Monetary policy without interest rates.

An evaluation of quantitative credit and monetary controls
during France's Golden Age, 1948-1973.

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Abstract : Many econometric studies use both a narrative approach and an interest rate series to investigate the effects of US monetary policy. The two alternative measures provide very similar conclusions. This similarity in the results is not likely to be found when central banks use numerous instruments, including unconventional quantitative targets. This paper studies the French experience with temporary quantitative controls from 1948 to 1973. First, I explain why a quantitative monetary policy uses by nature many instruments (including controls both on the credit supply and on the money supply) that negate the role of interest rates and why this policy cannot be measured in the usual way. Second, I use a narrative approach, relying on various archival records, to build an accurate measure of this quantitative policy. The proposed measure takes into account the duration of restrictive episodes and is treated endogenously in a SVAR. Contractionary monetary policy shocks decreased production and inflation significantly. The impulse response functions show a pattern very similar to standard VAR studies despite the sample, the country, the type of monetary policy and the identification method being all quite different. On the contrary, using interest rates as measures of monetary policy does not provide any consistent result.

These results offer a revisionist account of postwar monetary policy under Bretton Woods and before the Great Inflation. They also suggest that quantities of money and credit can play a greater role than their prices in the adjustment process of the economy.

Keywords: monetary policy, credit controls, VAR, narrative approach, French history, Bretton Woods.

JEL: N14, E31, E32, E51, E52, E58.

'By the middle of 1950, in the comparatively hopeful days before the Korean crisis, France had attained reasonable internal stability and had approached an acceptable international balance. In the rehabilitation and stabilization of the French franc, credit controls have been an essential instrument, but France's experience with them has remained almost unnoticed on this side of the Atlantic.'

M.A.Kriz, *American Economic Review*, 1951.

'There is no case, whatsoever, for direct controls on credit'. [1]

Milton Friedman, 1980

1 Introduction

Recent central bank interventions[2] have raised new concerns about the use of quantitative instruments as devices for monetary policy. Yet this creates a great uncertainty about the future of monetary policy's effectiveness and raises questions about the possibility to use credit controls or other quantitative tools when inflation strikes back. But it is often forgotten that quantitative controls have been the main instruments of monetary policy for decades in Western Europe, Japan and East Asia after WWII, during the period of highest growth ever experienced by these countries. Many countries, prominently China, still use them today.
These monetary policy experiments are nevertheless widely absent of the standard

[1] Quoted in Batini and Nelson (2005), p.57.

[2] I thank my advisor, Pierre-Cyrille Hautcoeur, and Guillaume Bazot, Vincent Bignon, Michael Bordo, Jean-Edouard Colliard, Martin Eichenbaum, Jean-Olivier Hairault, Sophie Osotimehin, Thomas Piketty, Franck Portier, Romain Rancière, Albrecht Ritschl, Pierre Sicsic, Eugene White, Yanos Zylberberg, for helpful comments and discussions. I also thank seminar participants at WEHC Utrecht 2008, MMF conference 2010, Paris School of Economics, Econometric society world congress in Shanghai, London School of Economics, the Norges Bank summerschool. This research was supported by fundings from French ministry of Education and Research, the Banque de France and Fondation Thiers-Institut de France. It could not have been possible without the constant help of the archivists of the Banque de France, especially Frederik Grélard. I remain solely responsible for the errors and interpretations.

literature on the effects of monetary policy. The first explanation of such a neglect is the widely held view that inflationary fiscal Keynesian-type policies were the main determinants of the business cycle in the three decades following WWII, whereas monetary policy was either inexistent or ineffective. A second explanation is that usual econometric methods take for granted that the interest rate is the main instrument of monetary policy and fail to account for the peculiarity of unconventional policies. We thus lack tools to compare the effectiveness of these policies to standard results about conventional monetary policy such as the ones collected in the classical papers by Sims (1992) and Christiano, Eichenbaum and Evans (1999) using the SVAR framework.

French postwar monetary policy from 1948 to 1973 was a paradigmatic example of the use of temporary quantitative credit controls that negated almost completely a role for interest rates[3]. But, as for similar policies in history, we have neither a comprehensive account nor a quantitative evaluation of its effects. Such a policy was associated with an average GDP growth rate of 4,5% over the period and average inflation rate of 5%[4]. The very high volatility of inflation during this period (ranging from 1% in 1953 to 15% in 1957) suggests that monetary policy could have played an important role in avoiding much higher inflation rates. This paper thus proposes to characterize this quantitative policy and to estimate how it affected real and nominal variables.

The first contribution of this paper is to show that combining a *narrative approach* (following Romer and Romer 1989, 1994, in the spirit of Friedman and Schwartz, 1963) with vector autoregressions (VAR) is necessary to study the effects of monetary restrictions when monetary policy is not conducted primarily through interest rates. In so doing, I stress methodological requirements that are

[3]In a authoritative survey of credit controls in western Europe, Hodgman (1973) writes that the experience of credit controls were very diverse across countries. "In Germany interest rate policy and indirect instrument of monetary policy were already strongly upheld. The Netherlands and the United Kingdom occupied an intermediate position. Only in Belgium, Italy and France credit controls were fully accepted and extensively applied in practice", p.138.

[4]As shown by Bordo and Schwartz (1999), this period, mainly under the Bretton Woods system, corresponded to a monetary regime with very good performances compared to historical standards.

necessary to apply the narrative approach to other contexts than the US history. I especially show the importance of taking into account the duration and the potential endogeneity of monetary restrictions.

The second contribution of the paper is to highlight the importance of monetary policy in the European Golden Age of growth after WWII. Up to now, the literature has mainly considered fiscal policy and productivity shocks as the main factors explaining business fluctuations in Western Europe during the period which preceded the Great Inflation (Carré, Dubois, Malinvaud, 1972, Cooley, Ohanian, 1997, Battilossi, Foreman-Peck, Kling 2009). I emphasize that a proper measurement of monetary shocks shows that monetary and credit policy also mattered. Because of this measurement problem, no previous study had provided econometric estimations of the effect of French monetary policy over the period. [5]. While the effectiveness of monetary policy through quantitative controls is debatable and unclear from a theoretical point of view, French postwar policy offers an interesting case of study. I find that the actions taken by the Banque de France over this period explain around 40% of the variance of industrial production and the price level. The ability to control banks and to avoid substitutability between assets was crucial to the implementability of such a policy.

Can quantitative monetary policy instruments have an effect on the economy ? From a theoretical point of view, we need to distinguish whether the quantitative instruments affect directly either the banking loans (credit) or the money supply. Friedman (1969, p.75) stresses the point that this distinction is fundamental although it is often neglected in monetary models. Credit controls can be appealing since they can affect negatively output and prices while decreasing interest rates on money and bonds[6] (Bernanke and Blinder, 1989). But they may create an

[5] Among the authors that previously dealt with the effects of monetary policy in France, Sims (1992) estimated a VAR on French data from 1966 to 1990 and found a very strong price puzzle and a long delay of the response of production to innovations on the interbank (call) rate. He did not attempt to restrict the sample to the pre Great inflation period. Using also a VAR approach, Bruneau and De Bandt (1999) chose 1972 as their starting date. Mojon (1998) chose 1986. In their study of international monetary policy reaction functions, Clarida et al. (1998) used French data starting 1986. In all these studies, the difficulties that arise using the interest rate as a measure of monetary policy - rather than the lack of data - probably motivated the choices of the sample.

[6] Furthermore, the use of discount ceilings allows the central banks to set interest rates on

adverse monetary expansion because of assets substitution (Tobin, 1970, Davis, 1971), or even have no effect at all if the LM curve is vertical (Friedman, 1969). Hence the need to combine both types of instruments: controls on credit and on money.

For practical purpose, I will nonetheless use the term 'monetary policy' in the remaining of the paper to refer to the whole set of central bank operations (including both direct actions on credit and on the stock of money). However, the two kinds of instruments, and possible channels of transmission, will be distinguished in the analysis.

The Banque de France indeed combined quantitative controls on money and credit, rather than relying on interest rates. Credit controls included discount ceilings and, starting 1958, limits on credit expansion. Controls on the money supply (or liquidity controls) included minimum reserves requirements (on Treasury bonds, on medium term credit and then obligatory reserves starting 1967). The evolution of both kinds of instruments aimed to avoid the risk of circumvention of the controls by banks. The quantitative instruments kept adapting to the changing financial system. Some had been used only during one restrictive episode, over 2 or 3 years. As a whole, I have counted 13 quantitative instruments used by the Banque de France between 1948 and 1973.

Such characteristics of monetary policy are challenging for the econometrician who wishes to construct a measure of quantitative monetary policy over a long period. Building an index of several instruments is made too difficult by the impossibility to weight the importance of each of them and, most of all, by the fact that most of them are discontinuous and were used over a part of the period only. Furthermore, using interest rates or spreads would lead to inconsistent results since the aim of quantitative credit ceilings is by nature to distort or to downplay the role of prices in the allocation process (McKinnon 1973, van Wijnbergen 1983, Farahbaksh and Sensenbrenner 1996, Demetriades and Luintel 2001, Monnet 2011b)[7]. Using the money supply as a measure of monetary policy would also be

loans below the market clearing rate (Monnet, 2011b).

[7]More generally, the use of quantity controls characterize second-best equilibria when the price mechanism is not sufficient to reach the first best equilibrium (cf Weitzman 1974, Guesnerie and Roberts 1984).

unsatisfactory since it would miss the potential direct short term effects of credit controls on production. As a consequence of these difficulties, there is a lack of econometric estimations of the impact of monetary policy in countries that use quantitative controls and comparisons with the conventional interest rate policy are absent [8].

However, there exists an alternative to measuring monetary policy with single series such as interest rates or borrowed reserve. This alternative method, called *narrative approach*, was pioneered by Friedman and Scwhwartz (1963) and then integrated to an econometric framework by Romer and Romer (1989). The main feature of this method is to identify monetary policy shocks using narrative evidence on the intentions and instruments of policymakers. While the initial insight of the Romers'work was to find an exogenous measure of monetary policy, the narrative approach also proved very useful to take into account much more information about policy than a single statistical series (Romer and Romer 1990, Boschen and Mills, 1995). Recent work has also been devoted to show that VAR techniques and the narrative approach are actually compatible in various ways. Christiano et al. (1999) among others, showed that using narrative measures of monetary policy shocks ('the Romer dates' or 'the Boschen and Mills index') led to results that are close to the ones of a SVAR with interest rates or borrowing reserves[9]. But we have many reasons to believe that this result is actually very peculiar to the US case since the United States is the only country which has almost always used open market operations and interest rates as its main instruments of monetary policy[10].

This paper argues that measuring and identifying monetary policy with a narrative approach is the only way to give a proper account of the monetary policy stance when quantitative controls are used. It thus should be relevant for the history of many countries. To my best knowledge, this is the first study that extends Romer

[8] Comparing the effects of monetary policy in Honk Kong, Taiwan and China, Mehrotra(2007) is only able to conclude that "in China, interest rates have not been an important monetary policy tool and neither exchange nor interest rate shocks influence significantly price developments."

[9] The narrative and VAR measures of fiscal policy had also been compared by Favero and Giavazzi (2010) and Ramey (2011).

[10] The Volcker disinflation from 1980 to 1982 used mainly reserves. This change in the policy main instrument can create some problems if we use interest rates, cf Bernanke and Mihov (1998) and Coibion (2011).

and Romer's narrative approach in a similar way (notably using a dummy variable in a auto-regressive estimations) to another country than the United States.

A strong requirement of the narrative approach is that the measure of monetary policy, even though it takes into account many instruments, must describe restrictive episodes of a similar nature. In other words, it is context specific. In this paper, what will be measured are temporary quantitative controls (on credit and on money) implemented to fight inflation and to solve balance of payments problems. Such a has been used between September 1948 and September 1973 only. Before 1948, only qualitative controls and the discount rate were used. At the end of 1973, after the first oil shock, the nature of French monetary policy changed. Quantitative credit controls remained permanent but looser (often non binding) until the mid 1980s, and interest rates started to play a more important role. This hybrid system is different and would require another identification of monetary policy shocks.

Relying on archives of the Banque de France, I construct a dummy variable that takes the value one when temporary quantitative controls were tightened or imposed in order to make monetary policy restrictive. In contrast to the Romer and Romer (1989) methodology, my method is able to take into account the duration of the monetary policy restrictions. Since the duration of controls is endogenous to most of the economic variables (as highlighted by narrative evidence and statistical tests), the dummy is introduced as endogenous in a VAR. This follows a recommendation by Leeper(1997) and common practice (Gertler Gilchrist 1994, Carlino and De Fina 1998, Ramey 2011). The narrative evidence provide justifications for an appropriate Cholesky decomposition: policy-makers knew only lagged values of the nonpolicy variables (the dummy variable is thus ordered first in the VAR).

SVAR estimations using the narrative measure show that monetary policy influenced significantly and importantly French business cycle and inflation. It accounts for around 40% of the variance of production and prices and lower their level by 5% after 20 months. The striking result is that the impulse response functions of production, prices, money and unemployment show a pattern very similar to standard VAR studies of monetary policy despite the sample, the country, the

type of monetary policy and the identification method being all quite different. The impact on money and production is immediate while the impact on unemployment is delayed (as an evidence of labor market rigidities). The impact of quantitative controls is maximum after around 20-25 months. Contrary to most studies (Sims 1992, Christiano et al. 1999, among others), there is no price puzzle. Interestingly, I find a strong price puzzle and a lag in the response of production to a monetary policy shock only when the duration of monetary policy restrictive episodes is not taken into account. On the other hand, using the discount rate or the money market rate in a VAR does not show any significant and consistent response of nominal and real economic variables.

These results shed light on the fact that monetary policy was not absent during the French postwar period[11]. They show that quantitative controls can actually be effective to decrease output and prices. Furthermore, whatever the instruments used, an appropriate identification of monetary policy shocks display very standard and common results. It pushes further the case for the combination of VAR methodology and the narrative approach to bring robust stylized facts useful for the construction of business cycles models. This investigation of French postwar monetary policy can also be though as a radical example of the 'liquidity puzzle' (the link between the money base and the interest rate is broken)[12]. Without any liquidity effect we nevertheless obtain standard impulse response functions. And monetary policy still does matter indeed. This result may provide some reasons to give more importance to quantity variables (credit and money) in macroeconomic models.

[11] The idea that monetary policy played a minor role during the postwar 'Keynesian consensus' in Europe is notably due to the influence of the Radcliffe Report written in 1959 by British prominent Keynesian economists. This report refuted the quantity theory of money, casted doubt on the effectiveness of monetary policy on short-term fluctuations, and consequently stated that the role of central banks should be limited to avoid distorting the structure of interest rates (Kaldor 1960, Batini and Nelson 2005). On the other hand, studies of US monetary policy state that the effect of monetary policy on output was actually greater before the so-called 'Great moderation' (Boivin and Giannoni 2006, Mojon 2008, Mahdi Barakchian and Crowe 2010) although the average inflation rate was higher. In their studies of US monetary policy, Romer and Romer (2002) and Meltzer (2009) have also rehabilitated monetary policy in the 50s.

[12] The standard and seminal reference is Gordon and Leeper (1992).

Section 2 provides a simple model of monetary policy through quantitative controls and explains how and why such controls can be implemented. It concludes in explaining why only a "narrative approach" can account fully for such a policy. **Section 3** discusses the methodological issues of the narrative approach. **Sections 4 and 5** applied the narrative approach. The historical evidence are presented and contractionary episodes are defined. I then justify the structural identification in the VAR. **Section 6** presents the results of the VAR estimations, discusses their implications and provides robustness checks and alternative specifications.

2 Quantitative instruments for monetary policy

2.1 Direct controls on credit or on money ? Theoretical insights.

The reasons why central banks may choose quantitative instruments is still not very well understood from a theoretical point of view. The mechanisms and the transmission channels that link these quantitative controls to the behavior of real and nominal variables are often not clear and miss important distinctions. The many studies that have surveyed the popular use of credit ceilings or other direct instrument of monetary policy in Europe and Asia until the 80s as well as in developing countries (Hodgman 1973, Alexander et al. 1995, Farahbaksh and Sensenbrenner 1996, De Melo and Denizer 1997), do not rely on a well specified model of the economy. On the contrary, the usual dynamic stochastic general equilibrium models that are used nowadays to assess the role of monetary policy rely on interest rate policies and include credit only as a provider of frictions that can amplify other kind of shocks[13]. Understanding the nuts and bolts of quantitative instruments first requires to distinguish between controls that affect the supply of credit and controls that affect directly the stock of money. The need for such a distinction was already highlighted by Milton Friedman (1969)[14].

[13]Recent promising exceptions include Curdia and Woodford (2011).

[14]"When I refer to *credit policy*, I mean the effect of the actions of monetary authorities on rates of interest, terms of lending, the case with which people can borrow, and conditions in the credit markets. When I refer to *monetary policy*, I mean the effect of the actions of monetary authorities on the stock of money - on the number of pieces of paper in people's pockets, or the

As it will be shown below, a central bank that decides to use mainly quantitative instruments is likely to combine these two types of control. But their theoretical effects are very different. To see how and why they differ, it is necessary to use a model that features different assets and different interest rates (as suggested by Brainard and Tobin, 1963, Tobin, 1969 and Brunner and Meltzer, 1972) and thus includes both a credit market and a money market. It was done in some modified standard IS-LM models including a credit market: Blinder (1987), Bernanke and Blinder (1989), and Greenwald and Stiglitz (1992) and recently Woodford (2010)[15]. These very stylized model are not dynamic but provide sufficient insights to understand the main short-term mechanisms at work in the distinction between controlling the credit supply or the money supply[16]. I present the simplest version as possible that combine the main features of the Bernanke-Blinder and Greenwald-Stiglitz models, in order to study the macroeconomic short term effects of monetary policy. A more formal discussion of the potential substitution effects between credit and money is conducted in Appendix B within the framework of the Bernanke and Blinder (1989) model.

Let's construct a simple IS curve that features a loan market whose conditions affect directly investment. This kind of modified IS curve is also called CC in Bernanke and Blinder (1989) for 'commodities and credit'.

$$y_t = \underset{-}{i}(\rho_t, \underset{+}{L_t}) + \underset{-}{c_t}(r_t, \underset{+}{y_t})$$

quantity of deposits on the books of banks. Policy makers, and central bankers in particular, have for centuries concentrated on credit policy and paid little attention to monetary policy. The Keynesian analysis, emphasizing interest rates as opposed to the stock of money is only the latest rationalization of that concentration.", 1969, p.75.

[15]Contrary to the other papers, Woodford(2010) models the credit market through a market-based financial intermediation. I prefer here to stick to a bank-based intermediation because postwar France was characterized by the predominance of banks in the financing of the economy (cf Wilson 1957, Monnet 2011a). Note however that in his model, Woodford does not discuss the problem of assets substitution.

[16]My rationale for using this simple model is neither to characterize optimal quantitative monetary policy nor to reproduce French postwar business cycle. Such motivations are left to further work. This model aims to identify and explain the economic reasons underlying the choices of instruments by the Banque de France at that time. Explaining such a choice requires taking into account at least five different assets and a non-market clearing credit market. Unfortunately, it is impossible to introduce all these characteristics in standard DSGE models and obtain a tractable form, cf Appendix B.

Then a traditional LM curve that features the usual negative relationship between money and interest rate:

$$r_t = \psi(\underset{+}{y_t}, \underset{-}{\frac{M_t}{P_t}})$$

where y is output, ρ is the interest rate on loans, L is the quantity of loans in the economy, r is the interest rate on bonds, c is consumption, i is investment, P_t is the price level and M_t is the money stock[17]. To see what happens on the price level, we can add a Phillips curve to the model : $\Pi_t = \alpha\Pi_{t-1} + \beta(y_t - y^*)$, where Π_t is the inflation rate.

As in Tobin, Bernanke -Blinder and Greenwald-Stiglitz, the interest on loans depends positively on the interest rate on bonds. Banks that have to pay more to raise equity will also charge a higher interest rate on loans. The stock of loans L_t is decreasing in both interest rates.

ρ and L are variables that intend to take into account the peculiarity of the loan market. This model can be microfounded in various ways (see Stiglitz and Greenwald, 1993, for the microfoundation of the IS curve), and can be considered as a static version of new Keynesian models in which credit frictions affect the IS curve. One interesting aspect of this IS curve is that it can also take into account an important characteristic of quantitative credit controls policy in a very simple way: the Bank rate may be set by the central bank at a level below the market clearing rate. Such a rationing policy is intended to increase the participation of banks in the economy (Monnet 2011b). It is a rent allowed by the central bank to banks that would not have access to the lending facilities if the discount rate was set at a higher level. In case of a second best equilibrium on the loan market, the central bank may have incentives to set a stable interest rates below the market clearing and vary only the quantity of credit through discount or credit ceilings. In the model, it corresponds to the case when L is decreased directly by the central bank through discount or credit ceilings without a move in ρ (or at least without a increase a ρ equivalent to the market clearing case). Such a disequilibrium situation can break the link between ρ on r[18].

[17] See Stiglitz and Greenwald (1992) for a version of this model including government expenditures.

[18] The fact that monetary policy using credit controls or legal ceilings on interest rates leads to desequilibrium (the price is not the market clearing price) have been discussed notably in

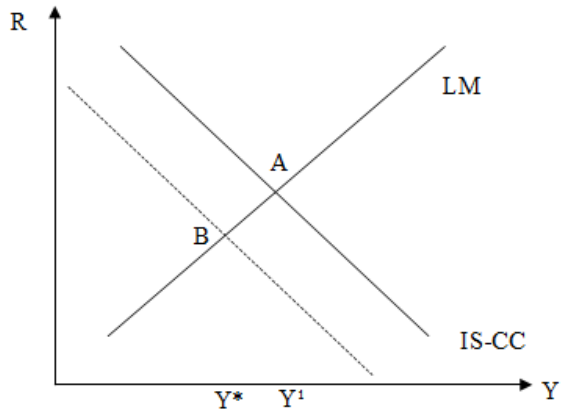
To investigate the effect of a restrictive monetary policy through quantitative credit ceilings, think about a central bank that observes a positive deviation of output from its natural level corresponding to an inflationary boom. Credit controls will reduce the amount of loans that banks can lend to firms and thus will shift the IS-CC curve downward[19]. Graph 1) on Figure 1 shows the short-run impact of such a policy that would target potential output, y^* in order to lower inflation. The price level is affected through the Phillips curve and finally the money stock through the wealth effect of the LM curve (demand for money for transactions motives is lowered). But, if the LM curve is fixed in the short run (that is there is no action of the central bank on the money stock), credit controls also cause a decrease in the interest rate on bonds (and on money) since agents have less wealth for a fixed amount of money[20]. If the correlation between ρ on r is very high, this effect will be partly offset nevertheless because r increase with the price of credit ρ. It is not likely to be the case if the price of credit is not the market clearing price. As discussed earlier, a zero correlation between both interest rates in the short run is thus even more realistic when credit ceilings are imposed.
However, the impact of credit controls can be offset for other reasons even if the interest rate on loans increase in the short run. Such a scenario, that points out why credit controls can actually create an expansion of the money supply, was originally discussed by Tobin (1970) and Davis (1971). Cottarelli et al.(1986) made a similar statement studying the Italian case. [21] The mechanism works as follows: when the

McKinnon(1973), van Wijnbergen (1983) or Blinder (1987).

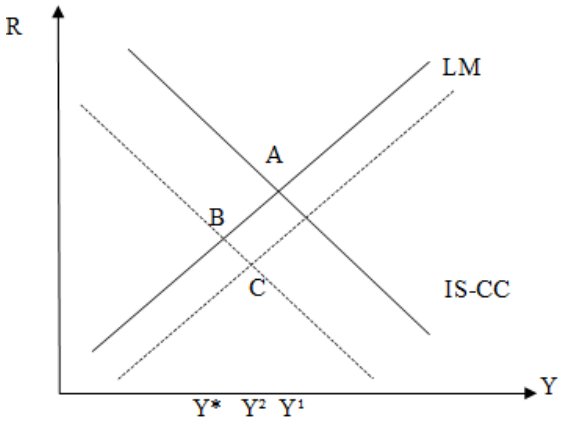
[19]It is thus equivalent to a contractionary fiscal policy, except that the cost is not directly supported by the State

[20]DSGE including credit frictions also find that a negative supply credit shock decrease the unique short-term interest rate, cf Curdia and Woodford 2011, Gilchrist and Zakrajsek (2011).

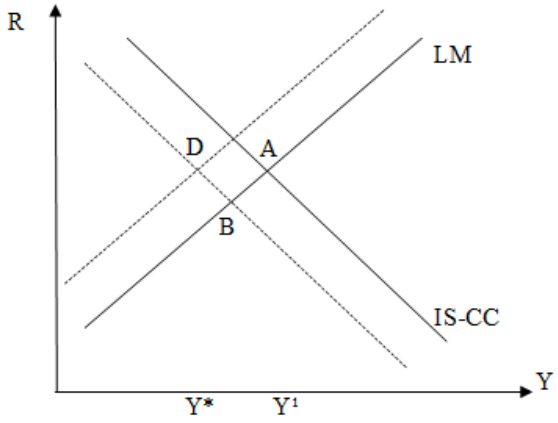
[21]Nonetheless, Davis pointed out and regretted that it could not be shown in a simple IS LM framework. Hopefully, an IS-LM model augmented with a credit market *à la* Bernanke-Gertler fulfills Davis'wishes. "It is somewhat tempting to argue the case in familiar IS-LM terms. On this interpretation, the imposition of bank credit ceilings in the face of less-than-perfect nonbank alternatives shifts the IS curve to the left at any given level of 'the' interest rate. Given the money supply, by assumption fixed at the policy target, and assuming no shift in the liquidity preference schedule at given levels of 'the' interest rate, the equilibrium values of both aggregate demand and the interest rate would fall. However, since a multiplicity of financial markets, demand sectors, and interest rates is an essential feature of this problem, the IS-LM framework



1) Quantitative credit policy in the short run



2) Quantitative credit policy with an adverse increase in the money supply.



3) Combination of quantitative credit and money policy

Figure 1: Quantitative policies in the IS/CC - LM model

banks cannot grant anymore the amount of loans they wish, a substitution effect can occur in favor of other assets and thus increase the liquidity in the economy. Three possible substitution effects are more likely to occur (see Appendix B for a formal discussion) and increase liquidity: banks buy more short-term bonds issued by firms instead of granting loans, they reduce the time deposits that financed the loans which increases demand deposits, and, finally - only when credit controls are imposed on banks refinancing rather than on the total amount of loans[22] - banks increase deposits to continue financing loans. The increase in short-term bonds supply will decrease their price and if there are substitutes to money, it will also lower the price of money and create a monetary expansion. On the other side of banks' balance sheet, time deposits can be converted in demand deposits, leading to a expansion of the money supply. These substitution effects are likely to offset the restrictive effect of credit controls, especially if many alternative financial instruments are available to agents (i.e markets for short-term bonds, eurodollars etc.). Facing ceilings on loans, the banks will inject more liquidity in the economy. Such an adverse effect is shown on Graph 2), Figure 1.
Only direct controls on liquidity creation or on the money multiplier can restore the power of the central bank's policy.
This is the role of quantitative instruments affecting directly the money supply.
As shown in graph 3), Figure 1, the combination of credit controls on the IS-CC curve and other controls on the LM curve can lead to an important drop in output, achieving potential output, with a stable interest rate on money and bonds.

This simple model thus highlights three very important characteristics of quantitative controls.
First, the combination of controls on credit and on money is needed for the former to be effective. If agents substitute short-term bonds for loans or if more liquidity is created though deposits, credit ceilings may actually create an expansion of the money supply. It is even more likely to be true if credit controls take the form of

with its single interest rate is a clumsy device. Thus, while the 'average' (in some sense) level of interest rates might fall in response to a bank credit ceiling, some particular interest rates could certainly rise."

[22]That is when credit controls take the form of discount ceilings at the central bank rather than limits on credit expansion per bank.

discount ceilings rather than ceilings on credit expansion (cf appendix B).
Second, such a combination eliminates the role of interest rates. Such a dismiss of interest rates is achieved both by the fact that the loan rate can be set at a non-market clearing level and by the combination of the two types of control that maintain a stable interest rate on bonds. Let's think about the difference with a contractionary policy on the LM curve. It would rise the interest rate on money and bonds which will then finally push the IS-CC curve downward. In this case, the interest rates would play an important role in the adjustment. On the contrary, the use of quantitative controls both on credit and money keep interest rates stable and considerably reduce their role in the adjustment process. Note that the combination of two types of credit could actually lead to a rise in the rate on bonds. But such a rise is lower than what would have been necessary to reach potential output without credit controls.
Third, this model also possibly features the monetarist criticism of credit controls. If the LM curve is vertical, then quantitative credit controls will have no effect and output. Their only effect is on the interest rate. It is solely a way to decrease the cost of financing for the government and it creates the risk of a positive pressure on the money supply in the medium term (cf Cottarelli et al. 1986). If the central bank wishes to decrease output, the price level and the money stock, then only restrictions on the money supply are justified.[23]
Although this model explains quite well the combination of quantitative instruments in the short run, there are many things left aside about the transmission of monetary policy shocks. Prominently, this old-Keynesian model does not take into account the possible effect of real interest rates in the medium or long run. If monetary policy decreases inflation, then real rates increase and hamper further output growth [24].
Despite these unfortunate pitfalls, the consequences of this theoretical discussion for measuring monetary policy are clear. Looking at only one instrument of quantitative monetary policy is not sufficient and can be misleading. Observed interest rates do not necessarily reflect the stance of monetary policy. Considering only

[23]On the other hand, the model also shows that if the economy is in a liquidity trap, then credit policy is an appropriate choice for the central bank.

[24]It also assumes that expectations do not play an important role for the choice of monetary policy instruments.

one type of controls would miss the potential substitution effects and would not fully account for the overall strength of monetary policy[25].

2.2 The case for credit controls

The main goal of the previous model was to explain why monetary policy combines quantitative instruments in order to affect directly both the IS-CC curve an the LM curve. The next section will study how such a combination was indeed implemented by the Bank of France. Meanwhile, let's recall briefly why quantitative controls, and especially credit controls, are used by some central banks. The decrease in the interest rate on Treasury bonds - as highlighted in the model- is only one of them.

The justifications fall into two categories. The first category includes all the arguments that value controls as increasing the intervention of the State in the allocation process. Monetary policy is then an instrument of selective credit policy since exemptions can be used to favor some sectors (Monnet 2011a). Such credit subsidies were common in postwar Europe and East Asia, designed to solve coordination failures in the loan market (Johnson 1974, Rodrik, 1994). They were an element of an investment-based strategy that can enhance catch-up growth such as described in Acemoglu, Aghion, Zilibotti (2006). In addition to supporting an interventionist allocation of credit, credit controls also block channels of financial intermediation and maintain the banks in an equilibrium that does not contradict other public policies. It can avoid speculation on public debt or on the currency, thus being complementary with capital controls. Again, it is especially true when they are combined with other quantitative controls that impede financial desintermediation. The general limitation of financial intermediation also impedes a rise in velocity during restrictive episodes, thus giving more power to monetary policy (Hodgman, 1973). The latter argument is reminiscent of the argument that financial repression helps the government to maintain its short term monetary and fiscal objectives (McKinnon 1973, Reinhart and Sbrancia 2011).

The second category includes all the reasons that focus on the ability of credit controls to decrease interest rates. As shown in the model, credit controls lower

[25]This caveats are obviously neglected in standard general models of monetary policy with only one interest rate and without a loan market and a LM curve.

the interest rate on bonds which is beneficial for government's financing. It is again a classical explanation for financial repression. Another advantage of maintaining lower interest rate on bonds may be to disconnect domestic policy with international policy. As stated by Hodgman (1973), credit controls "check the flow of credit to the private sector without raising domestic interest rates and thus attracting foreign funds through the balance of payments". The latter argument do not apply to the French economy in most of the period studied here because there were capital controls (at least until 1958) and because most of restrictive episodes aimed to decrease domestic product in order to solve balance of payments problem. However, this argument was recognized and had been used by French policy makers at some points, in 1963 and 1972 . Finally, credit controls can also be a way to reach an interest rate on loans that is below the market clearing rate (Monnet 2011b). It is a way to increase bank's access to the central bank discount window during restrictive monetary policy episodes. In the long run, it can foster financial deepening without impeding the effectiveness of monetary policy. In contrast to a market clearing situation, quantitative rationing increases the number of projects financed but gives less to each of them (Demetriades and Luintel 2001 make a similar argument with interest rate ceiling, another measure usually associated with financial repression and that was also used in France).

To shift the LM curve, the central bank could use either open-market operations or quantitative instruments such as reserves requirements, or liquidity ratios. The reason why the latter may be preferred to the former is well known: open market operations need a well functioning monetary market. In economies where credit policy remains important because the central bank has important power on banks, especially through the discount window, the money market is less likely to be developed. Hence, when credit controls are used on the IS curve, the central bank is also more likely to use quantitative direct instruments on the LM curve. Note however that it is not required from a theoretical point of view and that some countries have combined or combine open market operations with credit ceilings (De Melo, Denizer 1997).

Credit controls are not a panacea. They may create a lot of distortions in the economy and lead to unproductive investments. They may maintain the economy

in a lower level of financial development. These criticisms are well known (McKinnon, 1973, Alexander et al. 1995) and are beyond the scope of this article[26]. The focus remains here on their aggregate impact on production, money and inflation.

2.3 How the Banque de France combined quantitative instruments

We have now sufficient elements to interpret the choice of the main instruments of French monetary policy from 1948 to 1973.

In the years after World War II, most European countries faced two main economic problems : the economy (especially industry) needed to reconstruct, inflation was very high and kept rising. Governments reacted in different ways, some as Belgium or Italy implemented very restrictive stabilization plans as soon as early 1947 while others delayed the stabilization. In France, no rigorous stabilization happened before the end of September 1948 when fiscal discipline and a restrictive monetary policy were jointly decided[27]. At this date, the French central bank decided to control quantitatively banking credit in various ways in order to fight inflationist pressures. Starting 1948, the two main features of the new French monetary policy were first that quantitative measures (not only qualitative) were taken and second, that quantitative credit control episodes were designed to be temporary.

Indeed, by October 1947 France first imposed qualitative restrictions on credit that consisted in telling banks the sectors that deserved priority. But they were not sufficient to stop inflation. As stated by the National Credit Council, "qualitative measures are too soft to have an effect on inflation and are only designed to organize a better allocation of credit."[28]. Thus, by 29 September 1948, the Banque de France decided to implement quantitative measures.[29]

[26]These issues about French postwar economy are studied notably in Monnet (2011a).

[27]The Banque of France forced the Government to impose this rigorous policy. For a comparison of stabilization plans between France and Italy, see Casella and Eichengreen (1993).

[28]In the Report of the National Credit Council, September 1948, p.38.

The National Credit Council (Conseil national du crédit) was created by the law of December 1945 that nationalized the Banque de France. The Council is within the Banque de France and is in charge of 'credit policy'.

[29]Hereafter, I translate all the quotations from the archives of the Banque de France. Original

The conviction that credit controls should be used only temporarily in order to avoid damages on the competition mechanisms is a second important feature over the whole period. It lasted until 1974. It is well expressed, among others, in a letter from the Governor of the Banque de France to the Finance Minister on 6 February 1958 : "Needless to say that these measures should not be considered as irremovable. They are conceived at a general economic level in response to a specific situation, and the stabilization of credit will need to be changed in one way or another when the factors of this situation evolve. In the long-term, if nothing is done, limitations on banking credit would probably create rents that would distort the normal rules of a competitive sector.[30]"

The Banque de France had been nationalized in 1945 and remained dependent of the Treasury and the Government over the whole period. Most of the important measures were discussed between policymakers from the Ministries and from the Banque of France. It sometimes led to conflicts as in 1948, 1952 or 1957 (Feiertag 2006). Thus monetary policy cannot be isolated from the political context and bargaining between the Banque and the Government. Government financing was a big issue all over the period. Within the Banque de France, the National Council of Credit was in charge of the implementation of credit control and the Commission of Banking Control supervised the banks . The tools of credit supervision were established first in the December 1945 law[31] and then effectively in October 1947 when qualitative (selective) credit control was implemented in order to allocate credit in high priority sectors. In a letter to the President of the Association of Professional bankers (10 October 1947[32]), the Governor of the central bank explained why credit control was essential to defend French economy and how banks had to declare each month the amount of credit they granted to each sector. Mandatory declarations and registrations of banking credit then became essential for the functioning of monetary policy. They were registered by the CNC and used to do policy recommendations by sector(Monnet 2011a). Sanctions (impossibility to use rediscounting at the Banque de France) would be applied to banks that did not declare their amount of credit or gave out false numbers. Threats on discount

quotations are available on demand.

[30]Archives of the Banque de France. 1427200301/334.

[31]"Loi du 2 décembre 1945 relative à la nationalisation de la Banque de France , des grandes banques de dépôts et à l'organisation du crédit".

[32]Archives of the Banque of France. 1331200301/9

facilities were credible and effective since banks used rediscounting at the Banque de France rather than the money market. As a whole, quantitative credit controls could not have been implementable without abilities to supervise banks and the development of a large collection of banking credit statistics [33].

Direct credit controls took only the form of discount ceilings until 1958. Once they were deemed less efficient to affect banking loans, ceilings on credit expansion were imposed (cf the narrative of the February 1958 choice in the next section). There were the two main tools used by the Banque de France to shift the IS curve downward. To offset substitution between assets, quantitative controls on banking liquidity and reserves were also implemented. They aimed to influence directly the LM curve. In 1948, a minimum requirement on Treasury bonds was introduced in order to prevent the banks from selling government securities for the purpose of obtaining resources with which to expand their loans to the economy. A similar mechanism was then imposed on the requirements of medium term credit in banks balance sheet in January 1961. This new tool, called the "coefficient de tresorerie", included both requirements on treasury bonds and on mid term credit. Since WWII, medium term credit (loans between 2 and 5 years) were rediscountable at the Banque de France. Preventing banks from rediscounting too much medium term bills during restrictive episodes (relatively to short term bills) avoided an increase in liquidity creation.[34]. Finally, in 1967, a system of reserve requirements was implemented. The reason why the Bank of France preferred requirements on bonds and credit rather than on reserves during almost 20 years was that, as long as the discount window was still one of the main instruments of policy, banks could have used it to meet their reserves requirements, thus leading to more money creation[35] .
Alongside these 6 main instruments, many others were used, including some exemptions (credit to exports, credit to construction in some episodes) and penalty

[33]For a general description of the system and credit policy, see Wilson 1957, Andrieu 1984 and Monnet 2010.

[34]The change from on tool to the other is well explained in a note dated from October 18, 1963 (Banque of France archives, 1331200301/79)

[35]Such an explanation can be found in many documents, notably in a note by H.Koch, 29 January 1963, (Banque de France archives, 1331200301/10) or in a speech by M.Debré, Ministry of Finance, at the CNC, on November 9 1966 (Banque de France archives, 1331200301/11)

discount rates for banks exceeding the credit ceilings.
The discount rate of the Banque of France was only one means of monetary policy but it had never been the major one over the period. It was sometimes moved or adjusted in function of the conditions on the credit market or to send signal to foreign countries. But, according to consensual views at that time, 'it has lost its meaning'[36]. Indeed policymakers knew that the price elasticity of credit demand was very weak because the banks were structurally indebted toward the central bank. Hence French central bankers used it mainly for 'its psychological effect'[37]. Policy makers considered it as a "qualitative" instrument, as opposed to direct credit control, named "quantitative", which imposed ceilings on discount or credit expansions.[38] All over the period, the discount rate thus remained very low, often negative in real terms (cf Figure 6).

By nature, a quantitative monetary policy involve many kind of instruments. Moreover these instruments are likely to evolve over time in order to adapt to the development of the financial system. Changing the instruments overtime in response to financial innovations is the better way to avoid the adverse substitution effect that financial intermediation can cause to quantitative controls. Not only monetary policy with quantitative instruments over a long period cannot be measured in the usual way with one single series, it is also impossible to build an index of several continuous series.

For this reason, I follow Romer and Romer (1989) in using narrative evidence to build a measure of central bank actions as a dummy variable (restrictive monetary policy takes the value one). While these authors, in the spirit of Friedman and Schwartz, first justify this method in order to find an exogenous measure, the benefit of this approach is also to take into account numerous instruments or actions that cannot be summed up in a single series. The second reason was predominant in the work of Boschen and Mills (1995) who construct a discrete variable

[36]'La politique du crédit en France'. Revue du personnel de la Banque de France, n°5, nov.1954.

[37]This statement is notably expressed in Archives of the Banque de France, PVCG, 30 September 1948 by the Governor E.Monick and in Archives of the Banque de France, PVCG, 11 octobre 1951, p.511, 11 avril 1957, p.278, by Baumgartner.

[38]Notably expressed by the Governor Baumgartner , PVCG, 11 october 1951).

taking several values (from -1 to 2) in order to take into account the magnitude of monetary policy and its duration. But as written by Bernanke and Mihow " although Boschen and Mills provide a more continuous and possibly more informative measure of policy than do Romer and Romer, their indicator likely also suffers relatively more severe problems of subjectivity and commingling of endogenous and exogenous policy changes."(1998, p.870) . Indeed the narrative approach creates a trade-off between a broad measure that may suffer from subjectivity and a narrow measure that filters out some relevant information. It is thus necessary to review the pro and cons of the narrative approach in order to justify the construction of our measure.

3 The narrative approach in practice

Any researcher willing to replicate or extend Romer and Romer(1989) seminal paper would realize that the 'narrative approach' faces strong requirements and is subject to specific caveats and problems that may differ from the standard structural VAR identification of monetary shocks. In particular, it needs a great amount of qualitative information and enough pieces of evidence in order to prove the exogeneity and the accurateness of the measure and to avoid subjective bias. The measure of the shocks then largely depends on the information available to the researcher (the Greenbook forecasts used by Romer and Romer, 2004, to improve their original measure is a good example) and is not likely to be easily extended to different countries or periods. It is definitely a context-specific approach. Furthermore, it faces four major issues. These four problems are in fact common to the narrative identification of monetary policy shocks and fiscal policy shocks (Ramey and Shapiro, 1998, Romer and Romer, 2009, Ramey, 2011). I emphasize here that, although not entirely neglected in the previous literature, they have not been fully taken into account. One reason might be that the narrative approach exclusively focused on US post-war economy up to now and thus lack of institutional comparisons.

First, this approach requires monetary policy to be sufficiently homogeneous over a long period, even though it can take into account several instruments used by

the central bank. Indeed, if the central bank keeps changing its instrument and its objectives, no comparison and no long run statistical analysis is possible. In other words, the monetary policy regime should be stable enough in order to ensure that monetary restrictions are commensurable. This homogeneity is usually assumed when one uses the bank rate as the measure of monetary policy in the estimations, but conversely the narrative approach could not take it for granted when dealing with unconventional policies. Second, the sample must be relatively free of other big exogenous shocks or major shifts in the economic situation. For example Hoover and Perez (1994) criticized Romer's work for not being able to separate the effect of monetary policy from the effect of oil shocks. Furthermore, a shift in the monetary policy measure may be correlated with a regime change in the economy, thus leading to a bias in the results.

These first and second points imply that the narrative approach must especially devote attention to the choice and the justification of the sample. In a more general way, not specific to the narrative approach, Boivin and Giannoni (2006) and Mojon(2008) shown with VAR estimations that the estimated results of the impact of monetary policy differ radically depending on the sample choice[39]. In particular, standard results of the VAR literature on the US disappear if one does not include the Great Inflation of the 1970s in the sample. A careful choice of the period may be as important as the choice of the measure of the shock. [40].

Third, as already recognized by Romer and Romer (1989), the narrative approach often lacks information about the duration of monetary policy restrictions or expansions. While a series of interest rates or reserves is continuous and can be introduced as such in the VAR, the narrative approach identifies discrete episodes that are most of the time introduced as dummy variables in the econometric model (Romer and Romer, 1989, 1994, Ramey, 2011) without specifying the duration of the policy. The reason is that the restrictive effect of a rise in the bank rate does not necessarily lasts until the central bank decreases its rate. But the lack of information on the duration of the shock may have important consequences. Indeed, if a central bank raises its discount rate by 2%, the impact of this policy on the economy is not only caused by the initial shock but also by the fact that the cost

[39]Bernanke and Mihov (1998) among others also emphasize this sample problem.

[40]Bagliano and Favero (1998) also pointed out that only VAR models estimated on a single monetary regime feature parameters stability and do not show signs of mis-specification

of credit remains high for several periods[41]. Not taking account the duration decreases the estimated values of the coefficients of the impact of monetary policy and then create misinterpretations of the impulse response function. More generally, this result is related to Ramey (2011)'s discussion of the 'timing problem and highlights that this problem is very specific to the caracteristics of the policy that is studied. Ramey has shown that a 'timing problem' arises when identifying fiscal shocks with government expenditures - in contrast to war dates - because of the timing of the implementation of public expenditures. I show here that the main issue for the right identification of the timing of monetary restrictions is the duration of quantitative controls.

Finally, the fourth problem concerns the assessment of the exogeneity of the measure. The great contribution of the narrative approach had been to state this exogeneity with the help of the analysis of the intentions and objectives of the policymakers using the deliberations, speeches and minutes available at the central bank. But such a method can be biased by a selective choice of the information and subjectivity. Furthermore, Hoover and Perez (1994), Shapiro (1993) and Leeper (1997) has criticized the Romer measures for being endogenous to output, based on the estimation of monetary policy reaction function. Information contained into archival material is a good source to identify causation but one must be very precise about the range of this causation. A decision is never exogenous to the whole economy, but only to some specific variables. For example, a decision can be relatively exogenous to output but completely endogenous to inflation. Furthermore, a decision (proxied by a variable D) taken at time t can be exogenous to a variable Y at time t but D_{t+n} is not exogenous to Y_{t+n}. Thus, if one wants to take into account the duration of the monetary restrictions, we must account for the fact that the initial decision may be exogenous to output while the duration of the restriction is not. Interestingly, researchers who use the Romer dates in VARs do not make the same assumptions about their exogeneity, and generally do not discuss their assumption. While in their seminal paper, Romer and Romer, stated that they variable can be deemed exogenous to production and unemployment only, some studies used them as exogenous to all the variables in a VAR, including inflation or interest rates (Eichenbaum and Evans 1995, Christiano, Eichenbaum

[41] For this reason, interest rates are introduced in level rather than in differences in standard VAR.

and Evans 1999) while other treat it as endogenous in a VAR (Boschen and Mills 1995, Gertler and Gilchrist 1994, Leeper 1997 , Carlino and de Fina 1998). Ramey (2011) also uses the dummy war dates (measuring fiscal shocks) as either endogenous or exogenous in a VAR indifferently. Giavazzi and Favero (2010) and Coibon (2011) have recently compared the use of a different measures constructed upon narrative evidence and discussed whether they could be introduced as exogenous in a VAR or if the inversion of the moving average representation is needed. Such a choice can of course lead to different results. Following Leeper(1997), I argue that there is some need to reconcile VAR methodology and the narrative approach and that it requires to state clearly whether the narrative measure of monetary policy (dummy variable) should be treated as either exogenous or endogenous in a VAR with several variables. Treating the dummy as endogenous still requires using narrative evidence to do an appropriate structural identification in the VAR. Recognizing the endogeneity of the measure is not a dismiss of the narrative approach but a continuation by other means.

This paper tackles these four issues in the following ways. The choice of the sample (1948 - 1973) and the insights from the model of section 1 justify that the dummy variable is a proxy for a similar policy: *temporary contractionary central bank's interventions using quantitative instruments in order to affect directly both credit supply and the money stock*. There is thus a common interpretation of the monetary policy shocks. Narrative evidence will also be provided in the next section to ensure that the magnitude and the intentions of the central bank were similar across the different episodes. Keeping this narrow definition of monetary policy (0 or 1) is less subjective than the Boschen and Mills proposal and more in line with the intentions of the Banque de France at that time: credit policy was either contractionary or normal. Ending the sample in September 1973 also avoids the criticism made by Hoover and Perez (1994) about the contemporeanous effects of oil shocks. The oil shock was not only contemporeanous to a restrictive monetary policy, it also caused changes in the objectives and instruments of monetary policy during the 70s. Starting 1974, credit ceilings became permanent and the central banks started to target M2 growth. But the unemployment crisis led to choosing much looser credit ceilings than before. On the other hand, the Bank of France also started to give much more importance to open market operations.

The study of French monetary policy in the 70s will thus require another measure and another identification[42].

The main advantage of quantitative monetary policies, compared to the US monetary policy studied by Romer and Romer, is that it provides an easier identification of the duration of restrictive episodes. Much more information is taken into account by the dummy variable: the other variables in the estimation are thus not only affected by the change in policy but also by the fact that this policy remains restrictive or not. I will show in section 5 that taking into account the duration leads to a more precise estimation and considerably reduces the delay of the response to shocks. But taking into account the duration of restrictive episodes has a cost. It could be argued, as in Romer and Rome 1989, that the shift to a restrictive monetary policy is exogenous to some variable. But, as it will be discussed in the next section, the duration of restrictive episodes is not likely to be exogenous to any important economic variable. Following Leeper (1997) I will thus treat the dummy as endogenous in the VAR. In so doing, the narrative evidence on the construction of the measure will help to choose an appropriate recursive identification. Furthermore, as stated by Leeper, even though it is often not mentioned by VAR studies using dummy variable as endogenous, we need to distinguish two possible estimation methods: estimate the monetary policy reaction function in the VAR with ordinary least squares (OLS) or with a logit/probit estimator.

4 Definition of restrictive episodes of monetary policy

In the records of the Banque de France (official records as well as preparatory notes and minutes), the discussions of all the monetary policy instruments, including the discount rate, appeared in the same category : Credit Policy (*Politique du Crédit*). At each meeting, the Council General of the Banque discussed and stated whether credit policy should be restrictive or not.

[42]This is partly done by Bruneau and De Bandt(1999) who use a standard SVAR starting their sample in 1972.

According to policymakers themselves the discount rate could only have a psychological effect, not a 'practical' and effective one. Thus, *a priori*, I do not consider a rise in the discount rate, without any qualitative restrictive measure on credit, as a genuine instance of restrictive policy. I use the fact that the beginning and the end of credit control episodes are usually easy to identify (quantitative measures were imposed and then repealed). Nevertheless, before the 1958 episode, that is the first time ceilings on the expansion of credit were implemented, the ends of the episodes are more difficult to figure out because not all the previous measures were repealed. Nevertheless the available documents in the archives provide many indications that help to figure out when the central bank considered that the restrictive policy ended.
Besides the duration of the episodes, the aim of the 'narrative' identification procedure is to state as precisely as possible what the instruments and the objectives of each monetary restriction were. Consequently, it will be possible to state which economic variables central bank's decisions were endogenous or, on the contrary, exogenous to, at the time of the decision.
The sources that I used (see appendix A) are primarily the records of the weekly mettings of the General council of the Banque of France (denoted as PVCG), the deliberations of the sessions of the National Council of Credit (denoted as CNC), and various notes and letters from the archives of the central bank.

4.1 Six restrictive episodes

30 September 1948 - 8 June 1950 The first episode of credit control occurs in a context of political instability. In order to force the government to adopt fiscal and credit restrictions, the Banque of France raises its discount rate by 1 % on 2 September, without much effects, and finally decreases it on 30 September by 0,5% since credit control measures had been approved by the government and the National Council of Credit. The objective of the quantitative control of credit was clear : fighting against inflation by reducing the growth rate of credit. Among the reasons to reduce inflation was a government credibility problem : the inflation tax (seignoriage) was so high that the government had lost its credibility and could not increase its deficit anymore. These arguments were expressed clearly in a letter of the Governor where he suggested what the Prime Minister (*Président*

du Conseil) should say to the Parliament (Septembre 17th) to defend the credit control policy[43].

This new policy had two main objectives " The aim of this policy is twofold. First it must limit the expansion of credits in order to reduce the development of monetary facilities. Second, it must guarantee to the Treasury the resources that it has the right to expect from the banking system.[44]" Thus, the fight against inflation was also a reallocation of private credit toward public credit. The commitment of the Government to maintain its demand of credit in a non inflationary way was thus a fundamental component of this policy.

The measures, considered as excessive by many bankers, were the following : a lower limit on government securities owned by banks (*planchers d'effets publics*) equal to 95% of each bank's amount in September 1948, and an obligation for each bank to devote 1/5 of its new loans to government bonds. The reason for the control on bonds was not only to support financing of the governement but also to control liquidity: 'the limitation of credit creates an excess of funds that banks can grant with the help of their deposits. This excess must be invested in government bonds in order to avoid an increase of liquidity'[45]. Furthermore, the CNC devoted great attention to the new systematic application of rediscount ceilings to banks : the individual ceiling applied to each bank in 1949 is determined by the nominal amount of the ceiling in september 1948 plus 10% (expected inflation).

The ending date of this episode is more gradual and thus not as obvious as for the next ones. All along 1949, the Banque de France kept insisting on the importance of these measures[46], and at the beginning of 1950, The French monetary authorities have, in fact, encountered considerable resistance in implementing the restrictive credit policy. A relaxation, mainly based on lifting the ceilings on commercial bank rediscounting at the Bank of France, had been repeatedly advocated in the Parisian financial press and by certain business groups. In April 1950, the National Assembly, after a brief debate, formally requested the government to relax

[43]Letter of the Governor, Emmanuel Monick to Monsieur Filippi. Archives of the Banque de France, 1427200301/8.

[44](Preparoty notes for the CNC meeting, 29 September. Archives of the Banque de France, 1427200301/8.

[45](Preparoty notes for the CNC meeting, 29 September. Archives of the Banque de France, 1427200301/8.

[46]Archives of the Banque de France, PVCG, 1st September 1949.

the restrictive credit policy, despite the Secretary of State for Economic Affairs's warning that such a course of action would be inflationary. However, prior to the outbreak of the Korean crisis (June 1950), the Government and the Bank of France always avoided a relaxation of controls. Then, the profound change in economic climate consequent to world rearmament forced the Banque de France to keep a constant eye on credit and inflation(Kriz, 1951) but monetary policy however was relaxed for more than a year. There is also a consensus among observers to date the shift of credit policy between April and June 1950 (Kriz, 1951, Barrère, 1951, Guillaumont -Jeanneney, 1969) because of the adoption of 3 measures : rise of ceilings on credit requiring an authorization from the Banque de France, (from 50 to 100 millions) on 27 April, rise of discount ceiling on 11 May and decrease of the discount rate on 8 June. The Governor justified the timing of this ending as follows : "The proposed measure may be unorthodox, in the sense that in the past we probably would have waited for a stronger stabilization of lending to private economy. Nevertheless, it seems that with the uncertainty about the development of production nowadays, some of us tend to adopt some pessimistic views. I do not want to break with the tradition but only to adapt it to current circumstances."[47] Given the uncertainty regarding the end date of this episode, we will try these three ending months (April, May, June 1950) as a robustness check in the econometric analysis with monthly data[48].

11 October 1951 - 17 September 1953 The reasons for credit restrictions starting October 1951 are rather clear, and were repeated widely : inflation kept rising and France was running a permanent current account deficit. Once again, the central bank pointed its finger at the growth rate of credit, accused to fuel the current account deficit[49].

In order to reduce the demand for credit, two main measures were adopted : a rise in the discount rate (from 2,5 to 3%, and then to 4% on 8 November 1951) and new and more rigorous discount ceilings : banks could exceed their ceiling only by 10% and a special discount rate (*escompte D*) applied to the overruns.

[47] Archives of the Banque de France, PVCG, 8 June 1950.

[48] It obviously does not differ when using quarterly data.

[49] Archives of the Banque de France, PVCG, 11 October 1951.

The Governor viewed these two measures (discount rate and discount ceilings) as complementary but gave a more effective weight to direct credit control : "Even though credit restrictions are more efficient from a practical point of view, a rise in the discount rate has a greater psychological effect on the French and the foreign opinion. It clearly shows that all possible efforts will be made in order to defend the currency.[50]"
These measures were not well received by bankers and businessmen. For instance, there was an interesting exchange between the Governor of the Banque of France and the President of the Chamber of Commerce of Paris (letters dated from 15, 25 October, 30 November, 8 December). The latter was complaining that the restrictive monetary policy was very dangerous for the development of production and business. The Governor answered : "I do not deny that a rigorous monetary policy is likely to cause some troubles and real difficulties to the firms, but there is no sign today (looking at the index of industrial production and the level of unemployment) that this policy has pushed the country into a crisis. [...] To tell you the truth, the difficulties that firm managers are facing today are essentially due to the recent worsening of an old inflationist situation and not to the monetary policy that has been implemented to fight it." (30 November)[52]. This exchange highlights the motivation of credit restrictions and shows that, for the French central bank, inflation was clearly the priority ; production, firm profits and unemployment were of little concern for monetary policy choices, at least in the short-run or at the time of the decision.

The end of the restrictive period occurs on 17 September 1953, after three weeks of negotiations between the Government and the central bank. As soon as early September, rumors were already beginning to circulate in the Press and among bankers. The central bank decreased the discount rate from 4% to 3,5% and, most of all, the National Council of Credit adopted many measures to ease banking credits : rise of discount ceilings and suppression of a half of banking tarifs. The Governor of the Banque of France considered these measures - claimed by the Government - as necessary but he also pointed out the contradictions in the Government's claims : " We must consider how difficult the Government's task

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[52]Archives of the Banque de France, 1427200301/15.

is. Indeed, on one hand it wants French prices to become more competitive and the threat of a rise in wages to disappear , and on the other hand it wants the economic trend to be stronger than in the past. For this reason, one can speak of contradictory views."[53]

(26 June 1957) 5 February 1958 - 5 February 1959

On 11 April 1957, the General Council of the Banque of France decided to increase its discount rate from 3% to 4% because the deficit of the balance of payments kept increasing as well as the growth rate of credit. Exchange reserves had decreased by an amount of 300 millions dollars since January 1957. This measure applied to short and mid-term credit but not to treasury bills and credit to export activities. According to the Governor of the Banque, the main justification for this increase was that it took place in a general coherent plan implemented by the Governement in order to stabilize the price level, including wage restrictions and reductions in taxes. The General Council believed that the increase of the bank rate, together with governmental measures, would have a strong psychological effect and consequently be sufficient to slow down the growth rate of credit. This increase was intended to work together with price control that the Government had implemented a few months before. Except for consumer credit (*vente à tempérament*)[54], no quantitative restrictions was imposed on credit. On 25 April, the Banque of France also raised the discount rate for banks exceeding their discount limits.

A few weeks later, in June, the newly appointed Minister of Economics and Finance, Felix Gaillard, completely changed the orientation of the economic policy and proposed new measures. In order to fight inflation, he gave up price controls that had a counterproductive effect. In order to solve the trade deficit, he decided a 'disguised' devaluation, beginning in August : purchase of foreign currencies were taxed by an amount of 20% (cf Koch, 1982, p.309 ; Feiertag 2006, p.528). Gaillard also obtained advances from the Banque (300 billion) in order to finance government policies. In counterpart of these measures, which were not contractionary, the Banque of France imposed new controls. On 26 June, it imposed new

[53]Archives of the Banque de France, PVCG, 17 September 1953.

[54]Decision of the National Credit Council, 11 April 1957. The minimum initial amount for consumer credit rose from 25 to 30 %, and the duration of consumer credit decreased from 21 to 18 months for cars, and 15 to 12 months for household appliances

restrictions on consumer credit, extended the treasury coefficient (25% of bank assets must be compounded of treasury bonds), and started new discussions with bankers in order to offset the inflationary pressures caused by the 300 billion advance : "organize limitations on credit in order to neutralize the flow of money that is going to rush into the money market as a consequence of the new advances to the State. We know that, in this matter, the limitations can be implemented by two means : reserves or ceilings"[55]. Then, in July, the CNC decreased discount ceilings for each bank by an amount of 10%, and the discount rate applying to banks that exceeded their discount ceilings by an amount higher than 10% (*super enfer*) increased to reach 10%. In August, in order to sustain the 'disguised devaluation', the discount ceilings decreased by 10% again and the discount rate increased from 4 to 5% (from 6 to 7 % for the so called 'enfer' rate, that is the rate applying to banks exceeding their ceiling by less than 10%). On November 28, discount ceilings are decreased by 10% once more, and the 'enfer' rate increased to 8%.

Despite a positive effect on the balance of payments, these restrictive measures did not prove to be sufficient in order to stabilize inflation. As expected, the progression of short-term credits fell in the 3rd and 4th quarters of 1957, and credit from the Banque of France also decreased for the first time since 1955. But inflation in the third semester 1957 reached 2,8%, the highest level since December 1951[56]. For these reasons, the Banque of France decided to adopt a stricter policy that would definitely stabilize internal demand and inflation. These measures were actually imposed by the IMF and negotiated between its director, Per Jacobsson, and the Governor of the Banque de France. They provoked the opposition of two members of the General council of the Banque (M.Laurent and M.Lambert) who feared an increase in unemployment and a decrease in industrial production[57]. Adopted on 5 February 1958, this new measure - ceilings on credit expansion - marked a departure from the previous credit control policy : limitations not only applied to discount ceilings or reserves but directly to the growth rate of credit. Hence the

[55]Archives of the Banque de France, PVCG, 26 June 1957. Note that the term 'reserves' is used to denote 'liquidity ratios' and not 'obligatory reserves'.

[56]These figures were presented and discussed at the CNC meeting, 7 February 1958. Archives of the Banque de France, 1427200301/334.

[57]Archives of the Banque de France, PVCG, 6 February 1958.

new decision of the CNC forced banks to increase their credit to the economy in the same percentage as in the last quarter of 1957 (+ 3%, provided that banks furnish justifications). Banks which exceeded this percentage could be kept from discounting facilities. The motives were well stated in letters from the Governor to the Economy and Finance minister, and to the President of Professional Bankers (12 February 1958) : "Regarding private credit, a relentless action had been carried out for long in order to fight inflationist pressures. The measures taken in 1957 have led to a serious slowdown of the growth of banking credits. But these credits have nevertheless continued to grow a little bit. Thus, in order to maintain the ongoing effort, it seems necessary to adopt new measures to stabilize the amount of credit directly.[58]" This new policy, called *encadrement du crédit*[59] (official limits on credit expansion) was thus more rigorously defined than previous broad measures of credit control. Pressures from the IMF and EUP had a strong influence on these decisions (Feiertag 2006)[60].

This official quantitative credit control ended on 5 February 1959. Before this date, there had been two small changes in the policy. In July, because there were too many banks exceeding their discount limits, the *enfer* and *super enfer* rates decreased to their 1957 level. And in October, the discount rate fell from 5% to 4,5%. This small decrease was not intended to change the nature of monetary policy : it was just a response to the amelioration of the trade balance. The Governor clearly excluded to ease the 'quantitative' restrictions (that is to rise discount ceilings or to abolish ceilings on the expansion of credit), for economic as well as political reasons : despite the recent success of the General de Gaulle, foreign countries were still wary of the French political situation and it would have been premature to ease monetary policy[61]. At the end of December, some influent policymakers and economists , including Jacques Rueff, required the rise of the bank rate, in order to create a psychological effect over foreign countries. The reason was the launch of the new French franc in January 1959. But the Banque de France argued

[58] Archives of the Banque de France, 1427200301/334.

[59] This expression is sometimes said to have been coined by Valéry Giscard d'Estaing, when he became Secretary of State for Finances in 1959.

[60] The IMF pressures were a strong constraint on the General council of the Banque de France, as seen in the debates of the 5 February 1958 meeting. Archives of the Banque de France, PVCG, 5 February 1958.

[61] Archives of the Banque de France, PVCG, 16 octobre 1958.

that the rate was already sufficiently high compared to other countries (2,5 % in the USA, 4% in West Germany and England. In February, the discount rate fell to 4,25 % and, most of all, ceilings on credits expansion were abolished, sending a strong signal toward the end of the monetary restriction . The reasons for such a measure were first a balance of payment surplus, second the need to increase mid-term credit to finance public and private investment. From February to April, monetary policy then became clearly expansionary (decrease of the discount rate, rise of discount ceilings).

This restrictive episode shows the difficulties to establish clearly when the contractionary monetary policy started. Given our definition of a quantitative monetary policy (and compared to the other episodes), it would be inconsistent to pick the date of April 1957. July 1957 is a better choice since the Banque of France started to decrease discount ceilings. But this decrease was quite mild after all, and it was associated with an increase in the advances to the government. The advances were a signal that the Banque de France was not running a contractionary policy at any cost. According to most criteria, the true restrictive policy started in February 1958 when the Banque de France admitted that other means were either too loose or ineffective and finally really adopted instruments in line with its objectives. The influence of a different starting date of this episode will be discussed when the econometric estimation is presented in section 6.

28 February 1963 - 24 June 1965 On 28 February 1963, the Banque of France reestablished an official ceiling on the expansion of banking credit (*encadrement du crédit*). As stated during the General council of the Bank, the reason for such a restriction was that 'there was an abnormal rise of flows in the money market threatening the internal and external equilibrium of the currency[62]'. Thus, while banking credits have increased by 17,4% in 1962, monetary authorities stated that the total growth rate of credit in 1963 must not exceed 12%. In September 1963, this limit was changed to 10% (from September 1963 to September 1964). The treasury coefficient was also increased, from 32 to 35 %, and then to 36% in May. The 10% limit on credit was reconducted in September 1964 for one year, but in June 1965, the Banque prematurely ended this official credit control. According to the Governor, ending this measure before September was a strong signal because 'this reglementation would have been maintained if the monetary

[62]Archives of the Banque de France, PVCG, 28 February 1963.

situation had remained the same as it was until recently'. The justification is as follows : "The suspension of credit control (*encadrement du crédit*) is essentially justified by the fact that banks have recently managed to maintain quite easily their credit in the limits that have been imposed. [...]It seems that the moment is well-suited to end these measures because, even though they may not disturb banking activities in general anymore, they cause some malfunctionings because they apply to all kinds of companies and thus create some rents and discourage the dynamism of more active firms. There is no reason maintaining measures that would, in a way or another, lead to a sclerosis of the economy.[63]"
Because this restrictive episode was mainly due to inflationary pressures rather than balance of payments problems, the discount rate only played a minor role; it was not used as a psychological signal sent to foreign countries. He was raised from 3,5 to 4% in November 1963 and decreased to 3,5% in April 1965.

12 November 1968 - 27 October 1970

Due to a new large trade deficit, the Banque of France increased its discount rate from 3,5% to 5% on 3 July 1968. The reason seemed straightforward : "the state of our foreign reserves. In such a situation, it is not possible to maintain interest rates clearly inferior to those prevailing on international money market - especially the US market and the Euro-Dollar market - anymore, [...] The interest rate must be increased in order to stop the haemorrhage[64]". This decision regarding the interest rate is taken without any further considerations on credit or on inflation. Contrary to April 1957, the National Credit Council is even not involved or consulted. The signal sent by the Banque de France was not intended to announce the beginning of a restrictive monetary policy, but to show to foreign investors that the French Central Bank and the Government would defend the value of the currency. Furthermore, given the weak elasticity of banking credit to the discount rate, this decision alone was not likely to affect prices, credit and production.
Conversely, the rise in the bank rate (from 5 to 6%) that happened on 12 November showed a very different spirit. First, the justification of the measure was much broader and highlighted a general demand problem that monetary policy must

[63]Archives of the Banque de France, PVCG, 24 June 1965.
[64]Archives of the Banque de France, PVCG, 3 July 1968.

address : "the evolution of the foreign exchange market, as well as the domestic monetary situation reveal that the abundance of liquidities is not an accident but has been accepted to contribute to a new acceleration of the economy in a context of sustained expansion"[65]. Second, and foremost, the measures taken are not only 'qualitative' (discount rate) but quantitative. : the rate of obligatory reserves [66] rose from 4,5 to 5,5%, and new official limitations on credit were imposed (a maximum of a 4% rise from 30 September to 31 December[67]). But contrary to previous restrictive episodes, important exceptions not only applied to credit to exports[68] : mid-term credit financing housing, personal and household goods and exports were not included in the limitations. However, according to the Governor of the Banque of France, these restrictions did not differ strongly from 1958 and 1963, because banks had always been told to impose their restrictions on loans that were not financing investment, construction and exports[69].
The limitations were extended in 1969 and 1970, and the same exceptions applied. Each year, the growth rate of credit could not exceed 3%. On August 1970, a lively debate took place between the Finance Minister and the Banque of France. The growth rate of credit had been stabilized but the Banque wanted to wait for several months in order to be certain of the improvement. The Minister especially argued that French monetary policy was too strict compared to foreign countries and that "main indexes show a slowdown in economic activity that would justify a slight relaxation of credit controls" [70]. Finally, the Banque agreed to decrease its discount rate from 8% to 7,5 % in order to get close to international standards (Germany and UK had a 7% bank rate) but insisted to maintain an official restrictive policy and credit controls [71]. Finally, on 27 October 1970, the ceilings on credit expansion were abolished and the discount rate decreased to 7%.

November 1972 - 1973 The last restrictive episode is peculiar because the end of 1973 is a turning point from which the way French monetary policy was

[65] Archives of the Banque de France, PVCG, 12 November 1968.
[66] in 1967, obligatory reserves had replaced the treasury coefficient
[67] In 1967, the rise of credit for the last quarter, was 9%
[68] The discount rate applying to credit to exports remained at only 2%
[69] Archives of the Banque de France, PVCG, 12 November 1968.
[70] Archives of the Banque de France, PVCG, 27 August 1970.
[71] Archives of the Banque de France, PVCG, 27 August 1970.

implemented changed altogether. From then on, limitations on credit were not officially removed before 1984. Another reason is the important money market reform of 1971 that allowed money market rate to fall below the discount rate of the Banque of France (See Figure 5). This measure was recommended in the influent 1969 *Report on Monetary Policy* by Marjolin, Sadrin and Wormser, and would lead to the end of the discounting activity of the Banque of France in 1973. Consequently, discount ceilings were abolished in 1972 and the bank rate (then influencing the money market rate) became a penalty rate. The Banque increased slightly its rate on November 2 (from 5,75 to 6 %) in order to fight inflation, in agreement with Governement considerations, as clearly stated in the General Council : "this measure will first mean, in a symbolic way, that we have entered a period in which money will be more expensive and more difficult to obtain. Second, it will set, at a reasonable level, the penalty rate applying to banks that do not own enough assets to be traded on the money market"[72] For similar reasons, the bank rate increased to reach 7,5% on 30 November. In the minds of policymakers, changes of the discount rate would now have a similar effect than former dicount ceilings. Despite this strong psychological signal, no other quantitative measure was taken before 12 December 1972 when the requirement on obligatory reserves was raised and ceilings on the growth rate of credit (*encadrement du crédit*) were established again : bank lending on 3 April 1973 should not exceed by over 19 percent the lending on 5 April 1972. Since total credit had already grown by more than 12 % from April to December, 1972, this measure was really restrictive. On 28 December, the bank rate was increased to reach 8%.

For several reasons, this policy never clearly ended before 1984 but its nature radically changed at the end of 1973. What has been designed as a temporary very restrictive policy became a permanent policy far less restrictive. The reasons for such a change are clearly beyond the scope of this paper : because of economic (oil shocks and stagflation, end of the Bretton Woods system) and political factors (a new President and a new Prime Minister at the beginning of 1974), the nature of credit control radically changed in the second half of the 70's.

For these reasons, I stop my study in October 1973, before the first oil shock. Doing so, I avoid the analysis to be biased by a huge supply shock, and we take into account that this shock changed the nature of monetary policy and that our

[72] Archives of the Banque de France, PVCG, 2 november 1972.

method of identification of monetary policy episodes is not relevant anymore after 1973. To make sure that the results are not biased by the fact that the sample finishes in the middle of a restrictive episode, I will show later that main conclusions are not affected by the removal of the period November 1972- September 1973.

5 Converting the episodes into dummies

The narrative analysis not only defines the value that the dummy variable must take, but also brings important information which is crucial for the econometric identification. First, decisions of monetary policy appear to be endogenous to most economic variables : credit, inflation, production, balance of payments. Hence the need to include the dummy in a VAR as an endogenous variable. Second, the timing of the policy decisions suggests a structural identification in the VAR: monetary policy decisions are affected by past but not by contemporaneous values of economic variables. On the other hand, quantitative monetary policy affects contemporeanously the other variables.

5.1 Endogeneity of the dummy.

The information set of the policymakers, though sometimes imprecise, was very large. Although the primary objective of restrictive monetary policy was to fight inflation and to keep the balance of payments stable (to maintain "the external and the internal value of the Franc"), credit, unemployment and production were not left out of consideration. It is especially true regarding the duration of the restrictive episodes. A speech by the 1st Deputy governor in 1959, some months after credit controls had been repealed, provides a telling example. He stated that monetary policy in 1958 was a success since inflation fell, balance of payments' problems were solved and the Banque de France stopped financing the government deficit. He added that, as a consequence, neither the General council of the Banque nor the National Credit Council thought it was necessary to maintain a restrictive policy. The decision to turn to an expansive policy was taken in February. This change was aimed to "promote the recovery of the economic

activity."[73] Many other evidence discussed in the previous section confirm that policy decisions regarding the duration of the restrictive episodes were determined by an inflation-output tradeoff. Even though unemployment was low all over the period, it was also a concern. Estimating monetary policy reaction functions using the dummy variable as a dependent variable, following what Shapiro(1994) did with the Romer dates, do not provide robust results but we cannot reject that the dummy is determined by inflation and the output gap [74]. In the VAR, many past values of industrial production, unemployment, the price level and the money base significantly explain the dummy variable. Furthermore, Granger causality tests indicate that we should reject the null hypothesis that other economic variables variables do not Granger cause the dummy variable.

Following Boschen and Mills (1995) and Leeper(1997) among others, but contrary to Romer and Romer (1989) and Christiano, Eichenbaum, Evans (1999), I thus conclude that the narrative measure of monetary policy must be introduced as endogenous in the VAR. It does not mean that any narrative measure of monetary policy should be treated as such in a VAR. But narrative and statistical evidence suggest that this one must. Assuming that monetary policy is exogenous would bias upward the results of the estimation. The decision to impose quantitative control was not taken independently of development in the economy; they were likely to be imposed when money, prices and production were already growing rapidly. An exogenous dummy variable in the estimated equations would be negatively related to the error terms. It would produce a biased overestimation of the impact of monetary policy.

Hereafter, monetary policy shocks will thus be interpreted as innovations to the dummy variable. It requires an appropriate structural identification. As in most SVAR, I choose a recursive , short-term, identification. The assumptions underlying the identification can be justified with the narrative evidence.

[73] Speech of Jean Saltes, 1st deputy governor of the Banque de France, December 2 1959. Archives of the Banque de France, 1331200301/10.

[74] Results available on demand.

5.2 Structural identification.

Consider a simple bivariate auto-regressive system where both variables are treated symmetrically. It is called a 'structural VAR'.

$$y_t = a_{10} - a_{12}z_t + b_{11}y_{t-1} + b_{12}z_{t-1} + \epsilon_{yt}$$

$$z_t = a_{20} - a_{21}y_t + b_{21}y_{t-1} + b_{22}z_{t-1} + \epsilon_{zt}$$

These are not reduced-form equations and a transformation is needed in order to estimate the system. An equivalent form is called VAR in standard form[75]:

$$y_t = c_{10} - c_{11}y_{t-1} + c_{12}z_{t-1} + e_{1t}$$

$$z_t = c_{20} - c_{21}y_{t-1} + c_{22}z_{t-1} + e_{2t}$$

The transformation notably defines the error terms of the estimated system as composites of the two shocks of the structural VAR:

$$e_{1t} = (\epsilon_{yt} - a_{12}\epsilon_{zt})/(1 - a_{12}a_{21})$$

$$e_{2t} = (\epsilon_{zt} - a_{21}\epsilon_{yt})/(1 - a_{12}a_{21})$$

A structural identification is needed to recover the value of the ϵ from the estimated e. The most standard identification, associated with the work of Christopher Sims, is a recursive identification. For example, we can set $a_{21} = 0$, which means that z_t has a contemporeanous effect on y_t while the reverse is not true. The residuals equation are thus:

$$e_{1t} = (\epsilon_{yt} - a_{12}\epsilon_{zt})$$

$$e_{2t} = \epsilon_{zt}$$

Then, for example, if z is a measure of monetary policy, $e_{2t} = \epsilon_{zt}$ is identified as a monetary policy shocks. This kind of identification thus depends on the ordering of the variables. The recursive/triangular decomposition of the residuals is called a Choleski decomposition. In an n-variable VAR, the exact identification requires $(n^2 - n)/2)$ restrictions (Sims 1992, Christiano et al. 1996, 1998). The issue of the structural VAR identification is thus to justify the restrictions that have to be

[75]The standard form is the inversion of the moving average representation of the structural system.

imposed in the matrix linking shocks to residuals. The identification of monetary policy shocks in the VAR imposes to discuss whether we consider or not that the dummy variable has a contemporeanous effect on other variables.

The evidence in Banque de France's PVCG show that the information available to policymakers -especially the economic statistics - refer to the values of economic variables of the months preceding the decision. The only exceptions were the variables of the central bank's balance sheet (such as reserves, gold etc.) which were available weekly[76] and the foreign and domestic interest rates whose changes were known immediately. Otherwise, the information about production, unemployment or the money stock were based on statistics of the previous months. There are also many evidence that banks, households and firms adjusted immediately their comportments to the announcement of the measures. Quantitative controls reacted to past values of the other economic variables but have a contemporeanous effect on the economy. The way I compute the dummy is consistent with this interpretation: when a decision is taken at the end of a month, the dummy variable takes the value one in the subsequent month[77]. The opposite recursive identification would be to assume no contemporeanous effect of quantitative controls on agents's behavior once the controls are announced. This would rule out any effect of expectations[78] which is unfortunate when dealing with policy decisions. Furthermore, the instruments were usually implemented immediately in the month following their announcement. My ordering of variable in the recursive Cholesky identification of the VAR is thus the opposite of usual practice using a money market interest rate (CCE 1996, 1999 Coibion 2011). The dummy variable is placed first. It is due to the different nature of the variable that measures monetary policy.

[76] Each weekly meeting starts with the presentation of the weekly balance sheet data of the central bank.

[77] Thus, when the decision to restrict money growth has been taken at the end of the month, I do not give the value 1 to this month but only to the following months (cf Table 1). For example, for the episode starting on February 27 1963, the value of the February 1963 dummy will be zero.

[78] Allowing for such an effect of expectations in the narrative identification is crucial , as shown by Ramey (2010) for fiscal shocks. Agents are likely to decrease loans, consumption, investment etc. as soon as a restrictive policy is announced. Note also that the expectation effect can go in the opposite way: banks that know that they are going to be constrained grant more loans just before the implementation of the control. There would be no reason to ignore such a potential effect in the identification, whatever its direction.

Table 1: **Dummy variable of monetary restrictions**
Dummy variable = 1

Monthly data	alternative	**Quarterly data**	alternative
10/1948 - 06/1950	- 04/1950	4:1948 - 2:1950	-
10/1951 - 09/1953	-	4:1951 - 4:1953	-
02/1958 - 02/1959	07/1957 -	2:1958 - 1:1959	3:1957 -
03/1963 - 07/1965	-	1:1963 - 3:1965	
11/1968 - 11/1970	-	4:1968 - 4:1970	-
11/1972 - 10/1973	end in 10/1972	4:1972 - 4 :1973	end in 3:1972

As explained earlier, the only variables that can be placed before the dummy are foreign interest rates, foreign or black market exchange rates (the official French exchange rate is fixed) variable of the central bank's balance sheet and domestic interest rates (except the discount rate that is directly controlled by the central bank). The other variables are ordered in a more usual way (CCE 1996, 1999): production, unemployment, money stock and prices. However, I will check the robustness with two alternative ordering: the opposite assumption that places the dummy variable last; and an other strategy that considers that prices and the money supply affects contemporeanously the policy variable while the reverse is not true. The second strategy is justified by the fact that some partial information about the price level and the money supply were investigated more closely at the time of the decision. Prices are also known to react with a lag to monetary policy shocks. These different assumptions actually do not modify the main results and interpretations (results available on demand).

In line with the conclusions of the narrative identification presented in the previous section, I construct a benchmark series reported in Table 1, with alternative specifications that will be tested when the dates are debatable.

6 Impact of monetary policy on the economy

6.1 A graphical view

It is first useful to have a look at the correlation between restrictive episodes and economic variables on simple graphs.
Figures 2, 3 and 4 show that the cyclical component of the money stock (M2), the industrial production index and the price level experience a drop during restrictive episodes. Our dummy variable is indeed associated with negative monetary shocks (that seems to have a rather similar magnitude)[79]. Most of the downturns of money, production and prices over the sample seem to correspond to monetary policy actions. Note however that the fluctuations in the price level are much larger in the first part of the sample.

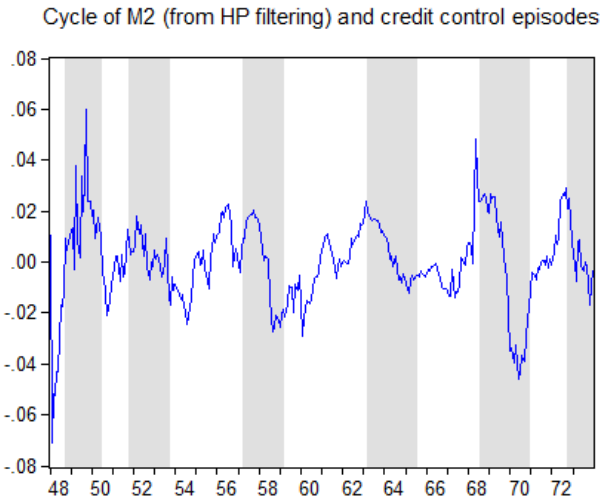

Figure 2: Cycle component of M2 and credit control episodes.

The pattern of interest rates (Figures 5 and 6) during monetary policy restrictive episodes is also very informative. According to the simple IS-LM model presented in the first section of this paper, interest rates must have a pretty stable pattern when the central bank uses quantitative controls. The discount rate (or

[79]The black vertical line within the 1957-1959 episode represents the February 1958 starting date when monetary policy became really restrictive.

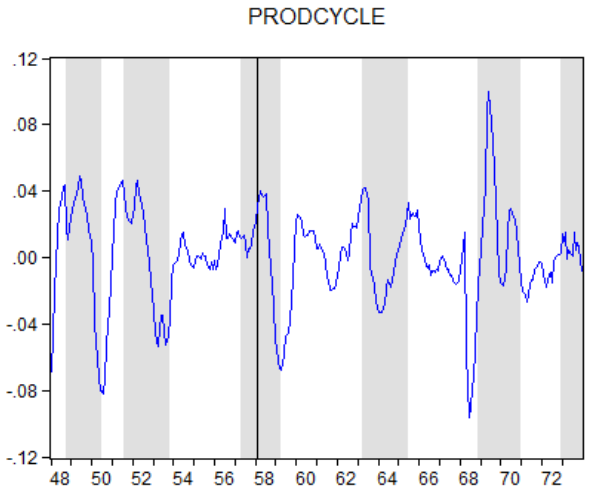

Figure 3: Cycle component of production and credit control episodes.

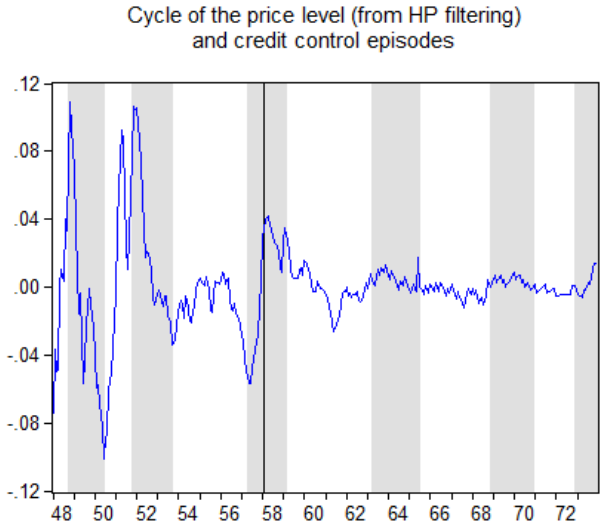

Figure 4: Cycle component of the price level and credit control episodes.

any interest rate on loans) should rise very little and the interest on bonds should be quite stable. Figure 5 shows that the rise in the Bank rate (discount rate) was very modest during restrictive episodes. The money market (interbank) rate experience sometimes a larger increase but only in the second half of the sample. These two rates, although broadly correlated with the dummy variable, do not show a systematic correlation with the use of quantitative controls. The base lending rate is widely disconnected from monetary policy. The 5 and 10 years interest rates on governments bonds are very stable over the sample. The short term (3 months) interest rate on government bonds is also very stable during restrictive episodes in the first part of the sample, thus confirming the relevance of the model in section 1. However, this rate rises during the 1963-1965 and the 1968-1970 episodes. However, rather than the effect of monetary policy, these two strong increases may reflect political problems that the government was facing. The progressive increase from 1963 to 1965 was influenced by the French official positions against the Gold Pool and the Bretton Woods system. The mid 1968 increase (before the start of monetary policy controls) is mainly due to the strikes and political turmoils in May 1968.

Figure 6 show that real short term rates were very low all over the sample and sometimes negative. It supports the argument of a very weak elasticity of credit and money to short term interest rates.

6.2 Econometric estimations

In this section, I introduce the dummy variable in a VAR (vector autoregressions) with monthly data in order to estimate the impact of monetary policy on main economic variables. The inversion of the moving average representation is required.

As pointed out by Leeper(1997), a standard VAR estimated with OLS does not respect the dichotomous nature of the dummy variable. If non-linearities are important in the determination of the dummy, the linear approximation may give misleading inferences. In the appendix C, we check the robustness of our results when taking into account non linearities, that is estimating the dummy variable equation in the VAR with a logit estimator[80]. As in Leeper (1997), the differences

[80] Combining a singular equation (here a logit) with a system of equations estimated with OLS

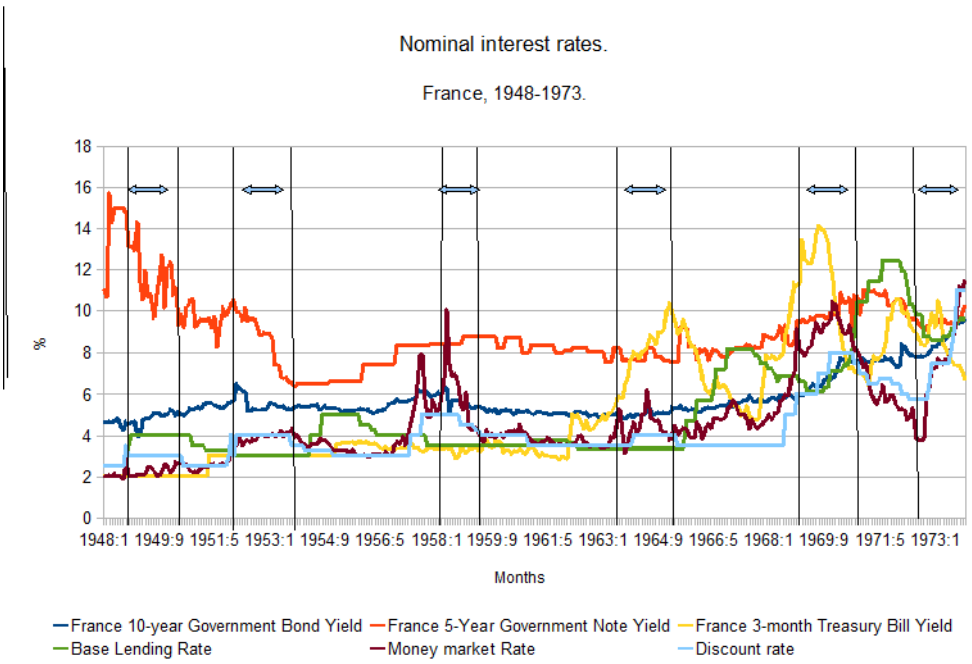

Figure 5:

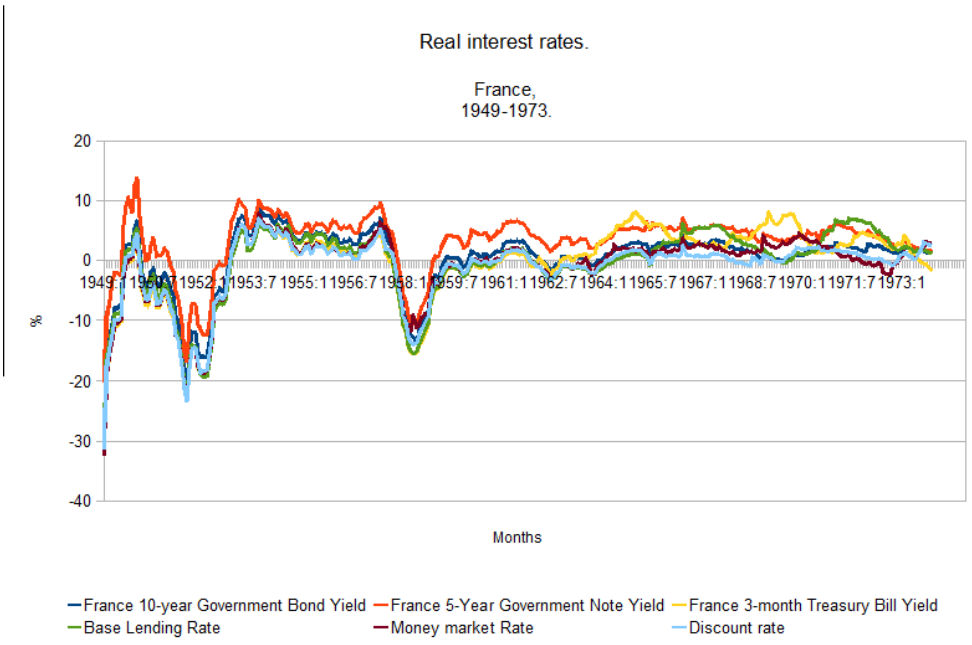

Figure 6:

in the results are not important enough to pursue the discussion on the potential non-linearities of the monetary policy reaction function.

I use monthly variables to obtain more degrees of freedom and to ensure accuracy about the Cholesky decomposition (recursive identification is better justified with high frequency data...). Data are described in the appendix A. The benchmark specification includes 36 lags. Romer and Romer (1989, 2004) argued that this is necessary to use such lags to take into account fully the effects of US monetary policy. The AIC and BIC information criteria in our estimations in the French case also confirm that 36 months are the most reasonable lags. Results are robust when using 12 or 24 lags. However, the estimation with 12 lags is less precise and displays wider standard error bands. The VAR is estimated in level, following the common practice. Variables are in logs (except the unemployment rate and the various interest rates). Robustness checks show that the estimation in difference provide similar results. As in Romer and Romer (2004, 2009) and Ramey and Shapiro (1998), my basic specification includes only two variables. The rationale is that all the other shocks affecting output are not systematic, are not correlated with monetary shocks and will thus be taken into account in the output lags. One important argument supporting this assumption is that there were not important oil or commodity prices shocks during the period. Thus criticisms of the narrative approach because of simultaneity with oil shocks, like in Hoover and Perez (1994) are not relevant here. [81] However, a 2 variables VAR assumes a very narrow monetary policy reaction function. With sufficient degrees of freedom, the main results are not affected with a 3,4, 5 or 6 variables in the VAR (see below). [82]

The standard errors are computed with Monte Carlo simulations using 1000 repetitions. I display one standard error band.

The dummy variable is denoted 'Control' on the graphs of the impulse response functions. The responses read as follows : after 20 months, the percentage change of industrial production (Figure 7) is 5% lower than what it would have been without a monetary shock, the price level (Figure 8) is 4% lower and the unemployment

is often called a quasi-var.

[81] Most important would be the problems of the potential effects of wars in Indochina (1946 -1954) and Algeria (1954-1962). But, together, these wars lasted over 16 years, more than the half of the period, and thus are not temporary shocks.

[82] Since the general results are robust, I can keep using the 2 variables specification in order to save degrees of freedom when working with sub periods or with quarterly data.

rate (Figure 9) is 2% percentage point higher than what it would have been without the shock. The response of the dummy variable to a monetary shock is normalized such that the dummy takes the value 1 when monetary policy becomes restrictive (as shown on Figures 7 and 8); the effect of the shock then vanishes gradually.

A 4 variables VAR including money and the price level is then estimated (Figure 10). The response of M2 to a shock on the monetary policy variable confirms that the identification is right and that a shock on the dummy variable is indeed a monetary shock. As with a 2 variables VAR, the effect on the price level is significant. It is more precise when money is included in the VAR[83] and there is no price puzzle. The absence of price puzzle highlights the fact that when sufficient information is included in the VAR and when the measure of monetary policy is accurate, the response of prices to a monetary policy shock has no reason to be at odds with economic theory. This finding is in sharp contrast to the results of VAR that use the Romer dates and find a very strong price puzzle (Leeper 1997).

The IRFs display three features that are particularly striking :

- industrial production starts to fall almost immediately, as soon as the second month after the shock. This is a sharp contrast with many studies that often find a 3-8 months delay. The effect on unemployment is much more delayed : around 10 months. Labor market institutions in France over the period (indexed wages, powerful unions) and the general low level of unemployment may furnish good explanations to the lagged response of the unemployment. The response of the price level is not delayed: it falls below zero after 3 months.

- both for industrial production and unemployment, the marginal impact is maximum after 20-25 months and vanishes around 36 months. Surprisingly this pattern is very similar to the one observed for the US by Romer and Romer (1989, 2004), despite the strong differences between the instruments of monetary policy between US and France, and despite the 'Great Moderation' is not included in the sample. As stated by Cochrane (2004), this result is important for monetary theory since current models are not able to explain

[83]Leeper and Rousch(2003) argue for the introduction of the money supply in models and VARs for similar reasons.

Figure 7: Impact of a monetary shock on industrial production. VAR with 2 variables.

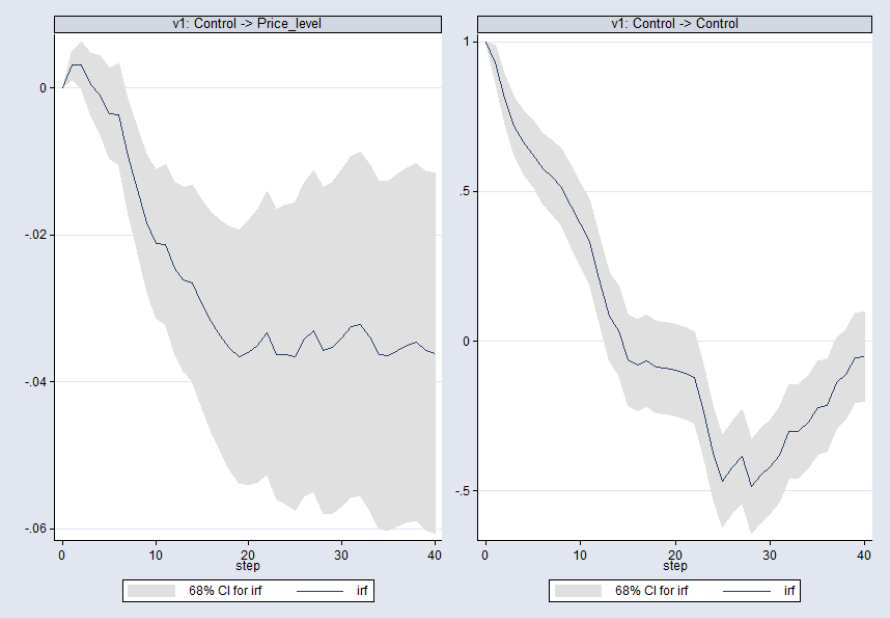

Figure 8: Impact of a monetary shock on the price level. VAR with 2 variables.

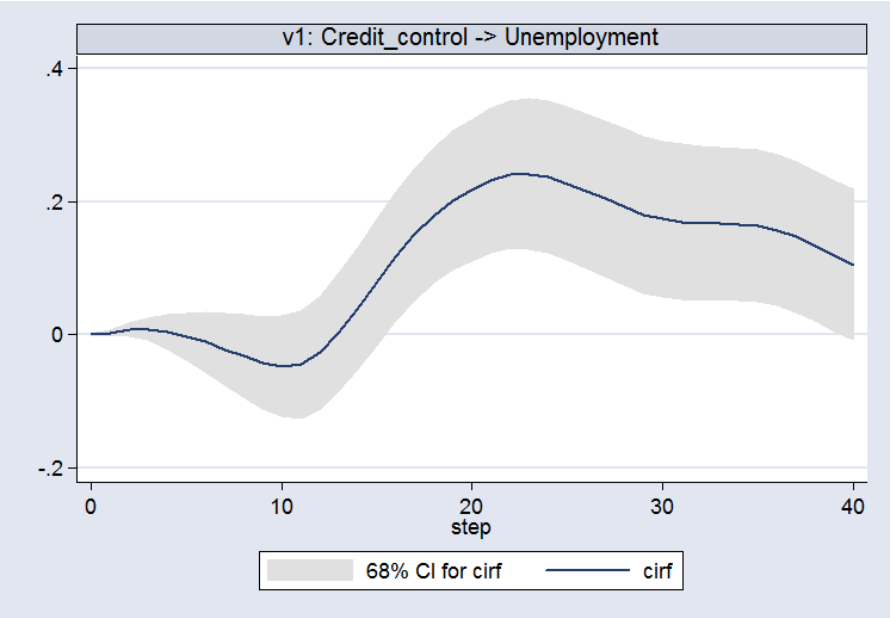

Figure 9: Impact of a monetary shock on unemployment. VAR with 2 variables.

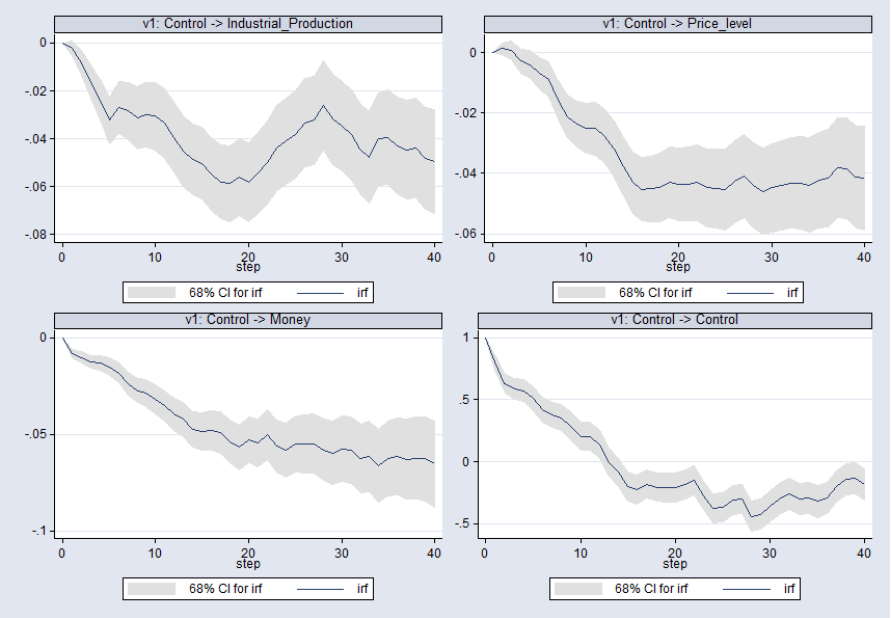

Figure 10: Impact of a monetary policy shock restriction. Var with 4 variables. Money. Price level. Production

these very long lasting effects. Indeed, models of monetary policy including rigidities (mainly sticky prices) can explain lags in the response of output to a shock but explain very badly the persistence of the impact.

- these effects are strong. According to the variance decomposition displayed in Figure 11 (with a 4 variables VAR including money, the price level, the dummy and production), a monetary policy shock explains around 10% of the variance of production and the price level and 20% of M2 after one year. After three years, monetary policy explains around 40% of the variance of production and price and 50% of the variance of M2 (the remaing is explained by shocks endogenous to the economy). Interestingly, around 2/3 only of the variance of the dummy variable is explained by monetary policy shock after 2 years. It confirms the need for considering the dummy as endogenous in the VAR.

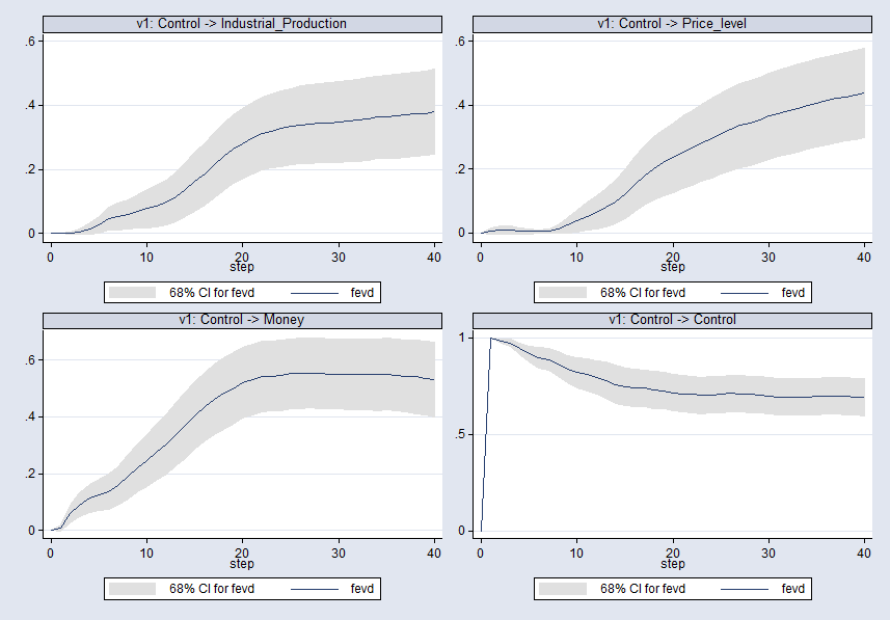

Figure 11: Variance decomposition. Var with 4 variables. Money. Price level. Production

Did monetary policy shocks have an effect on interest rates ? Figure 10 shows that the effect on the money market (interbank) rate is non clear and poorly significant. The same result is obtained on the discount (Bank) rate. On the other

hand, the response of the short term government bonds is significant and positive but not immediate : it reaches its maximum only after 10 months. According to the model in section 1, this result shows that the LM curve was actually shifted upward which had an effect on the short term bond rate. However, this effect is not immediate and is rather a medium term effect. On the contrary, credit controls were not significantly associated with a rise in the price of credit.

Figure 12: Impact of a monetary policy shock on bond and money market rates

The responses of interest rates to a monetary policy shock show a very strong 'liquidity puzzle' (Gordon and Leeper 1992). When restrictive quantitative controls are implemented, there is not necessarily an increase in the price of credit or money. This liquidity puzzle is obviously due to the peculiarity of French postwar monetary policy. What is remarkable is that even though monetary policy does not affect interest rates, the responses of production, money, the price level and unemployment are similar to other studies in which the liquidity puzzle is absent or at least not so strong.

The measure constructed in this paper can be used to investigate the effects of French postwar monetary policy on many other variables as long as data are available. It can be used with quarterly data also. There is no room here to display all results and this task is left to a companion paper. I can only state briefly some

results (codes, estimations outputs and graphs are available on demand). The previous conclusions are robust to the introduction of the exchange rate (official or black market) and of foreign reserves in the VAR. As expected under a fixed exchange rate regime, there is no significative effect of monetary policy on exchange rate but on foreign reserves only. 10 months after a monetary shock, the amount of reserves detained by the central bank increase by 10%. Introducing a wholesale price index (in place of commodity prices) in the VAR does not alter the response of the CPI. The response of the wholesale price index to a monetary shock is of similar magnitude to the response of the CPI (- 5%). Using quarterly data, I estimate the effect of monetary policy on credit (both short term and medium term), on consumption and on investment. All these variables respond significantly and negatively to a monetary shock. After two years, the drop is around 5% for all of them. When I divide the sample in two parts (before and after 1958), a general result is that the impact of monetary policy is stronger in the first period. The pattern of the impulse response functions is however similar accross samples.
In section 5, I have discussed how the dummy may take several values for some restrictive episodes (cf Table 1), because of some uncertainty in interpreting the behavior and objectives of the central bank. The main results and interpretations are not affected by changing slightly the ending date of the 1st and last episodes (cf Table 1). But the modification in the start date of the 3rd episode (July 1957 rather than February 1958) changes the results of the estimation. Such a change is expected since monetary policy in the second semester 1957 was known at that time to have been not effective enough (this is why new measures were implemented in early 1958 under pressure of the IMF). The estimations results are displayed in Figure 13.

The price level responds with a lag of about 9 months[84]. Production and money respond immediately but the magnitude of their response is lower 10 months after the shock in comparison to the benchmark case of Figure 10. With the 'July 1957' measure, the impact on production is around 2% after 10 months while it is between 3 and 4% with the 'February 1958' measure. Interestingly, after 20 months, the magnitude of the impact on price level, production and money is very similar whatever measure is used. I interpret these findings as an evidence that the narrative approach managed to capture accurately the stance of monetary

[84]I have checked that this lag is still observed when including wholesale prices in the VAR.

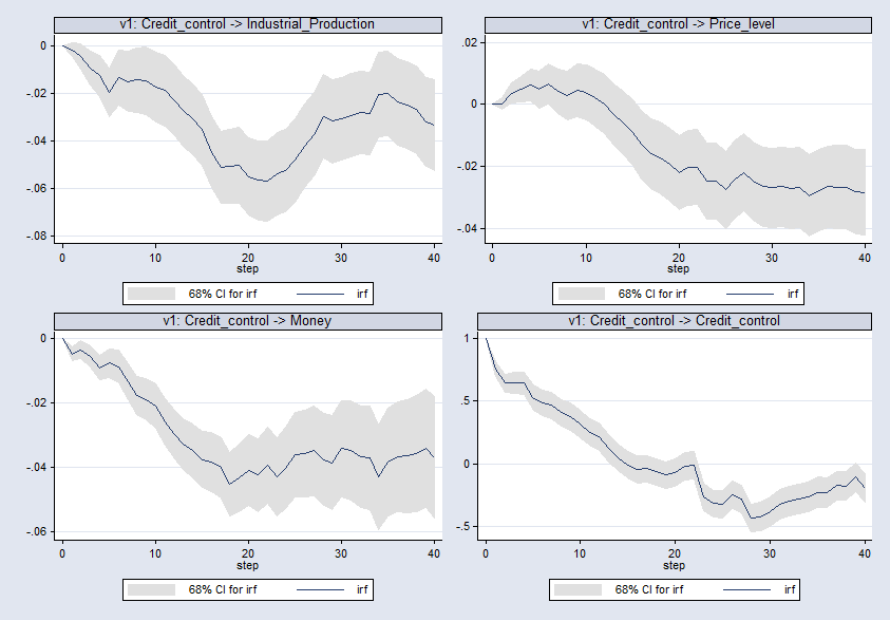

Figure 13: Impact of a monetary policy shock, using the 'July 1957' measure.

policy. The difference between the decision and measures taken in July 1957 and in February 1958 is reflected in the estimation outcomes in a consistent way. The results are indeed sensitive to the definition of the dummy variable.

6.3 Comparisons with other measures of monetary policy

In order to assess further the relevance and the contribution of the narrative approach, I compare these results with usual measures of monetary policy that are used in other contexts. Without specific knowledge of French monetary policy over the period, one would presumably estimates a VAR with the following measures of monetary policy : either the French discount rate (or the money market rate), or the Fed discount rate. The rationale for the Fed rate would be to find an exogenous measure of monetary policy. The Fed rate is an obvious candidate in the Bretton Woods system. [85] All the interest rates are ordered last in the VAR, but the main conclusions are again not sensitive to the ordering. The results of a 4 variables VAR, presented in *Figures 13 and 14* clearly show that these measures

[85] For this reason, Mojon (1998) used the German rate in his study on French monetary policy during the 80's, under the fixed exchange rate regime of the European union.

suffer from identification problems : industrial production responds positively to a rise of the French bank rate and negatively to an increase of the money supply. Rightly, the VAR with the Fed discount rate does not experience such a problem (Figure 16): industrial production responds in the normal way. Nevertheless, the overall effect is less important, the impact on unemployment is not significant and there is a strange pattern of industrial production after 10 months. Undoubtedly, the 'narrative' measure of monetary policy is leading to better estimations and is the only one to produce findings that are consistent with the VAR literature that have tried to address efficiently the identification problem.

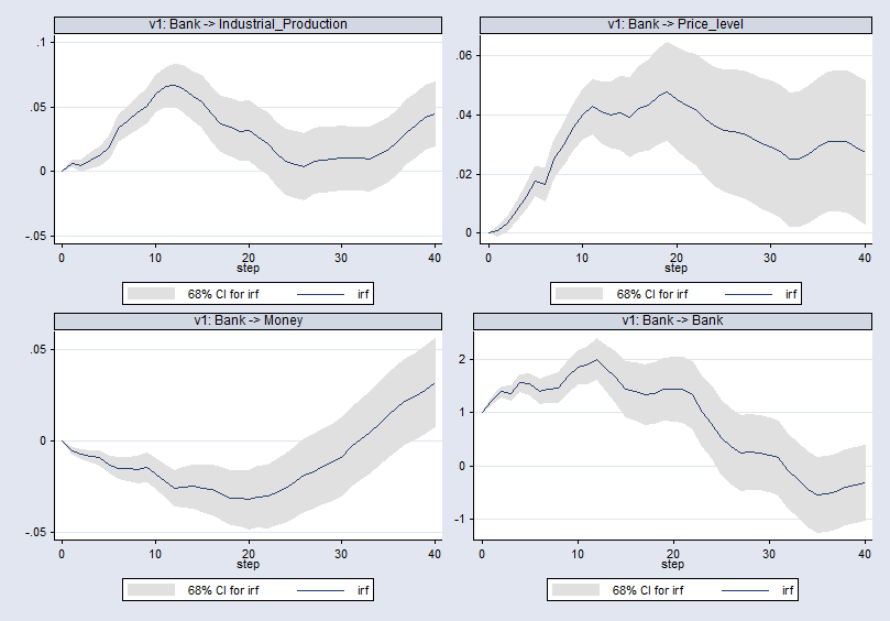

Figure 14: Impact of a rise in the French discount rate. VAR with 4 variables.

We also test for the possibility of real interest rates to be a measure of monetary policy (Figure 17). It is not likely to be the case since the distinction between nominal and real interest rates was not an important feature of the vocabulary of the Banque de France. The VAR is estimated with industrial production, M2 and the real interbank (money market) rate. The results do not support the conclusion that the real bank rate was a measure of monetary policy. The response of the money supply prevents from interpreting an innovation on the real rate as a monetary shock. Moreover the magnitude of the impact is excessively small: less

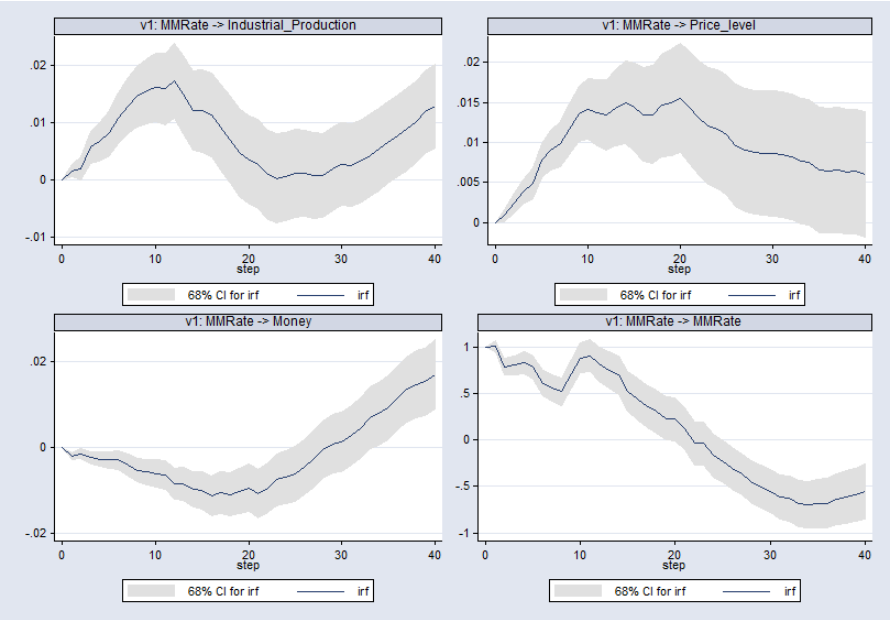

Figure 15: Impact of a rise in the French money market rate. VAR with 4 variables.

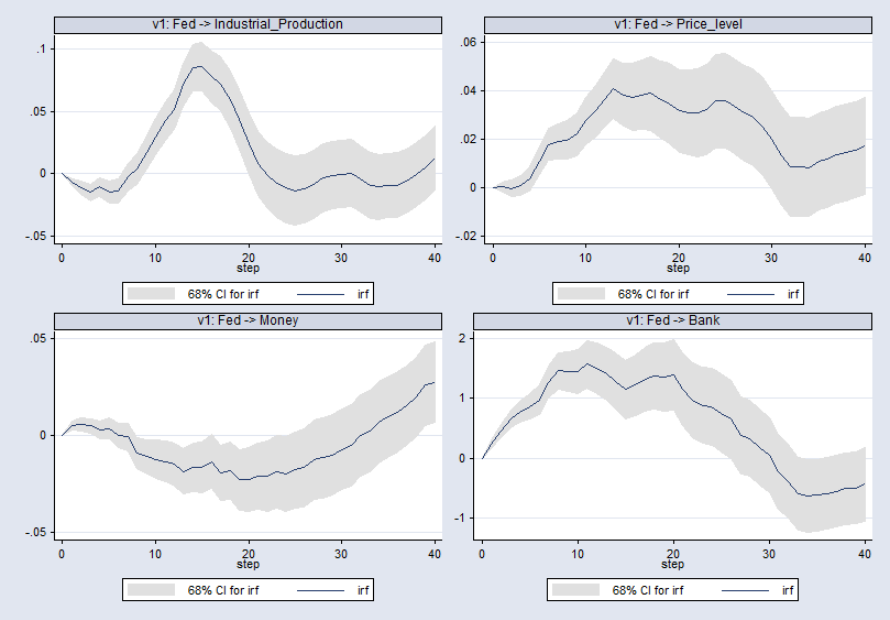

Figure 16: Impact of a rise in the Fed rates. VAR with 4 variables.

than one percent of change in production and money after 20 months. Similar results are obtained with the real discount rate.

Figure 17: Impact of a rise in the real intrebank rate. VAR with 4 variables.

6.4 The duration of restrictive episodes and the 'timing problem'

In the previous sections I have assumed that taking into account the duration of the monetary restrictions in the dummy variable was necessary. But one might argue that only the change from a normal regime to a regime of quantitative control is important in terms of monetary policy stance. Thus I construct a new dummy variable that takes the value 1 only in the first month of the monetary restriction. Then this measure turns out to be similar in kind to the one used by Romer and Romer (1989, 1994). *Figure 18* shows that industrial production and the price level respond to monetary shocks with a much longer delay than in previous estimations (respectively 12 and 20 months). This lag is comparable to the one found by Romer and Romer (1989, 1994) and Leeper(1997) using the Romer dates. Interestingly, the other features of the IRFs of production and money (magnitude, maximum at 25 months) are unchanged. These comparisons

lead to an important conclusion : accounting for the duration of the restrictive monetary policy reduces considerably the lag of the response of output and prices to a monetary shock. We interpret this result in two ways. First, taking only the change from an accommodating policy to a restrictive policy does not rightly take into account the behavior of firms and households. For instance the behavior of firms and households at time t is not only influenced by a change in monetary policy that happened several months before but is also explained by the ongoing restrictions and credit and by the fact that, if the change of monetary policy had been credible, they expect the restriction to last for some months (years). They have no incentive to delay their response and they react immediately. Second, taking into account the duration of the monetary restriction causes that the shock in a VAR does not arise in isolation : if the shock arises on the 12th month of a monetary restriction, its effect is immediate since the preceding months are likely to have been months of credit control.

These findings, and the argumentation about the duration of the shock, may explain the 'timing problem' highlighted by Ramey (2011), that is why one finds such a difference of lags between narrative measures of policy shocks (dummy variable) and other measures. While in the case of fiscal shocks measured by military dates the 'timing problem' may be due to the delay in the implementation of the (and then expectations), this paper has shown that in the case of monetary policy it is crucial to take account for the duration of the monetary restriction.

7 Conclusion

Many studies of US monetary policy use both narrative measures (the Romer dates or the Boschen and Mills index) or single variables (interest rate or nonborrowed reserves) to investigate its impact on the economy. Eichenbaum and Evans (1995) used both to investigate the impact of monetary policy on exchange rates, Boschen and Mills (1995) compared their respective effects on money and interest rates, Christiano, Eichenbaum and Evans (1996, 1999) studied their impact on output and nominal variables, Carlino and De Fina (1998) looked for differences in the responses of regional variables, Kashyap, Stein and Wilcox (1993) and Gertler and Gilchrist (1994) also used both Romer dates and interest rates to study the

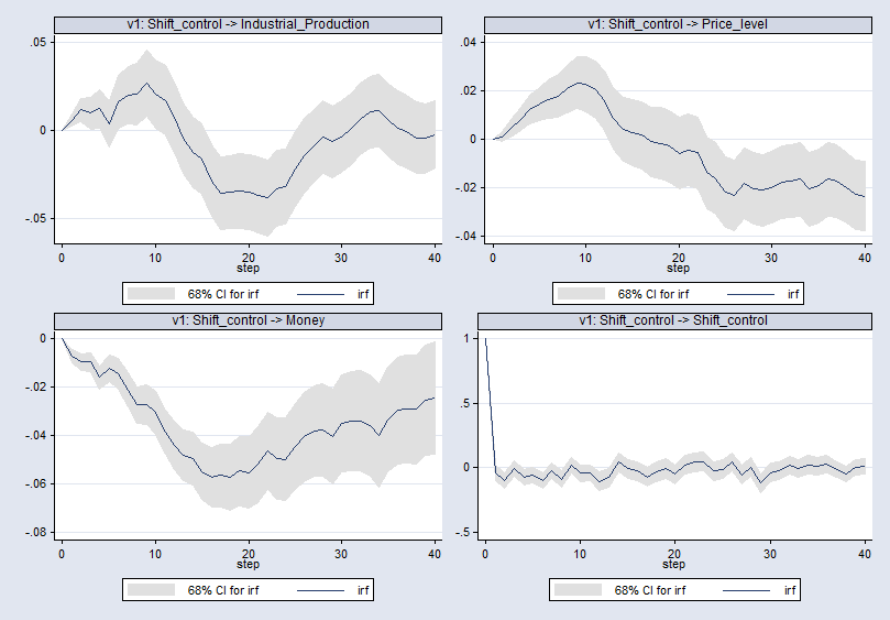

Figure 18: Impact of a one-month restriction.VAR with 4 variables.

bank lending and credit channel. In all these studies, the two types of measure provide very similar conclusions and share common identification problems, a point already highlighted by Leeper (1997). This similarity in the results is not likely to exist when monetary policy used many instruments. Historically, central banks have often used quantitative controls or other kind of unconventional policy that cannot be measured by a single series. Such measures are still used nowadays by many central banks, prominently in developing countries. But surprisingly, the narrative approach has not been used to investigate such kind of policy.

This paper have studied the French experience with temporary quantitative controls from 1948 to 1973. I have shown why the narrative approach is the only way to measure appropriately such a policy. Using various records at the central bank, I have constructed a dummy variable that takes the value one when the central bank decided to run a restrictive monetary policy through different means. The measure is treated endogenously in a VAR but narrative evidence provide justification for a structural identification of monetary shocks.

The results show that French quantitative monetary policy had a significant effect on the economy and that the impulse response functions are very similar to the ones derived in other studies using different measures, countries and periods. As

long as monetary policy is accurately measured and that there is a sufficient information set in the VAR, there is no price puzzle. On the contrary, using interest rates (discount rate or money market rate) as a measure of French monetary policy does not provide any consistent result.

This paper thus provides a revisionist view of European monetary policy in the postwar period before the Great Inflation. The fact that the effectiveness of monetary policy during this period has been widely neglected or dismissed may be explained by the inability to present an appropriate understanding and measure of central banks' behavior and choices. The rehabilitation of French postwar monetary policy before the 1973 oil shock raises two questions that must be addressed in further work. First, one may wonder to what extent these results shed light on the functioning of the Bretton Woods system. The account of French monetary policy in the 50s and 60s could suggest that Western European domestic policies were crucial for the stabilization of output and prices over the period. Could it then explain why the Bretton Woods system actually managed to function despite its intrinsic instability (Triffin dilemma) ? Second, these findings tend to reformulate the responsibility of monetary policy in the Great Inflation: did the quantitative instruments become less effective in the 70s or did the Banque de France change its objectives (giving more priority to unemployment rather than to inflation and the balance of payments stability) ?

The analysis developed in this paper could also be easily extended to other countries that have used quantitative instruments in the past or still use it today. It may shed a new light on the performance of some monetary policy regimes.

Finally, the fact that monetary policy without interest rates have been effective for short term stabilization of the price level in a specific context and period, may also raise interesting issues for macroeconomic modeling. The response of economic variables to monetary policy shocks in the French experience of quantitative controls show patterns very similar to the traditional VAR results that are replicated in most DSGE models with sticky prices or credit frictions. What we learn from the French postwar case is that these stylized impulse response functions can be obtained without any 'liquidity effect'. A decrease in quantities is not necessarily equivalent to an increase in prices.

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Appendices

A Sources and data

Archival sources at the Banque de France

- Minutes of the General council of the Banque: *PVCG du Conseil Général.*
- Quarterly reports of the National Credit Council :*Rapports du Conseil National du Crédit*

- Archives of the National Credit Council (minutes, speeches, preparatory notes and documents): *Fonds du Conseil National du Crédit*, n°1427200301.
- Archives of the Direction of Credit (notes and documents): *Fonds de la Direction Générale du Crédit, sous Fonds Cabinet*, n°1331200301.
- Archives of the Direction of Economics and monetary studies. *Fonds de la Direction Générale des Etudes, Direction des analyses et statistiques monétaires*, n°1417200405.

Data

- Monthly price level and industrial production are from *Rapports du Conseil National du Crédit*. 'Real time' data, computed by INSEE (National Institute of Economic and Statistics studies). The price level is the consumer price index from 1950 to 1973. For 1947-1949, I use the wholesale price index since the CPI is not available. The Industrial production index does not include the construction sector. Data from the construction sector were only data about employment. INSEE also computed an production index with the construction sector, available from Pierre Villa's website, published in Villa Pierre, 1993, *Une analyse macro-économique de la France au XXème siècle*, Paris, CNRS. *http://www.cepii.fr/francgraph/bdd/villa/mode.htm.*
- Money (monthly M2) is from Jean-Pierre Patat and Michel Lutfalla (1986), *Histoire Monétaire de la France au XXe siècle*, Paris, Economica.
- The monthly unemployment rate is from Pierre Villa's website: *http://www.cepii.fr/francgraph/bdd/villa/mode.htm*, published in *Séries macro-économiques historiques*, INSEE Méthodes, N°62-63, Paris, 1997.
- The discount rate and the money market rate are from *Rapports du Conseil National du Crédit*. The interest rates on government bonds are from Global Financial Data (*http://www.globalfinancialdata.com/*). All of them are monthly.
- Weekly data on the Banque de France's balance sheet (reserves, discount volumes etc.) are from the database ANNHIS computed by Patrice Baubeau *http://www.banque-france.fr/fr/instit/histoire/annhis/html/idx-annhis-fr.htm.*

- Monthly exchange rates data are from Carmen M. Reinhart and Kenneth S. Rogoff, 2004. 'The Modern History of Exchange Rate Arrangements: A Reinterpretation,' The Quarterly Journal of Economics, MIT Press, vol. 119(1), pages 1-48, February. Their data on the black market are from the *Picks Black Market Yearbook.*

- Quarterly data on credit are from *Rapports du Conseil National du Crédit.*

B Credit controls in the Bernanke-Blinder model

This section shows how the Bernanke-Blinder (1988) model can feature two characteristics of credit controls: the interest on loans may not be the market clearing rate and credit controls may increase liquidity and lead to a monetary expansion. These issues were not discussed in the original model whose main focus was the transmission channel of monetary policy. As the discussion below will make clear, accounting for the many possible effects of direct credit controls needs to distinguish between numerous assets and liabilities: loans, short-term bonds, long-term bonds, time deposits, demand deposits, reserves. Because of the high number of assets in the model (and so, the high number of interest rates) and since we need to account for possibly non-clearing market, it would be extremely difficult to build a full DSGE model with all these characteristics. I thus rely on the simple static Bernanke-Blinder model, which obviously comes at a cost: we are only able to identify short-term effects of monetary policy and the substitution effects between assets is not microfounded in a portfolio model. Providing a complete dynamic model including several assets and credit policy is certainly a great issue for further research. Recent work has already provided some first steps: Andres, Lopez-Salido and Nelson (2004) provided a DSGE model that distinguished between short and long term interest rates; Curdia and Woodford (2011) introduced a credit spread between the interest rate faced by savers and the interest rate faced by borrowers. ρ is the interest rate on loans and r is the interest on bonds. The loan demand is $L^D = L(\rho, r, Y)$. It depends negatively on the interest rate on loans but positively on the interest rate on bond (due to a substitution effect) and on the total wealth of the economy (y). Bernanke and Blinder consider a simplified bank balance sheet in order to explain the loan supply. On the asset side, there are reserves (BR),

bonds (B) and loans (L). On the liability side, there are only deposits (D). Reserves consist of required reserves (τD) plus excess reserves (E). The bank balance sheet is thus represented by the equality: $B + L^S + E = D(1-\tau)$. The portfolio proportion of loans depends on the rates of return of the available assets (zero for excess reserves). The loan supply is thus $L^S = \lambda(\rho, r)D(1-\tau)$. It depends positively on ρ and negatively on r. And there is clearing on the loan market if $L(\rho, r, Y) = \lambda(\rho, r)D(1-\tau)$.

Bernanke and Blinder show that the LM curve is defined as

$$D(r, Y) = m(r).BR$$

where m is the money multiplier depending positively on r and negatively on τ. This relationship is found considering that banks hold excess reserves equal to $\epsilon(r)D(1-\tau)$; the supply of deposits is then equal to bank reserves, BR, times the money multiplier, $m(r) = [\epsilon(r)(1-\tau) + \tau]^{-1}$. As in a traditional LM curve, the demand for money (here as a demand for deposits), depends positively on Y and negatively on the interest rate r. The IS (or CC for "commodities and credit") curve is simply a negative relationship between Y and both interest rates.
Let's focus on what happens to the loan supply when the central bank imposes credit controls. The controls are simply modeled as a negative shock on λ : the value of banks'loans is a lower proportion of their liabilities. If r increases then the demand for loans decreases. But if r is lower than its market clearing level, then there is an excess demand for loans. This excess demand can be fulfilled in two ways. The first possibility is that the banks buy more bonds to finance firms. It is only possible if bonds and loans are substitutes (but still imperfect substitutes, otherwise the CC curve reduces entirely to a IS curve). This will decrease the price of bonds and expand the money supply if money and bonds are close substitutes. The second possibility to fulfill excess demand is that D increases. An increase in D will automatically lead to an increase of the money supply. If credit controls take the form of discount ceilings, then the increase in D is a simple way to circumvent the reduction of financing of the banks by the central bank. The banks that must borrow less at the central bank can simply increase their resources through deposits. This case is the worst for credit controls: the total amount of loans does not decrease and there is an increase in the money supply. If credit controls take the form of limits on credit expansion, then the

loan supply is definitely fixed. But, following Tobin (1970) and Davies (1971)'s argument, the distinction can be made on the liabilities side between time deposits and demand deposits, assuming that loans are financed by time deposits (TD) but that money is only compounded of demand deposits (DD). The balance sheet is then $B+L^S+E = (TD+DD)(1-\tau)$ and the loan supply: $L^S = \lambda(\rho, R)TD(1-\tau)$. If the loan supply is entirely rationed, and whatever happens to the excess loan demand (either converted or not in bonds financing), then credit controls can lead to a decrease in TD and an increase in DD, hence a increase in the money supply. To counteract these many possible substitution effects, the central bank can act on the reserve requirement ratio : τ. Then, because of a decrease in the money multiplier m, an increase in deposits will not lead to an extension of the money supply. Another possibility is to influence directly the substitution between bonds and money. If the central bank forces the banks to detain long-term bonds rather than short-term bonds, which are close substitutes to money, the LM curve is not affected by bonds transactions. This can be done simply in the Bernanke-Blinder model if we distinguish within the banks balance sheet between long and short term bonds, assuming that only the interest rate on the latter enters the LM curve[86]. The instrument that force the banks to maintain a high proportion of illiquid assets (such as long term treasury bonds) is commonly called 'liquidity ratio'.

C Accounting for non linearities

All along the paper, I estimate a fully linear system that treat the dummy variable and other variables symmetrically. This is done in most of the papers that use policy dummy variable as endogenous in the VAR; see Gertler and Gilchrist 1994, Carlino and De Fina 1998, Ramey 2011. However, it could be a strong assumption. Following Leeper(1997) it is thus necessary to check the robustness and compute a Quasi-VAR that estimate the equation with the dummy variable with a logit estimator and then combine it with the other equations estimated with OLS.
Compared with the fully linear system, Leeper (1997) do not obtain important differences. I also find that the two estimations lead to similar results. The esti-

[86]This assumption means that only the interest rate on short term bonds influences the demand of banks for excess reserves.

mation output below shows that the pattern of the impulse response functions is very similar. When the shock are normalized such that the dummy variable jumps to the value 1 following a monetary shock, the magnitude of the effects is very similar. Note also that, as stated by Leeper (p.655) "because of the non-linearities, it is not obvious what sort of conditioning set yields 'typical' responses to the monetary policy dummy". Given the robustness of the results, it is thus a better option to keep the fully linear system that allows a better interpretation of the results and comparisons with other studies.

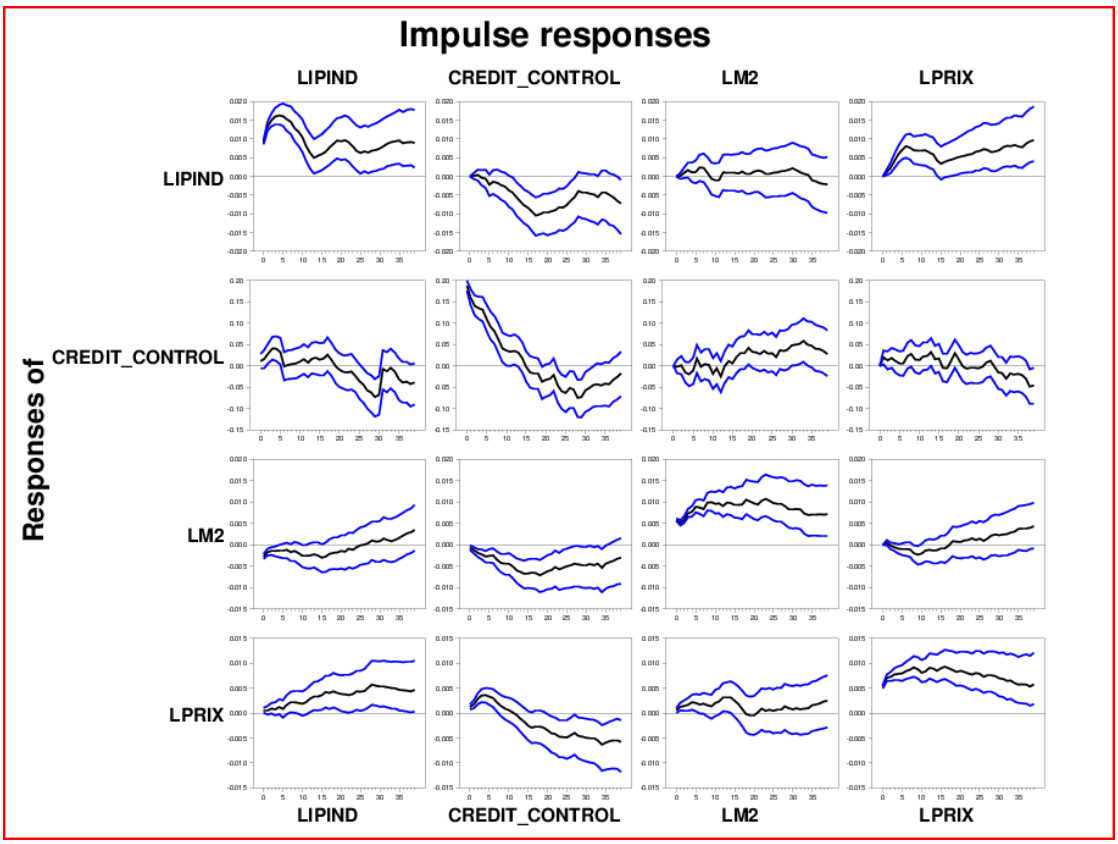

Figure 19: IRFs with a Quasi VAR with probit estimation