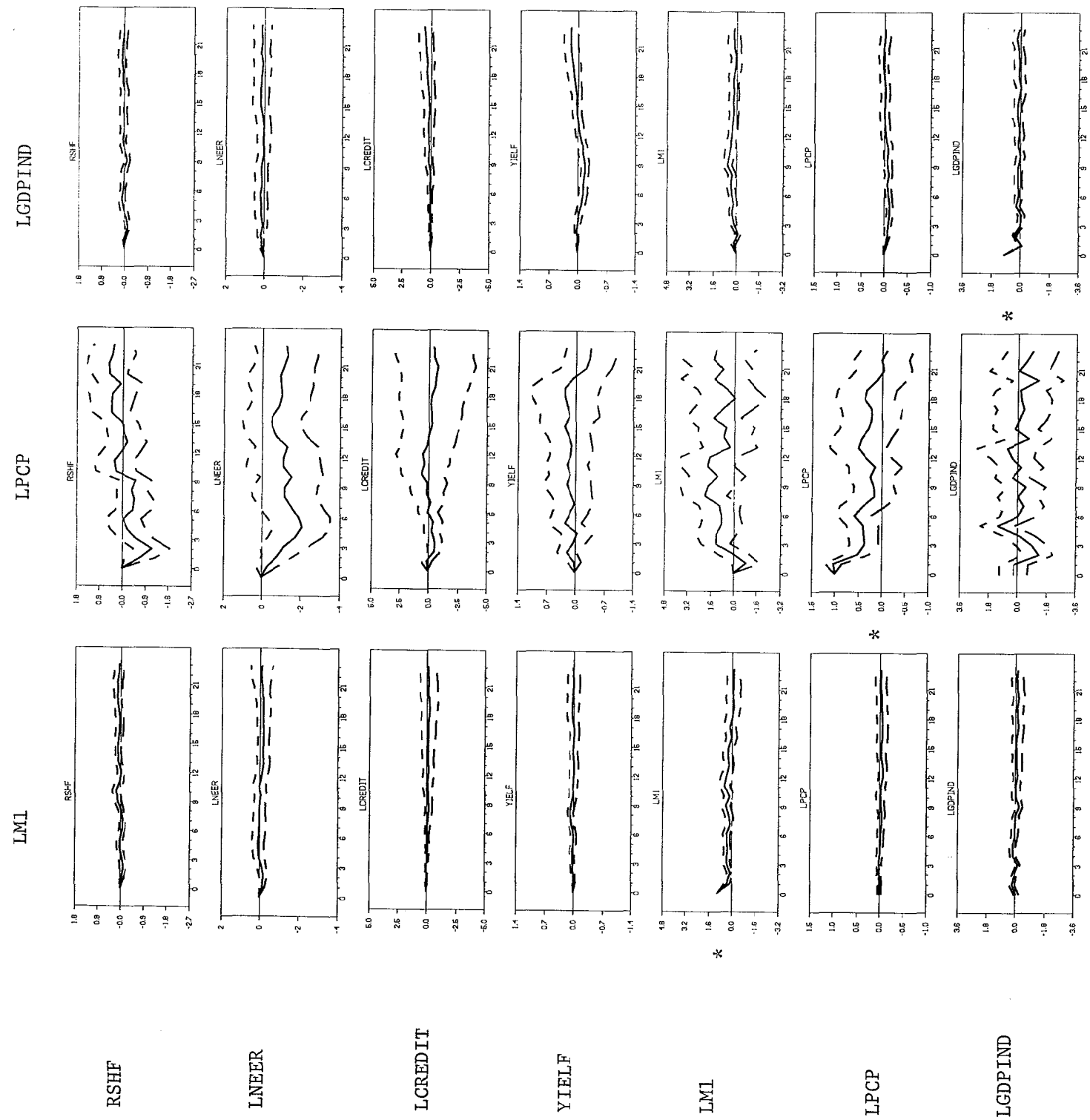
[19] The difficulty arises because not only impulse responses are non-linear functions of the autoregressive coefficients obtained from the VAR, but the cross-equation restrictions imposed on the system imply that the covariance matrix of these coefficients is not the same as that for OLS (Hamilton, 1994; Zellner, 1971). The Monte Carlo procedure used in this paper is based on the one suggested in Doan (1992).

Chart 1. France: Impulse Responses: System with French Interest Rate
(Asterisks indicate origin of shocks)



Definition and source of variables can be found on the Data Appendix.

Chart 1. France: Impulse Responses: System with French Interest Rate (concluded)



Mojon (1996), we were unable to reproduce the latter authors' conclusions regarding the statistical significance of the effect.[20]

The estimated impact of a change in the short-term rate on prices is even weaker. In particular, based on the estimated impulse response function, we cannot find a discernible impact of a 1 percentage point increase in the short-term interest rate on the CPI: the effect is statistically insignificant and the point estimate is very close to zero throughout the simulation period. Our result thus lies somewhere in between the finding of Sims (1992) of a persistent positive impact and that of Barran, Coudert and Mojon (1996) of a moderate, but statistically significant negative impact. These differences probably reflect the sensitivity of the effect under consideration to the sample period employed, thus providing indirect confirmation of substantial structural changes, including policy regime shifts, over time.[21]

With regard to the impact of the short-term rate on intermediate transmission variables, certain patterns emerge. Thus, a 1 percentage point increase in the short-term rate is estimated to: (a) result in a small appreciation of the nominal effective exchange rate, with the effect turning statistically insignificant 6 months after the shock; (b) lead to a decline in credit, with the effect remaining significant for a year after the shock; (c) have virtually no impact on the long-term interest rate; and (d) lead to a decline in money, with the effect remaining significant for more than a year after the shock.

Turning to the autonomous impact of the intermediate transmission variables, our results would suggest that the effective exchange rate has more of an impact on the target variables than the short-term interest rate. Thus, a moderate 1 percent appreciation is estimated to lead to a fall in output, which remains marginally significant for about a year and a half after the shock. The difference is, however, more striking in the case of prices, as a 1 percent effective appreciation is estimated to lead to a fall in the CPI by some 0.3 percent below its baseline path, with the effect remaining significant for some 17 months after the shock. These results underline the openness of the French economy.

On the impact of other intermediate variables, a positive shock to credit is estimated to have a strong and significant positive impact on both output and prices; a similar shock to output, however, has no discernible impact on the target variables. A positive shock to the long-term rate is estimated to have a stronger effect on output than a similar shock to the short-term rate, but once again has no discernible impact on prices.

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[20]It should, however, be recalled that these authors use error bands 1 standard error in width, while ours are 2 standard errors in width. In that sense, our statistical significance tests are more stringent.

[21] As noted above, the sample used in Sims (1992) ranges from 1965 to 1990; that in Baran, Coudert, and Mojon (1996) ranges from 1976 to 1994.

V. Impact of the German Rate versus that of the Domestic Premium: Theoretical Considerations

In the preceding section, the French money market rate was treated as an adequate proxy for the monetary policy instrument in France, in line with previous research. While this may be formally correct, in an important way this approach does not pay adequate regard to a central feature of French monetary policy: the fact that throughout the period under consideration it has to a large extent been geared to supporting the franc's exchange rate vis-à-vis the DM. Viewed in this way, the French short-term rate is composed of two distinct components: the anchor currency interest rate and the differential vis-à-vis the anchor currency interest rate. In effect, the approach of the previous section, which is generally adopted in the literature on the monetary transmission mechanism in European countries, implicitly imposes the restriction that the impact of the two components of the French short-term rate is identical. We argue below that such a restriction may be unwarranted.

In fact, it can be argued that there are reasons to expect that the impact of the two components of the French short-term rate may be fundamentally different, so that including them separately, and in an unrestricted fashion, in the VAR system may prove worthwhile.[22] In particular, a number of transmission channels via which the impact of these two components may be fundamentally different can be identified. In the first place, to the extent that the franc/DM parity can be regarded as reasonably credible in the long run, French long-term interest rates could be expected to be largely driven by German long-term rates. Accordingly, it can be conjectured that a change in the French short-term rate that reflects a change in the short-term differential may have less of an effect on French long-term rates than a change originating from a change in the short-term interest rate in Germany (at least to the extent that a positive term structure effect is in operation in Germany). In that sense, the impact of a change in the interest rate differential on aggregate demand may be conjectured to be smaller than the impact of an interest rate change originating in Germany.

A second channel through which the two components of the French short-term rate might have different effects is the effective exchange rate channel. In this case, however, the relative strength of the two interest rate components is somewhat ambiguous. On the one hand, an increase in the differential might be associated with effective appreciation (depreciation) of the franc, depending on whether during periods of general ERM stress the French authorities were more (less) successful than other ERM members in maintaining the parity with the DM. On the other hand, vis-à-vis *non-ERM currencies*, increases in the differential might be expected to have less of an impact than increases in the German rate.

More generally, even in a situation where an increase in the differential may represent a response by the monetary authorities to unfavorable market perceptions regarding the long-

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[22] These reasons extend for the case of other ERM currencies (see Halikias and Levy, 1996 for a discussion regarding the Dutch guilder).

run credibility of the franc/DM parity, with an increase in the short-term premium accompanied by a rise in the long-term interest rate, the impact of the two components of the French short-term interest rate can be expected to be radically different. In this connection, it should be emphasized that the postulated effectiveness of both components of the interest rate hinges crucially on whether a nominal increase in either component of the interest rate is perceived as implying an interest rate increase in real terms. Given the French monetary policy strategy during the period under consideration, the French monetary authorities in some instances in which the franc was under attack probably attempted to raise the differential sufficiently so that market participants would be indifferent to holding francs or DM for given expectations of a franc depreciation. To the extent that expectations of a franc depreciation were associated with inflationary expectations,[23] it could be argued that the increase in the *ex ante* real interest rate resulting from a rise in the differential could be smaller than that resulting from a rise in the German rate. Indeed, in the (extreme) case where inflationary expectations are based on purchasing power parity, the increase in the *ex ante* real interest rate resulting from a rise in the differential could be zero.

Furthermore, the different impact of the German rate and the domestic premium could reflect aspects of strategic interaction on the part of EMS central banks. Specifically, whereas a change in the interest rate of the anchor currency need not affect the interest rate differentials vis-à-vis the anchor currency of other participating currencies, it is conceivable that the Bundesbank could well have an incentive to alter its interest rate policy in response to changes in the interest rate premia of key EMS participants, in particular if increases in the interest rate premia were not perceived as reflecting underlying "fundamentals" but were accompanied by a depreciation of the weaker EMS currencies. The weakening of other EMS currencies would make monetary conditions in Germany tighter and the German central bank might decide to ease interest rates on purely domestic considerations. This argument rests on the assumption that the conduct of monetary policy in Germany is not guided solely by adherence to the medium-term money supply targets, and that policy actually responds to changes in the DM exchange rate[24] Under these conditions, the impact of a change in the premium component of the domestic short-term interest rate can be expected to be less pronounced than a change (of similar magnitude) in the German rate.

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[23]No matter what the direction in which causality might run.

[24]In this connection, it would appear illustrative to recall that, during the months immediately preceding the 1993 EMS crisis, the Bundesbank had made clear that it would be willing to ease interest rates if the DM were to be allowed to revalue. See also Clarida and Gertler (1996).

VI. Impact of the German Rate versus that of the Domestic Premium: Empirical Results and Implications for EMU

On the basis of the discussion in the previous section, a 9-variable unrestricted VAR is employed to investigate separately the impact of the German short-term rate and the differential on the French economy, with the French money market rate replaced by the German money market rate and the French-German money market rate differential; the French-German bilateral exchange rate is also included.[25] The remaining variables are the same as in the previous section, as is the lag structure and estimation period. Chart 2 presents the estimated impulse response functions of this 9-variable system.

The most striking conclusion that emerges from the impulse response functions of Chart 2 is that the **impact of the German rate and of the domestic premium** on the target variables, as well as on the intermediate transmission variables, is indeed substantially different.[26] With respect to the target variables, this difference is particularly pronounced in the case of output. Thus, a 1 percentage point increase in the German short-term rate is estimated to entail a depressing effect on output, which turns statistically significant 6 months after the shock and remains statistically significant thereafter. By contrast, we failed to identify a discernible effect on output of a shock to the interest differential: the respective point estimate is very close to zero, and the effect remains statistically insignificant throughout the simulation period.[27] This result casts doubt on the widespread notion that raises in interest rates in defense of the franc in periods of market pressure entailed substantial output costs. On the other hand, the conclusions with regard to the price level are very similar to those of Section IV: the point estimate of the impact of an unexpected change in either component of the short-term interest rate is very close to zero, and the effect is statistically insignificant throughout the simulation period.

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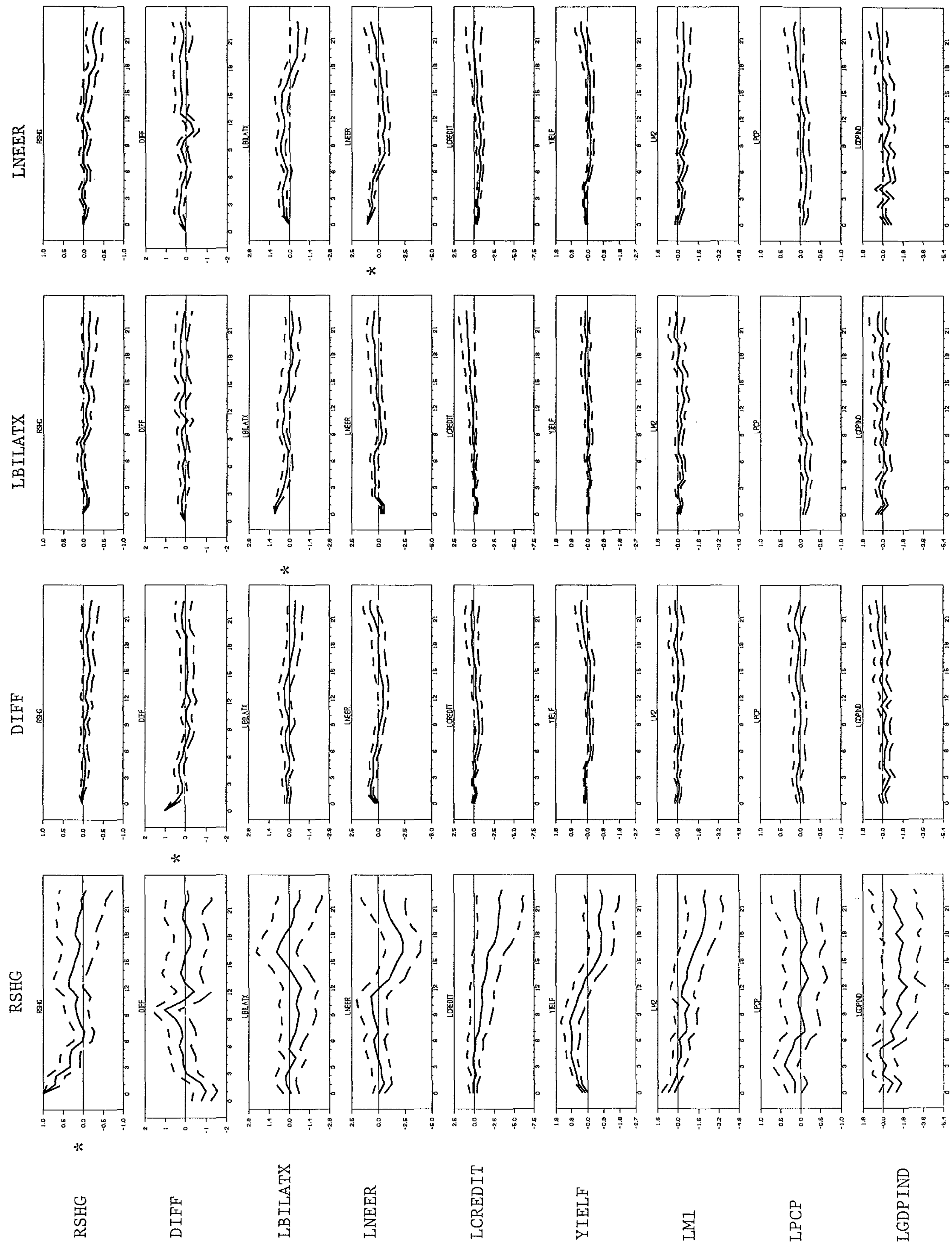
[25]This is done to facilitate comparison of results; use of a composite of core ERM currencies yields analogous results.

[26] The persistence of shocks in the German and domestic components is also different, with shocks to the first component lasting about three times longer than those to the domestic premium. It is conceivable that empirically this difference in persistence has a bearing on the distinct impact of innovations in these variables on output and intermediary variables.

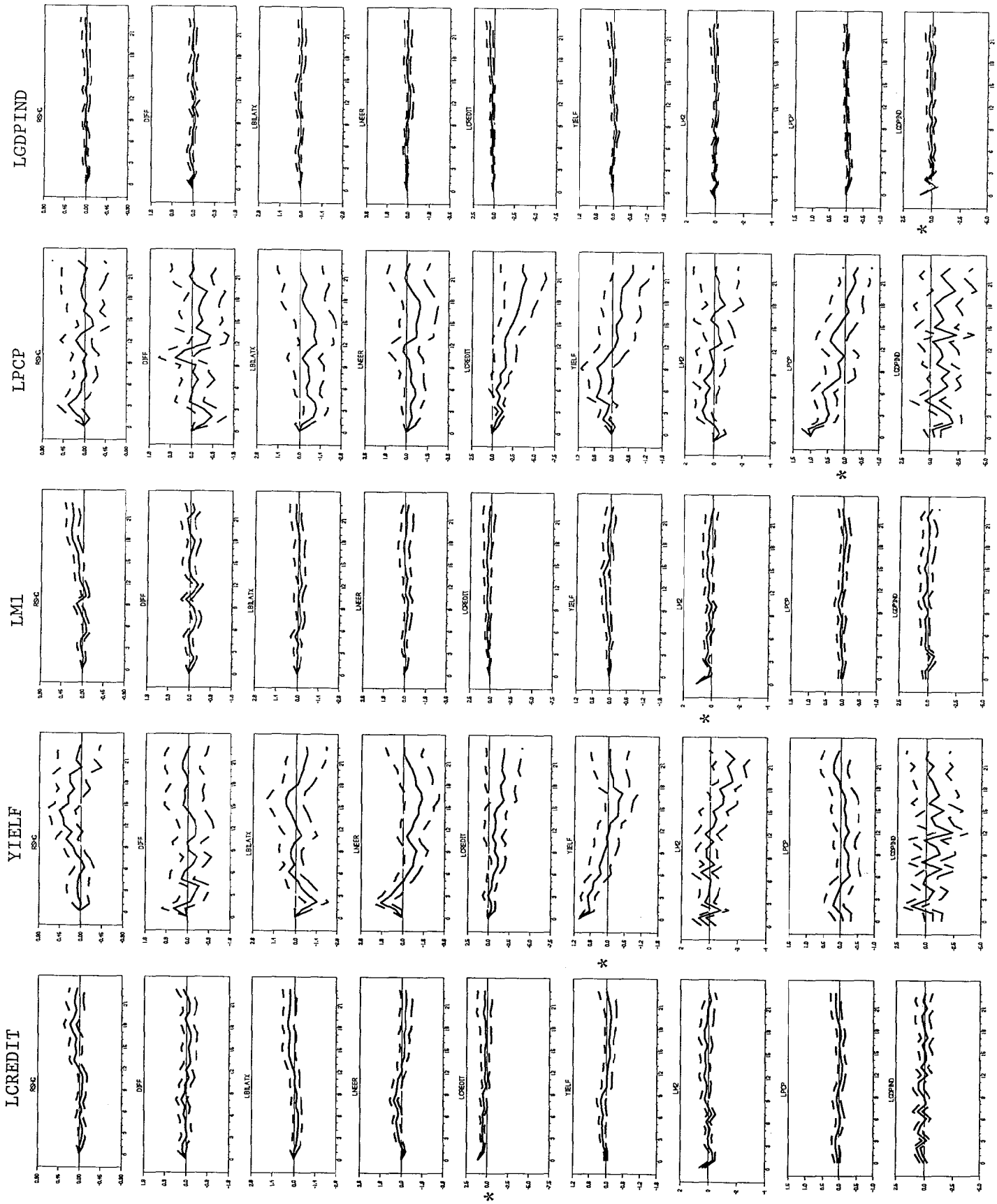
[27] The cumulative output loss in the first year following a one percent increase in the German component of interest rates was estimated at about 0.7 percent of annual GDP (with a standard deviation of 0.25 percent); the output loss of owing to an increase in the domestic component was estimated at 0.2 percent of GDP (with a standard deviation of 0.1 percent). The depressing effects from an increase in the German component grow in the second year, while those from an increase in the French rate vanish.

Chart 2. France: Impulse Responses: System with German Interest Rate and Domestic Premium
(Asterisks indicate origin of shocks)



Definition and source of variables can be found on the Data Appendix.

Chart 2. France: Impulse Responses: System with German Interest Rate and Domestic Premium
(concluded)



A stronger impact of the German rate relative to the differential can also be identified for most intermediate transmission variables as well. Thus, a 1 percentage point increase in the German rate is estimated to have a pronounced positive impact on the long-term interest rate, with the effect peaking at some 0.9 percentage points and remaining statistically significant 10 months after the shock. By contrast, a shock to the differential has no discernible impact on the long-term rate, both in terms of the size of the point estimate and in terms of statistical significance.

Similarly, the impact of the German rate turns out to be larger with regard to the money and credit variables. Thus, a 1 percentage point increase in the German rate is estimated to have a substantial depressing impact on credit, which at the end of the simulation period stands some 5 percent below its baseline path; the effect is statistically significant during most of the simulation period. The same shock to the German rate is estimated to also have a sizeable negative impact on money; this latter effect, however, turns statistically significant only in the second year of the simulation period. These results provide a preliminary indication that the money and credit channels may play an important part in the transmission mechanism, with credit in particular being a major transmission channel. By contrast, the corresponding impact of a 1 percentage point shock to the differential is estimated to be much weaker. Specifically, the impact on money is essentially zero and statistically insignificant throughout the simulation period. While the impact on credit is statistically significant for part of the simulation period, the respective point estimate is very close to zero. We return to the question of the strength of the money versus credit channels in Section VIII below.

On the other hand, with regard to the effective exchange rate, the estimated impact of the differential turns out to be stronger than that of the German rate, albeit only marginally. Specifically, a shock to the German rate is estimated to have a statistically insignificant effect on the nominal effective exchange rate throughout the simulation period. On the other hand, the effect of the differential turns out to be statistically significant during the first 6 months after the shock. The magnitude of the effect is, however, very small: a 1 percentage point rise in the differential is estimated to lead to a brief effective appreciation, with the effect peaking at some 0.5 percent above the effective exchange rate's baseline path. Taken together, the results for both components of the interest rate would suggest that the effective exchange rate is a weak channel for the **transmission** of monetary policy shocks in the case of France.

With regard to the autonomous impact of shocks on the intermediate transmission channels, the patterns observed in Section IV remain largely valid. Thus, an **autonomous appreciation of the effective exchange rate** is estimated to exert a depressing impact on both output and prices, an effect which remains significant during most of the simulation period. Furthermore, an **upward shock to the long-term interest rate** is estimated to lead to a fall in output and prices, with both effects being marginally significant during part of the simulation period. Unexpected changes in the other variables result in non-significant effects

in output (although point estimates of these effects were sometimes relatively large, as in the case of shocks to prices).

The question may be raised to what extent the empirical results of this section have any bearing on an assessment of the **likely impact of EMU on the French economy**. It should be emphasized at the outset that any conclusions in this area would of necessity be of a tentative nature, as the Lucas critique is likely to be particularly relevant. After all, while fundamental changes in the monetary authorities' policy instruments and ultimate targets are not envisaged, monetary union could be viewed as constituting a policy regime shift. Under these conditions, parameter estimates derived on the basis of a previous monetary regime should be treated with caution when utilized on the basis of trying to assess what the main features of the new regime are likely to be. While the VAR methodology employed in this paper can avoid some of the Lucas critique-type problems that affect large-scale simultaneous equation econometric models (provided that the estimation period and policy shocks are appropriately specified), the VAR methodology itself remains after all a reduced-form equation model, and parameter estimates derived along these lines are unlikely to remain invariant to such a regime shift.[28]

With these caveats in mind, the results reported above should provide at least some qualitative indications of the likely impact of EMU on the monetary transmission mechanism. In this regard, the separate analysis of the German rate and the domestic premium component of the French short-term interest rate proves rather convenient. In fact, one could investigate the likely impact of EMU on the transmission mechanism, at least to some extent, in terms of the impact of the elimination of this interest rate differential. In that sense, and given that the impact of the differential on prices and output is estimated to have been particularly weak, it can be conjectured that its elimination via monetary union may not have a significant impact for the transmission mechanism in France. On the other hand, the estimated strong impact of the anchor currency interest rate on output could have important implications in EMU. For example, several observers have argued that at the start the new European Central Bank may feel a need to keep short-term interest rates high for a period of time as a means to establishing anti-inflationary credibility. In this case, monetary union could entail a substantial (albeit transitory) depressing effect on economies in which monetary transmission has a significant impact on output.[29]

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[28]See, however, Keating (1990) for some examples of rational expectations VAR models which are immune to this problem, albeit at the cost of imposing a more restrictive structure.

[29]The impact of innovations in the anchor interest rates on output is not homogeneous across countries. Halikias and Levy (1996), for instance, find a smaller impact in the case of the Netherlands.

VII. NON-RECURSIVE IDENTIFICATION RESTRICTIONS

The unrestricted VAR approach utilized so far in this paper has come under some criticism (e.g., Cooley and Leroy, 1985). In particular, it has been pointed out that even if a general specification such as our equation (1) of Section II in fact describes the true structure of the economy, the imposition of a strictly recursive contemporaneous structure (i.e., the restriction that the matrix B_0 is lower triangular) is problematic, as it is usually not motivated in a satisfactory way by the relevant economic theory.[30]

For the specific case of monetary transmission in France, the main shortcoming of imposing a recursive contemporaneous structure would appear to relate to the implied restrictions on the contemporaneous response of the monetary policy instrument, i.e., the interest rate differential, to within-period realizations of other variables in the system. Specifically, the formulation utilized so far allows the contemporaneous innovation in the differential to be affected by the lags of all the variables of the system, but does not allow it to be affected by the contemporaneous innovations of these variables (with the exception of the German rate, which is placed first in the ordering). Such a formulation would appear unrealistic, given the context in which French monetary policy has been conducted over the period under consideration. Specifically, given that a major goal of monetary policy in France has been to maintain the franc stability vis-à-vis the DM, it could be surmised that the policy reaction function of the Banque de France could well involve within-period adjustment of its policy instrument in response to a shock to this bilateral exchange rate, as well as to a shock to the long-term interest rate to the extent that this reflects perceived policy credibility. In fact, this postulated contemporaneous feedback from the bilateral exchange rate and from the long-term interest rate to the interest rate differential does receive strong empirical support. Therefore, its exclusion from the specification employed in the previous sections may have affected our estimated impact of the policy instrument on certain key variables.

In order to sidestep the problems referred to above, we implement an econometric approach that entails a non-recursive **contemporaneous** structure, while at the same time retaining the advantages of an unrestricted lag structure.[31] Specifically, we allow the interest rate differential to be contemporaneously affected the bilateral franc/DM exchange rate, as well as by the long-term interest rate. Further deviating from strict recursiveness, we allow credit to be contemporaneously affected by prices. In order for the system to remain just-identified, and to ensure that the system of equations described by the new matrix B_0 has a

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[30] The often used approach of ensuring that the results are not overly sensitive to the particular ordering of the variables under consideration that has been chosen does not remove the essential arbitrariness of the Choleski decomposition, which fundamentally emanates from restricting attention to strictly recursive models.

[31] The econometric technique follows closely Blanchard and Watson (1984), Bernanke (1986), and Sims (1986).

solution (or that the matrix is invertible), we also place three additional exclusion restrictions on the contemporaneous structure.[32] Specifically, we impose no contemporaneous feedback from credit to the long-term interest rate, from the long-term interest rate to prices, and from the bilateral franc/DM exchange rate to output.[33]

The relevant methodology to compute the factorization implied by the above restrictions involves minimizing the log-likelihood of a function resulting from multiplying a transformation of the B_0 matrix by the sample variance-covariance matrix of the errors of the VAR estimation described by equation (2) of Section II, under the assumption that the matrix of residuals A is diagonal (see Doan, 1992 and Hamilton, 1994 for a detailed exposition).

Chart 3 presents the estimated impulse response functions on the basis of the identification restrictions described above (for clarity only point estimates are reported; shocks were not normalized). For the sake of comparison, the impulse response functions of the previous section are also included.[34] It is immediately apparent that the impulse response functions of Chart 3 are very similar to those of Chart 2, thus strengthening the results of Section VI. In particular, the fundamental asymmetry regarding the impact of the German interest rate and that of the interest rate differential on real activity remains evident under the different identification restrictions underlying Chart 3.[35] On the one hand, the impact of a shock to the interest premium on key nominal and real variables once again turned out to be minor. On the other hand, an increase in the German short-term interest rate was estimated to have a sizeable depressing effect on output. The robustness of these results notwithstanding, caution should be applied in drawing conclusions regarding the "true" structure underlying the French economy and the appropriate policy response to specific shocks to the economy. In principle, the estimated strong impact of the German interest rate on output, transmitted in part via the monetary and credit intermediate variables, can be viewed as consistent with a

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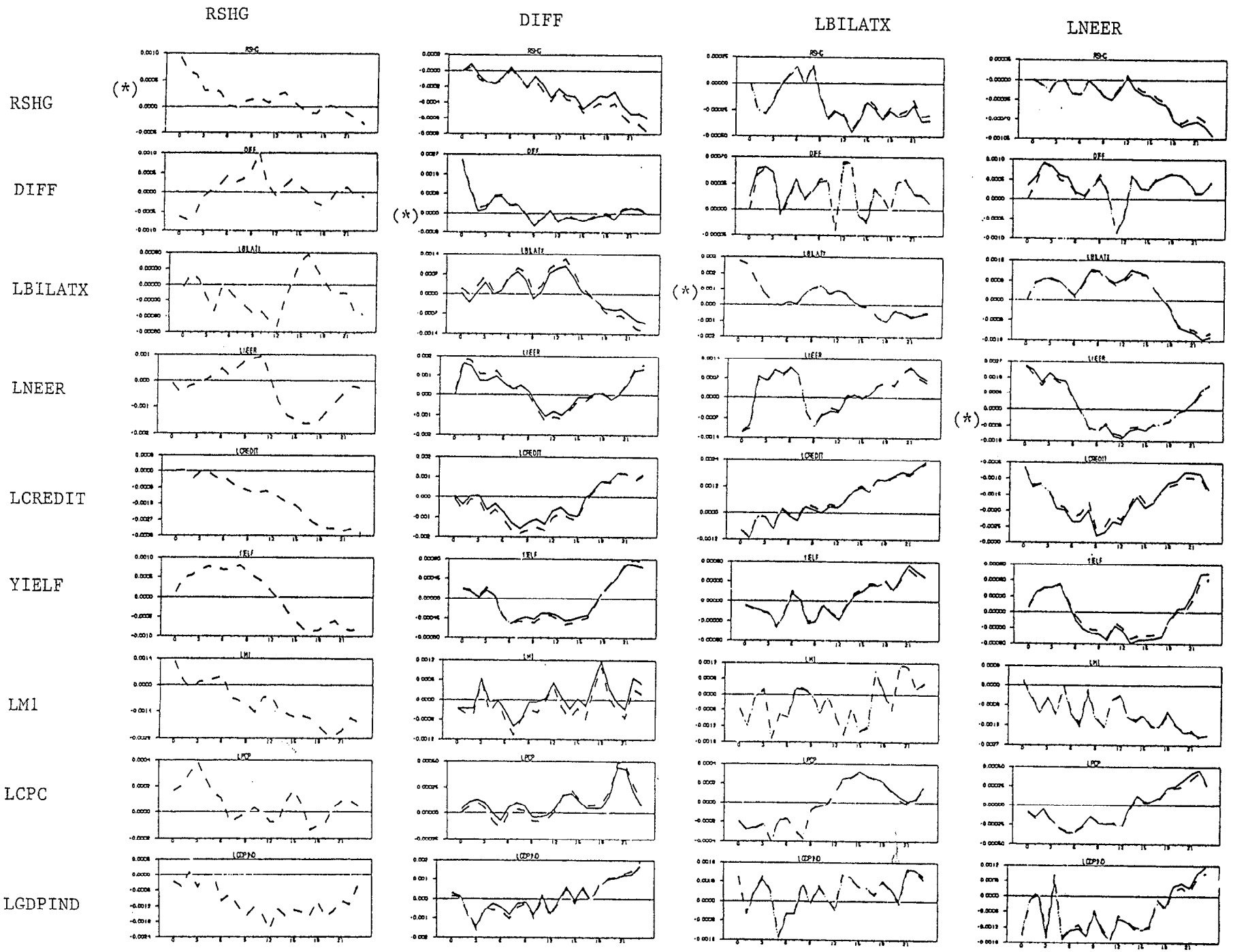
[32]The criteria on which these choices were made broadly follow Blanchard and Watson (1984).

[33]These exclusion restrictions are less strong than one might think. It should be recalled that the coefficients of matrix B_0 refer to the correlations between the innovations of the variables under consideration, rather than the variables themselves. Thus, no restrictions are imposed on the contemporaneous relation between the forecastable part of any set of variables.

[34] Although standard deviations were not computed, they should be very similar for both factorizations, given that the factorization matrices were very similar and the distribution of the dynamic coefficients is the same.

[35]An alternative formulation that allows contemporaneous feedback from the bilateral exchange rate to the differential, while remaining within the confines of the Choleski decomposition (and thus failing to incorporate a within-period impact of the differential on the bilateral exchange rate), also confirms the thrust of the results.

Chart 3. France: Impulse Responses: Non-Recursive VAR
(Asterisks indicate origin of shocks)



Structural - - - Choleski

Definition and source of variables can be found on the Data Appendix.

wide range of models. For instance, it could be consistent which both the textbook IS-LM model and real business cycle models with a cash-in-advance constraint, which often have different implications regarding the effectiveness of monetary policy as a countercyclical instrument.[36]

VIII. THE ROLE OF THE CREDIT CHANNEL

The results of Section VI provided some empirical indications that the relative strength of the money and credit channels of monetary policy transmission may be worth exploring. In addition, a number of considerations would suggest that the credit channel may indeed constitute a significant component of the transmission mechanism in France. In the first place, while recourse to commercial paper (an important type of non-bank financing in other countries) increased in the 1980s, the market remains small, suggesting that bank lending retains a dominant position in this regard.[37] Secondly, the importance of small and medium-sized enterprises in total private sector value added could again lead one to expect a role for the credit channel, as these enterprises are traditionally viewed as being largely dependent on bank financing. Thirdly, the need faced by banks to improve their capital position in view of the phasing in of higher risk-adjusted capital requirements would suggest they would be reluctant to reduce their stock of securities in order to maintain loan supply unchanged under circumstances of a tightening of monetary policy.[38] A further investigation of role of the credit channel is attempted in this section, proceeding along the lines suggested by Ramey (1993). While this approach has some drawbacks, it has the advantage of being rather simple to implement and interpret. Given that the results of the previous section suggested that alternative identification restrictions do not materially alter the results, for the purposes of this investigation we return to the Choleski decomposition of Section VI.

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[36]In order to distinguish between those two competing hypotheses, it would have been necessary to employ (non-recursive) identification restrictions that allow explicitly introducing key testable implications of the models in question, e.g. along the lines discussed by Blanchard and Quah (1989) and extended by Gali (1992) in his test of the empirical relevance of the IS-LM model for the U.S. economy.

[37]Recourse by French firms to domestic money market amounts to about 5 percent of the debt of these firms; negotiable instruments as a whole represent about 15 percent of total credit to firms.

[38]It should be noted that the two channels described above are not mutually exclusive. In fact, most proponents of the credit view tend to regard them as complementing each other, with the effect of a monetary policy change via the credit channel simply magnifying its effect via the money channel.

Ramey's method of assessing the strength of each monetary transmission channel essentially entails setting the coefficients that describe the impact of each transmission variable on the other variables of the system equal to zero (thus effectively "muting" the transmission channel in question), and comparing the resulting impulse response functions to the baseline impulse responses derived from the unrestricted VAR. The closer the "constrained" impulse response function turns out to be to the baseline impulse response, the weaker the transmission channel in question is postulated to be.

For the problem at hand, we explore the strength of the money and credit channel in transmitting the impact of a shock to the German interest rate to economic activity. Chart 4 presents the corresponding impulse response function derived from a system that in one case mutes the impact of the money channel and in the other case mutes the impact of the credit channel (along with the baseline impulse response function). The impulse response functions suggest that the money channel of monetary transmission is relatively weak. This would appear consistent with a view that emphasizes the endogeneity of the money stock for the case of an open economy pursuing a bilateral exchange rate parity. It also probably reflects the well-documented instability of money demand over the period under consideration; see for example Cassard, Lane, and Masson (1995).

The picture regarding the impulse response functions for the case of the credit channel is quite different. In this case, the estimated impulse response function that "constrains" the impact of credit to be zero being far from (i.e., between one and two standard deviations) the baseline impulse response. In fact, muting the credit channel results in a change in the German interest rate having virtually no impact on output. This result suggests that bank credit is a particularly potent channel of monetary transmission in France.

IX. Summary and Concluding Remarks

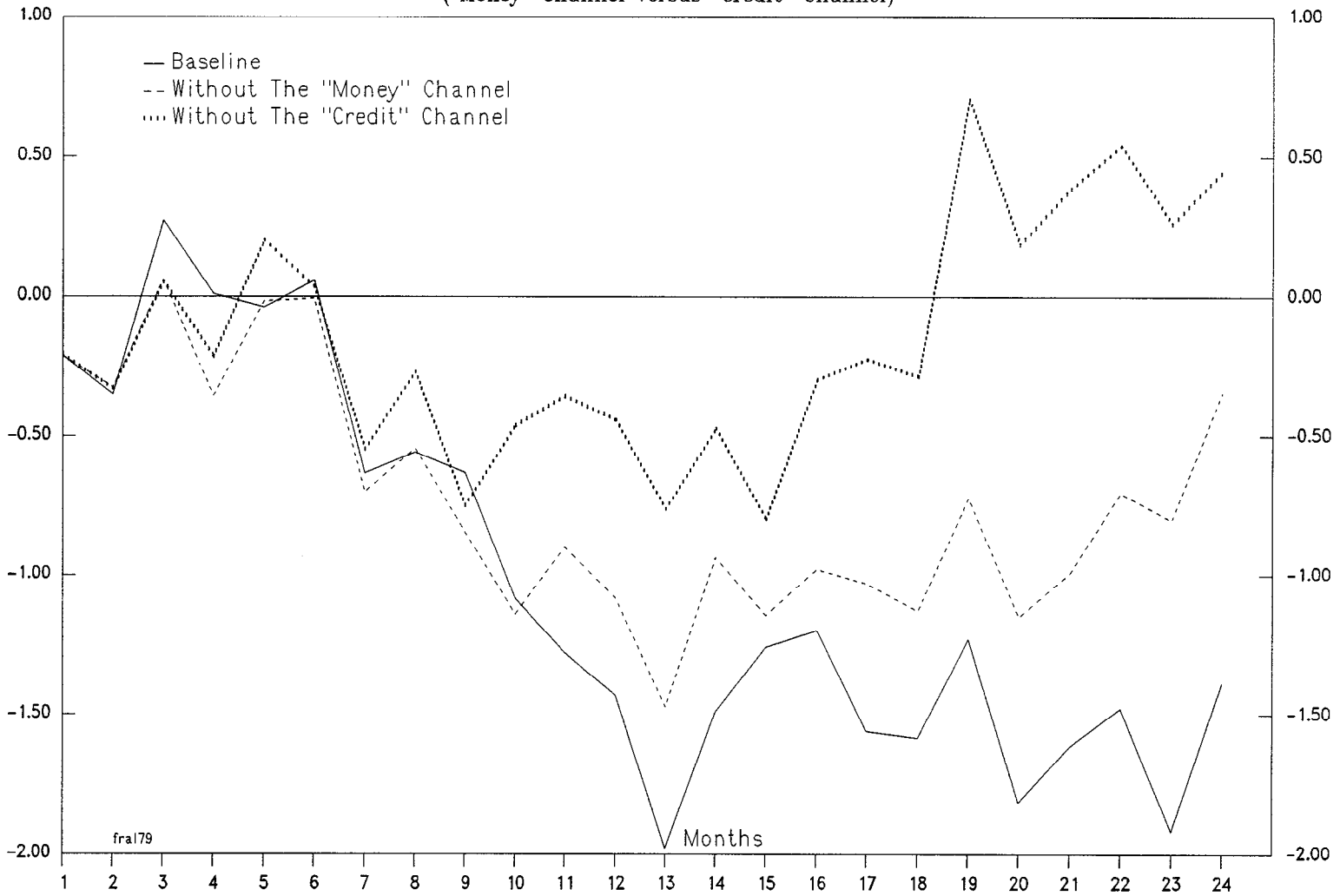
This paper has explored aspects of the monetary transmission mechanism in France, in an attempt to identify the main channels through which monetary impulses affect the economy. The main objective was to assess the impact of monetary policy instruments on certain key policy target variables—essentially prices and real activity—and to explore the role of intermediate variables such as the exchange rate, money and credit, in transmitting these effects. The analysis relied on some variants of the VAR methodology, which has proved a particularly attractive technique for studying such effects.

While most of the literature in this area focuses on a domestic short-term interest rate as the policy instrument, this paper examines separately the impact of the anchor currency interest rate and of the domestic premium component of the short-term interest rate For an economy where monetary policy is geared to a large extent to maintaining a stable exchange rate, there is a case for attempting to make a distinction between the effect of each component. Not only the two components could well be expected on theoretical grounds not

CHART 4
FRANCE

Effect of an Increase in the German Interest Rate on Output

("Money" Channel versus "Credit" Channel)



Source: Staff calculations.

to have an identical impact on the variables of interest, but such a decomposition may better capture the framework within which French monetary policy is conducted.

The empirical results of this paper suggest that this decomposition of the short-term interest rate is indeed a fruitful one. Thus, while both components of the French interest rate were estimated to have little impact on prices, their estimated impact on real activity turned out to be markedly different. On the one hand, an increase in the German component of the French short-term interest rate was estimated to have a strong, and statistically significant, dampening effect on output. On the other hand, the corresponding effect of an increase in the premium was estimated to be close to zero and statistically insignificant, on the basis of confidence intervals computed by Monte Carlo draws. This latter result would appear to suggest that episodes of a widening of the French-German short-term interest rate differential to defend the franc probably had a smaller effect on activity than is often supposed.

This result turned out to be robust to a number of alternative specifications. In particular, it was not affected by the imposition of a set of identification restrictions that departs from the strictly recursive contemporaneous structure that is commonly used in VAR models, in allowing the domestic premium to react contemporaneously to shocks to the franc/DM rate and to the long-term interest rate. This specification would appear to better capture the monetary authorities' reaction function under exchange rate targeting.

The paper also explored the question of the principal channels through which the impact of the German component of the short-term interest rate is transmitted to the economy. Among the potential candidates typically considered in the literature, the money channel was estimated to play a negligible role in the transmission, probably reflecting the extensive financial innovation that occurred during the period under consideration, but also the endogeneity of the money stock in the context of exchange rate targeting under international capital mobility. On the other hand, the credit channel turned out to be particularly important in the transmission of monetary policy shocks. This would appear to reflect certain features of the French economy, notably the limited importance of commercial paper, the importance of small and medium sized enterprises, and the relatively low capital to assets ratio of French commercial banks.

It appeared worthwhile to inquire what these results imply as to whether EMU participation can be expected to alter the effects of monetary in any fundamental way, the possible relevance of the Lucas critique notwithstanding. In this connection, the separate investigation of the impact of the two components of the French interest that was attempted in this paper appears rather useful. In effect, the likely impact of EMU on the transmission mechanism, at least to some extent, can be analyzed in terms of the impact of the elimination of the interest rate premium. Viewed in this way, the near-zero estimated impact of the premium on both nominal and real variables would suggest that EMU would entail at most only marginal changes of the monetary transmission mechanism in France; in a sense, France can be viewed as effectively being part of a monetary union already. On the other hand, the large degree of sensitivity of real activity to changes in the anchor currency interest rate also

carries important implications. It strongly suggests that changes in the monetary stance of the new European Central Bank are likely to exert a significant influence on economic activity in France.

DATA APPENDIX

List of Variables:

RSHF:	French call-money interest rate
RSHG:	German call-money interest rate
LBILATX:	Bilateral F/DM exchange rate
LNEER:	Nominal Effective exchange rate for France
LCREDIT:	Credit to the French economy
YIELF:	French long-term (10 year) bond yield
LM1:	French stock of M1, in logs
LPCP:	French consumer price index, in logs
LGDPIND:	French quarterly GDP (at constant price) interpolated using monthly industrial production figures
DIFF:	RSHF - RSHG

All series were drawn from the International Financial Statistics (IFS) published by the IMF, except for quarterly GDP and industrial production, which were drawn from INSEE data banks.

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