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Do we really know how to manage monetary policy? One Century with the Federal Reserve and its good policies... or good luck?

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DO WE REALLY KNOW HOW TO MANAGE MONETARY POLICY? ONE CENTURY WITH THE FEDERAL RESERVE AND ITS GOOD POLICIES...OR GOOD LUCK?

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Abstract

This paper aims, firstly, to contribute to the “good luck, good policy” debate by, secondly, analysing the relationship between the instruments of monetary policy used by the Federal Reserve, and its final and intermediate targets, for the interwar period and the period between 1958-2007. For that task, I estimate a structural Bayesian TVC-VAR. A new variable measuring the spread between the short-term rate of reference and the discount rate, along with the use of the correct instruments of monetary policy, sheds a clearer light on the debate already mentioned. It is found that the Federal Reserve mismanaged monetary policy during the interwar period, and from the end of the 1960s to the mid-1980s. Since then, the good luck hypothesis points out to the likely change of behaviour of private agents. For the beginning of the 1960s, there are doubts as to whether the good luck or good policies hypothesis applies. Last, it seems that there is not “price puzzle” but a real positive relationship between the federal funds rate and inflation for most of the period under analysis, due to the implementation of bad policies.

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1. Introduction

Monetary policy is considered nowadays one of the main factors influencing the performance of the economy. Nonetheless, it is still a relatively young field which needs more analysis and comprehension. The Great Recession and inherently, the inability to avoid it, supposed or should have supposed an inflection point. It showed that monetary policy, as a tool to achieve the goals established by central banks, was not properly managed and therefore, not properly understood. The history of central banks is not longer enough as one would like, in order to apprehend monetary policy. Yet, the last century is full of periods of success and failures from which it is possible to learn some lessons. This paper looks back to the first years of the Federal Reserve to analyse and discover how this institution and its members have reacted to political and economic events, how those actions have influenced the performance of the American economy, and how monetary policy has evolved until the previous years of the Great Recession. With this analysis I intend to clarify whether the Fed was responsible for those successes and failures, and learn how the Federal Reserve used its monetary policy instruments, in order to apprehend how those instruments interact with inflation, output and money supply.

Reasonable and necessary as this analysis may seems, the literature has focused only on certain periods of interest, studying them separately and using as instruments of the Federal Reserve the wrong variables by definition. Whereas federal funds rate or other measures of reserves have been used as instruments of the Fed, when actually they are intermediate targets, the real ones are open market operations, discount rate\(^2\) and reserve requirements ratio. Therefore, I believe it necessary to look at the whole picture, ergo, the entire last century, in order to compare and analyse among periods and policies, using the real instruments. Despite the possible thought of simplicity about the question addressed here, such is its complexity that there is a vast literature unable of disentangling, or at least to reach a consensus, as to whether the observed behaviour of output, inflation or even unemployment, is the result of monetary

\(^2\) Interest rate charged to commercial and other depository institutions for the money borrowed from the Federal Reserve at the discount window.
policy actions or external factors. This debate is known as “good luck or good policies”.

However, this debate has not always been explicit and some have addressed it indirectly, as it is the case of those who have studied the interwar period. They have mostly focused on the years of the Great Depression and around, being the narrative the style most commonly used to analyse the behaviour of the Federal Reserve, and determine its responsibility on the performance of the American economy. Without alluding to this “good luck or good policy” debate, Miron (1988) mentions that the policies of the Fed might have created more volatility in inflation and output during the 1920s and part of 1930s, while Bordo (1933, pp. 16) claims that “the gold standard and interwar period emerge as a relatively unstable period stressed by widely dispersed supply shocks”.

For those paying attention to whom was the responsible of the Great Depression, the debate has been focused on as to whether the death of Governor Strong supposed a change in policies implementation. For example, Friedman and Schwartz (1963), Bordo and Schwartz (1997), and Hetzel (1985) considered the years of Strong as governor of the New York Fed, as a period of mostly successful monetary policy, but once he died, those who were contrary to his ideas were in charge of monetary policy, what could have created or worsened the Great Depression. On the other hand, Wicker (1965), Wheelock (1989, 1990) and Brunner and Meltzer (1968) argue that had Strong lived during those years, the outcome would have been the same, as the policies were already ineptly administrated while Strong was alive. Some oblique literature concludes that although there was a slight change in policies during the 1920s, it is not enough to explain the Great Depression and there are some other factors behind (Hamilton, 1987). In this line, Ritschl and Woitek (2000) found that monetary policy before the stock market crash was not the cause of the recession. As much, it could have produced a mild recession, which is also in line with Temin (1973). For the period after 1933, Friedman and Schwartz (1963) and Orphanides (2004b) claim that despite the inactivity of the Fed during those years, the inflow of gold was the factor guiding the well functioning of the economy. Thus, although not explicitly,
the debate of “good luck or good policies” was already set up for the interwar period.

For the second part of the 20th century, basically since the Fed recovered its independence from the Treasury in 1951, the literature opens more explicitly that debate and approaches it rather methodologically. In order to support the “good luck or good policy” hypothesis some focus on the decrease of volatility in inflation and output since Volcker was chairman of the Federal Reserve. Thus, Clarida, Gali and Gertler (2000) using a GMM for a monetary policy reaction function, observe that there was a change of policy during the Volcker-Greenspan era. This change is assumed to be the one bringing stability to the economy, avoiding the indeterminacy equilibria happening before the Volcker era. With a similar model, Favero and Rovelli (2003) obtain also similar results. Gali and Gambetti (2009), using a time varying coefficients Bayesians structural vector autoregressive (TVC-BSVAR) and analysing the variations in non-technology and technology shocks, conclude that monetary policy could have been one of the factors explaining the decrease in volatility. Other works supporting or leaning in favor of the good policy hypothesis are those of Boivin and Giannone (2006), using a SVAR; Boivin, Lenza and Reichlin (2008), who using VAR models of different size and trusting more those with more variables included, argue that VARs supporting the good luck hypothesis, which contain fewer variables, are naïve models; Benati and Surico (2009) using a New Keynesian model via Bayesian methods, where they move from determinacy to indeterminacy states, are able to demonstrate that those works based on VARs and supporting the good luck hypothesis, may be misinterpreting good policy for good luck. With a VAR, Christiano, Eichenbaum and Evans (1998) found that the activism of the Federal Reserve declined in the late 1960s and it was neutral in the early 1970s. Then, the Fed became passive for the remainder of the 1970s, not increasing the federal funds rate enough to counteract inflation. In 1981, monetary policy became activist again until Greenspan’s term, when it decreased slightly but regained strength since 1993.

Orphanides (2004), comparing Taylor rules with real data and the data available for the Fed in every period, claim that bad policy played the relevant role
during the Great Inflation, as the Fed had the wrong understanding as to how the economy worked, predicting mistakenly larger output gaps and intervening the economy more than necessary, creating in that way instability. Once they focused on inflation rather than output gap, and the interventions were less and more accurate, the situation improved. Sims and Zha (2006) also using SVAR with regime switches and comparing it with Bayesians methods, although leaning more in favor of monetary policy changes, they conclude that the timing and permanency of this changes in monetary policy are not completely understood.

Contrary to this literature, Primicery (2005) using a TVC-BSVAR argue that despite a change in monetary policy is observed, it is not significantly different between the periods pre- and post-Volcker, and Canova and Gambetti (2009) with a similar method found that the policy was the same for both periods, showing that the Taylor principle was not satisfied in none of the periods, and that the transmission of monetary policy shocks to output and inflation has been stable over the periods analysed, but inflation persistence has changed over time. Cogley and Sargent (2005) applying also a similar model, observe changes in the stance of the Federal Reserve to inflation, but their conclusion are not decisive disentangling the good luck or good policy hypothesis. Using a semi-structural VAR, Hanson (2006) shows that a change in the policy is noticeable, but it seems more probable that shocks coming from variables such as output or prices have been important determining the performance of the economy.

There are also cases in the literature, in which both good luck and good policies hypothesis are accepted depending on the variable under analysis. Ahmed, Levin and Wilson (2004), with frequency-domain and VAR methods, show that the decrease in output volatility is probably due to good luck, whereas the same does not apply for inflation, where better policies seem to have determined the decrease in volatility. Stock and Watson (2002), analysing time-varying standard deviations and VARs with break tests, attribute the reduction of volatility to the decrease in the shocks, but also giving a 10%-25% of importance to improved monetary policy. Moreno (2004) develops a rational expectations model and shows that CPI inflation volatility declined in the 1980s and 1990s because of the propagation
mechanism, but looking at GDP volatility, the decline is explained by smaller shocks.

This paper uses the same model as in Primiceri (2005) i.e., a TVC-BSVAR with the corrigendum of Del Negro and Primicery (2013). Given the problems of the multi-move algorithm of this model, I also use the single-move algorithm used in Koop and Potter (2011). The main innovation in this paper, apart from including the real instruments of the Fed, is the inclusion of a variable measuring the difference between the short-term rate of reference for the period under analysis and the discount rate. The reason of the creation of this variable is that for those periods in which this spread was positive, banks had the possibility of taking advantage of the profitable opportunities provided by borrowing at the discount window and lending at higher rates. This fact made the money supply to increase, triggering more inflation in several occasions regardless of the increases in the short-term rates. Consequently, what in the literature has been seen as different or equal policies by only looking at the levels of the short-term rates in comparison with inflation levels, could have led to wrong conclusions regarding the impact of monetary policy.

The results obtained in this paper suggest that during the interwar period the Fed mismanaged monetary policy given its lack of knowledge as to how to use its instruments and about monetary policy itself. Along with the bad policies, it seems that gold flows had an important role determining the results obtained for intermediate and final targets. For the end of the 1950s and beginning of 1960s, the good policy hypothesis could be applied, but it casts doubts. From the second half of the 1960s to the mid-1980s, the results mainly support the bad policy hypothesis, and since then, it seems that good luck has been driving the good performance of the economy. However, this good luck could be the wrong dictum, because the change of expectations, knowledge and behaviour of the banking sector or other private agents could have been triggered by other Federal Reserve actions. If it were the case, I am not being able to capture it in the model. This could be related to determinacy or indeterminacy state in which the economy may have been immersed. Beyond the debate of “good luck or good policies”, there are
strong arguments suggesting that in order to decrease inflation, the increase of the federal funds rate alone is not enough, and the discount rate should be moved to the same level or set it as a penalty rate. Thereby, the positive spread between both rates is likely of being producing the “price puzzle” extensively commented in the literature, by which an increase in the federal funds rate led to an increase in inflation.

The structure of the paper is the following. Section 2 describes the model used. Section 3 covers the data sources, the identification structure of the VAR and the priors used for the model. Also, it explains the reason of the creation of the new variable and its implication in the model in relation to the other variables. In section 4, the results obtained are contrasted with a narrative review of the history of the Fed. Section 5, draws and gathers all the lessons and patterns obtained from section 4. Finally, section 6 summarizes the main conclusions.

2. The model
The model used in this paper is the same as in Primiceri (2005), a TVC-BSVAR, where unlike other similar models, not only the coefficients vary, but also the variance covariance matrix. The advantage of this model is that the drifting coefficients capture nonlinearities or time variation in the lag structure of the model, while the multivariate stochastic volatility captures potential heteroscedasticity of the shocks and nonlinearities among the variables. Thereby, it allows me to determine whether the possible variations observed in the relation among variables emanate from the shocks (impulse) or the propagation mechanism (response).

Using the same notation as Primiceri does, the model is the following:

\[ y_t = c_t + B_{1,t}y_{t-1} + \ldots + B_{k,t}y_{t-k} + u_t \quad t = 1, \ldots, T. \]  

(1)

where \( y_t \) and \( c_t \) are \( n \times 1 \) vectors of observed endogenous variables, and a vector of time varying coefficients multiplying constant terms respectively. \( B_{i,t}, i = 1, \ldots, k, \) represents \( n \times n \) matrices of time varying coefficients. Last, \( u_t \) are heteroscedastic
unobservable shocks. The variance covariance matrix \( \Omega_t \) is triangularly reduced and defined by

\[
A_t \Omega_t A_t' = \Sigma_t \Sigma_t'
\]  

(2)

where \( A_t \) is a lower triangular matrix with ones in the main diagonal, being \( \alpha_{ij,t} \) the non-zero and non-one elements of the matrix. \( \Sigma_t \) is a diagonal matrix with \( \sigma_{n,t} \) elements in the diagonal.

Hence,

\[
y_t = B_{0,t} + B_{1,t}y_{t-1} + \ldots + B_{k,t}y_{t-k} + A_t \Sigma_t \varepsilon_t
\]

(3)

\[
V(\varepsilon_t) = I_n
\]

Stacking all the \( B_{k,t} \)'s in a vector,

\[
B_t = vec(B_t') = [B_{0,t}, B_{1,t}, B_{2,t}, \ldots B_{k,t}]'
\]

And being

\[
X_t = I_n \otimes [1, y_{t-1}, y_{t-2}, \ldots y_{t-k}]'
\]

The VAR can be represented and modelled as:

\[
y_t = X_t' B_t + A_t \Sigma_t \varepsilon_t
\]

(4)

Stacking by rows the elements \( \alpha_{ij,t} \) of the matrix \( A_t \) and the elements \( \sigma_{n,t} \) of matrix \( \Sigma_t \), the state vectors or transition equations representing the dynamics of the model are:

\[
B_t = B_{t-1} + \nu_t
\]

(5)

\[
\alpha_t = \alpha_{t-1} + \zeta_t
\]

(6)

\[
log \sigma_t = log \sigma_{t-1} + \eta_t
\]

(7)

where both, the \( B_t \)'s and the non-zero and non-one elements of the matrix \( A_t \), \( \alpha_t \), follow random walks, while the standard deviations of equation 7 follow a geometric random walk, belonging in that way to the stochastic volatility models.
The innovations of the model are assumed to be jointly normally distributed, assuming the following variance covariance matrix:

\[
V = \text{Var} \begin{pmatrix}
\varepsilon_t \\
v_t \\
\zeta_t \\
\eta_t
\end{pmatrix} = \begin{bmatrix}
I_n & 0 & 0 & 0 \\
0 & Q & 0 & 0 \\
0 & 0 & S & 0 \\
0 & 0 & 0 & W
\end{bmatrix}
\]

where \( I_n \) is an n-dimensional identity matrix and \( Q, S \) and \( W \) are positive definite matrices. As Primiceri points out, the zero blocks could be replaced by non-zero blocks, but there are two reasons leaning for the assumptions taken. First, if already in Primiceri (2005) the number of parameters is considered high and adding non-zero blocks would require a sensible prior in order to prevent ill-determined parameters, I am including the double of variables in the model. Thereby, given the even higher number of parameters used, the algorithm gets stuck in non-stationary draws when more parameters need to be estimated. As a restriction of stationarity has been imposed, it would mean that no draw is taken. This limitation prevents the inclusion of more variables or lags apart from those already included, and of course, the substitution of these zero blocks for non-zero blocks. The second reason is that I do not have any structural interpretation to impose among the different sources of uncertainty. \( S \) is assumed to be block diagonal, with blocks corresponding to parameters belonging to separate equation, namely, the coefficients of the contemporaneous relations evolve independently in each equation. For the estimation of the model, I refer the reader to the Appendix A of Primiceri (2005), but taking into account the corrigendum of Del Negro and Primiceri (2013), where the algorithm used for the Gibbs sampling suffers a modification regarding the blocks from which the draws are taken.

In this model, as already commented, in order to impose stability, the B’s are restricted to be non-explosive. As explained in Koop and Potter (2011) (K-P henceforth) “in the absence of such inequality restrictions (or a very tight prior), Bayesian TVP-VARs will place a large amount of a priori weight on nonsensical paths for the states.” Primiceri uses the Carter and Kohn (1994) algorithm, which draws an entire vector of states and rejects any which violates the constraint
imposed. The problem of applying this algorithm, as already commented, is that when the number of parameter is relatively high, it is easy that the algorithm get stuck drawing explosive B's. Thus, all the draws are discarded and computation is not feasible, as it is the case in this paper. In order to solve this problem, K-P develop a single-move algorithm\(^3\). While the MCMC algorithm in Primiceri (2005) draws from the state space models without the inequality restriction, K-P’s single-move algorithm draws from the state space model subject to the inequality restriction, drawings the states one at a time. This single-move algorithm does not get stuck rejecting every candidate draw as does the multi-move algorithm. It draws \(B_t\) from \(p(B_t|y^T, Q, B_{t-1})\)\(^4\), accepting the single draw \(B_t\) with a certain acceptance probability, if it has satisfied the restriction imposed. Now, although the probability of getting stuck diminishes significantly, the algorithm mixes more slowly. In this paper I display results with both algorithms there where it is possible.

3. Data, identification strategy and priors

The sample under analysis is split in two periods. The first period covers the interwar period with monthly data from 1925:I to 1939:XII, and the second period with quarterly data encompass the period between 1958:I and 2007:IV. The reason of using a different periodicity is due to the computational time necessary for the second period in case of using also monthly data, being already quite demanding using quarterly data. For the first period, the variables used are Industrial Index Production (IPI), Consumer Price index (CPI), M1, the difference between the stock exchange call loans rate\(^5\) and discount rate (C-D), open market


\(^4\) The other blocks are not included in the notation (although they are in the algorithm) as the modification only affects the draws of \(B_t\) and \(Q\).

\(^5\) The call loan rate, for the interwar period, was the most similar rate to the federal funds rate nowadays. “The market for brokers’ loans, as it is generally conceived, is centered around the New York Stock Exchange. Although some of these loans grow out of a customer relationship between banks as lenders and brokers and dealers as borrowers, the majority are made in the open market on a strictly impersonal basis. The market in which these loans are made was until recent years the most active and the most sensitive of the money markets of the country. It was the market where surplus funds of banks, and sometimes of other lenders, could generally be readily placed or from which funds could be quickly withdrawn when needed. Because of the dominance of call loans, the branch of the money market dealing in brokers’ loans has been designated as the call money
operations (OMOs) and the discount rate (DRATE). The first three variables and OMOs are growth rates, while the spread between the call loans rate and the discount rate, and the discount rate alone, are in levels. For the second period the variables are the same, except for C-D, as the stock exchange call loans rate is substituted by the federal funds rate (F-D). In order to have all the variables on the same scale, they have been standardized. That is, \( \frac{y_t - E(y^*)}{\text{std}(y^*)} \). The order of the variables is the same as they have been listed above, in order to give a structural interpretation to the relation among the variables. Thus, while IPI reacts after one lag to other variables movements, DRATE reacts contemporaneously to all of them. The data have been collected from the National Bureau of Economic Research (NBER), Federal Reserve Economic Data (FRED), Bureau of Labor Statistics and the Reserve Archival System for Economic Research (FRASER).

Regarding the lag structure, I have found limitations with this model as commented previously. Given the high dimensionality of parameters estimated, adding more than one lag in any of the periods, triggers that the draws from the B’s distribution are non-stationary. Having imposed the stationarity restriction previously, the multi-move algorithm used by Primiceri, gets stuck in the zone of the distribution where the draws are non-stationary and therefore, no draw is taken. Using the K-P’s single-move algorithm I am able to introduce one lag more (including more than two lags makes the algorithm to collapse, as some matrices becomes non-positive definite. Consequently, it is impossible to apply them any decomposition). Thus, for the interwar period with monthly data, I use directly the K-P’s algorithm, in order to have at least two lags, which are already few. For the second period, although one lag may be reasonable for quarterly data, I also show results with two lags. For one lag, the results are presented with both algorithms, the single-move and multi-move algorithm, and for two lags solely the K-P’s single-move algorithm.

3.1 Priors and computational details

For the first period an invariant VAR from 1920:I to 1924:XII (60 observations) is estimated to calibrate the priors distributions, while for the second period the priors are obtained from the period of 1948:I to 1957:IV (39 observations). Again, following Primiceri (2005) notation and set up for the priors, these take the forms:

\[ B_0 \sim N(\hat{B}_{OLS}, 4 \cdot V(\hat{B}_{OLS})) \]
\[ A_0 \sim N(\hat{A}_{OLS}, 4 \cdot V(\hat{A}_{OLS})) \]
\[ \log \sigma_0 \sim N(\log \sigma_{OLS}, I_n) \]
\[ Q \sim IW(k_Q^2 \cdot 40 \cdot V(\hat{B}_{OLS}), 40) \]
\[ W \sim IW(k_W^2 \cdot I_n, 4) \]
\[ S_1 \sim IW(k_s^2 \cdot 2 \cdot V(\hat{A}_{1,OLS}), 2) \]
\[ S_2 \sim IW(k_s^2 \cdot 3 \cdot V(\hat{A}_{2,OLS}), 3) \]

where \( S_1 \) and \( S_2 \) are the two blocks of \( S \), \( A_{1,OLS} \) and \( A_{2,OLS} \) are the corresponding blocks of \( A_{OLS} \), and \( k_Q = 0.01, k_s = 0.1, \text{and} \ k_W = 0.01 \). Thus, the priors are not flat but diffuse and uninformative.

For the first and second period, when the single-move algorithm is used, 400,000 draws have been generated, discarding the first 200,000 and using one of every 100, in order to avoid correlation between them. For the second period and the multi-move algorithm, 450,000 draws have been generated, discarding the first 200,000 and using one of every 125. The difference in the number of draws is explained by the computational time necessary and the percentage of acceptance of draws for each algorithm. As commented previously, with the single-move algorithm the percentage of draws accepted increase significantly, and then, fewer draws are necessary. Regarding the computational time, while for the multi-move algorithm and that number of draws, the time necessary to estimate the model has been around 60 hours, for the single-move algorithm the time of estimation has been around 23 days.

3.2 Explaining the model

For the reader familiar with the literature reviewed here and with that related to the questions addressed in this paper, it will be known that the common way of
approaching and evaluating how monetary policy has evolved and influenced the performance of the American economy, has been using mostly the federal funds rate or some measure of reserves (typically total reserves or nonborrowed reserves) as instrument of the Federal Reserve. As mentioned in the introduction, by definition this assumption is wrong. The federal funds rate or any type of reserves measure has always been and will be an intermediate target (along with other intermediate targets such as M1), in order to achieve price stability, stable growth or low unemployment. Such goals can be referred as final targets. Actually, the Federal Reserve is able to play with three instruments in order to achieve its intermediate targets, and consequently its final targets. Such instruments are open market operations, discount rate and reserve requirements ratio. Accordingly, if one wants to analyse the role of the Federal Reserve and the impact of its policies on the performance of the American economy, the appropriated is to use those instruments. In my model, I count with two of them, DRATE and OMOs, two intermediate targets, C-D or F-D (in this case, as they are new artificial variables created, they are not really intermediate targets. However, the Fed could use them as such. It can be considered as a hybrid between intermediate target and instrument), and M1, and two final targets, IPI and CPI inflation. The reserve requirements ratio has not been incorporated given it hardly varies over time and the model misbehaves if it is included.

Then, why is the federal funds rate (or other short-term rate) not by itself the appropriated variable to measure monetary policy? Firstly, the money market must be conceptualized as two submarkets. The first submarket includes the central bank, in this case the Fed, in the supply side, and the banking sector in the demand side. In the second submarket, the banking sector switch to the supply side, being the other agents of the economy the demand side. Under an interest rate target the Fed controls the federal funds rate purchasing and selling securities in the open market and increasing or decreasing the discount rate. Thus, the Fed controls the amount (OMOs) and the price (discount rate and federal funds rate) of money in the first submarket, according to the banking sector demand of money

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6 The same applies for any measure of reserves, as a reserve target will determine the federal funds rate or the other way around.
and its considerations as to whether that level of demand could harm the stability of the economy, thereby, boosting or constraining that demand. Given the price and amount of money set up by the Fed, banks will also decide the amount (loans) and price (federal funds rate and loans rate) of money in the second submarket. Unlike the intentions of the Fed, banks will set up prices and amount conditioned on its profitability. Banks will consider the cost of getting reserves and the prospect of profits from lending. Thus, the federal funds rate is in both submarkets being affected by supply forces (the Fed) and demand forces (banks demand of money conditioned on the rest of the economy demand of money). The way in which the Fed has to operate with its instruments, in order to set a same level of federal funds rate at two different points in time, will be different depending on the demand forces. That is to say, the Fed will have to purchase or sell a different amount of securities, and the discount rate will have to be set at different levels, so that banks have the amount of reserves that in that moment are necessary to achieve the federal funds rate that the Fed has decided to arrange. In the end, the federal funds rate will be affected by demand and supply forces and it can be at the same level, despite having different equilibrium. A greater demand of money faced with a greater supply of money can have a price of equilibrium (the federal funds rate in this case) which can be the same with a lower demand and supply of money. However, this lower or greater supply of money will have a different impact on the economy, (despite having the same interest rate) because it will determine a greater or lower level of reserves and loans. Hence, including the federal funds rate in the econometric model as representative of monetary policy stance is a mistake, because it will be capturing demand and supply forces and the supposed policies carried out by the Fed will led to misleading results. Using the real instruments of monetary policy, the supply forces, and hence, the policies of the Fed, are isolated from the demand forces.

Yet, despite being isolated from the instruments of the Fed, the federal funds rate has another problem if included in the model by itself. Its impact as price in the second submarket depends on the price established in the first submarket, i.e., the discount rate. Here is where the new variable (C-D or F-D) plays its role.
Sometimes, even though the Fed increases the federal funds rate, if the spread between the federal funds rate (or other short term rate) and the discount rate is positive, it offers profitable opportunity for banks, whereby they will continue borrowing at the discount window and lending at higher rates than the discount rate. Consequently, not only will banks get profits from that spread, but they will even be able to lend at rates below the federal funds rate or at rates not as high as the Fed intends, if it were necessary, in order to not decrease the demand of money and obtain profits. Unavoidably, being this the case, an increase in the interest rate with the intention to tight the money market will not have the desired effect, which is to restrain the demand. It will mean that the Fed is not having full control of its targets. Thus, in the model used here, while the instruments of the Fed capture the supply side of the money market, this new variable is the bare price to which the demand side of the money market reacts, chiefly, the banking sector. This relative price is what in the end determines the real demand of money. Now, the initial supply of money coming from the Fed is directly faced by the demand of the private agents of the economy, so that I can observe the real effect of monetary policy on the economy. Be aware that this new variable is unable to separate whether the changes in the behaviour are coming from the banking sector or other private agents. In order to separate the demand forces of the banking sector and other private agents, partitioned models for each sub-market will be necessary, which will be addressed in a future research.

The problem under an interest rate target is that if the Federal Reserve intends to control the federal funds rate, and as it was mentioned before, for that task it will purchase or sell as many securities as it is necessary, it may be providing reserves without limit, as long as the demand of money is strong and more credit is demanded. If banks find profitable to sell securities in the open market or borrow at the discount window so as to extend more loans, they will continue to satisfy the demand of loans. In the end, loans will grow limitless until banks have to increase the lending rate, in order to cover the cost of their reserves. Being this true, the policies of the Fed will exert some impact only when it increases even more the federal funds rate, so that banks increase their lending
rates (as for them now it is more expensive to get reserves), either because borrowing from other banks is more expensive or because the Fed has reduced its purchase of securities. Along with that, the discount window should offer tighter conditions by increasing the discount rate. Specifically, the discount rate should be almost equal to the federal funds rate, or it should be set as a penalty rate. Otherwise, the possibility of getting cheaper reserves at the discount window would make the reduction in securities purchases or the federal funds rate increase useless, (up to certain extent, since banks have a limit of credit at the discount window) as the cost of those reserves would be below the indicated by the federal funds rate. Then, as mentioned before, banks could set a lower loans rate, which does not restrain the demand of credit.

4. Results and historical context

In this section, the questions under analysis are approached from two complementary but different perspectives. On the one hand, I expose the most relevant facts happening inside the Federal Reserve, the events affecting the knowledge of its members about monetary policy and the influence of these knowledge over the real economy. For that task, I base and referencemy narrative on authors who have covered the history of the Federal Reserve, such as Hetzel (2008), Meltzer (2003 and 2009)\(^7\). On the other hand, the model explained in the previous section, permits me to approach the questions from a methodological stance, with two different tools. First, I use the impulse response functions, in order to observe how a shock to one variable affects other variable behaviour. Each figure will show the posterior mean of the response of one variable to the shock of other variable. As time varying coefficients are being used, it allows me to discover whether the interaction between two variables has undergone any significant change over the period under analysis. This may be the first hint as to whether the Fed, at some point, modified its policies. Second and last, the posterior means of the standard deviation of the residuals for each equation of the VAR will

\(^7\) The following authors have also been reviewed: Fforde (1954), Friedman and Schwartz (1963), Wheelock (1991), Toma (1997), Moore (1990) and Mayer (1999), but given the level of completeness of these works (from a personal opinion), I expose mostly those facts narrated in Meltzer (2003 and 2009) and Hetzel (2008).
shed light regarding potential external shocks which may be affecting the results. That is to say, they represent potential variables which are not included in the model, which may have some influence on the results. To sum up, the impulse response functions are important in order to recognize whether policies have changed, and then, attribute the results to the “good or bad policies” hypothesis, whereas the deviation of the residuals sheds light on the possible “good or bad luck” hypothesis.

Initially, the “good or bad policy” debate is troublesome itself, as although certain policies could have worked in the past, it does not mean that they are good, because they may fail under other circumstances. Also, because the term “good” could be related to the goals established by the Federal Reserve, which may be wrongly set up. In the end, a theoretical good policy would be that which is flexible and capable of adapting to different conditions, offering the same results and keeping its essence. Therefore, in order to find a toehold in this probably metaphysic debate, and assuming stable growth and inflation as good policies, in the beginning the Taylor rule\footnote{The Taylor rule represented in charts 1.2 and 2.1 is the standard one proposed in Taylor (1993): $i = \pi + R' + 0.5 \times (\pi - \pi) + 0.5 \times (y - y)$, where $i$ is the nominal federal funds rate suggested, $R'$ is the natural real rate assumed to be 2\%, $\pi$ is the actual level of inflation (YoY), $\pi'$ is the inflation target, which is assumed to be 2\%, $y$ is the actual output growth (YoY) and $y'$ is the potential output growth. The same weight is imposed to inflation and the output gap, namely, the Fed responds equally to both targets.} is taken as reference of good policy. Later, because otherwise one of the aims of this paper would make no sense, the relation among variables and the way they evolve given the framework in each period, are used to reshape the definition and final declaration of good policy.

4.1 Interwar period (1925:I-1939:XII)

The results shown for this first period belong to the model with monthly data and two lags using the K-P’s algorithm. Even though the analysis starts in 1925, it is necessary to be aware of the knowledge of the Fed since 1919. By then, governor Benjamin Strong, chairman of the Fed of New York, already realised that the spread between the discount rate and short-term rates would avoid a decline in inflation, as it was profitable for banks to borrow at lower rates and lend. In 1921 began what today is known as the federal funds market. Banks with surplus
reserves sold reserves to banks with deficient reserves. However, its relevance was far from what that market is nowadays. By 1922, some members of the Fed noted that reserve banks could increase “momentum” purchasing in the open market and at the same time reducing the discount rate. Strong claimed that buying in the open market was equivalent to a member bank borrowing. Thus, open market operations experiments began in 1922. The discount rate during those years was at discretion of each reserve bank and its use was intended to be a penalty rate. Thus, it used to be above short-term rates, at least until 1921-1922, when market rates on commercial paper started to be above the discount rate. Apart from that, it was supposed to be the tool to follow the gold standard rules, namely, increasing it in periods of surplus and decreasing it when there was deficit. Also in 1922, Strong noted and commented what would determine monetary policy in the next years. His observation was that when banks were in debt, they used their surplus reserves to reduce borrowing. On the contrary, when they were out of debt, they reduced rates and put their surplus to work. “The reduction in our rate had no influence in the market. It was the competition to lend money that did it” (Meltzer 2003, p. 126). Thus, changes in the discount rate would be ineffective, and by selling in the open market, the reserve banks could reduce bank reserves and force them to borrow, thereby restoring the effectiveness of the discount policy. In 1964 Burgess reported: “First, as fast as the Reserve Banks bought government securities in the market, member banks paid off more of their borrowing; and, as a result, earning asset and earnings of the Reserve Bank remained unchanged...” (Meltzer 2003 p.153).

Given the concern of the Fed about speculative credit during the 1920s, it had to increase interest rates to avoid the growth of stock exchange lending, thereby attracting more gold. In order to maintain price stability, the Fed sterilized gold inflows. Thus, this policy reduced the monetary expansion triggered by those gold inflows. Another characteristic of these years which led Federal Reserve banks to follow the wrong policy is explained in what was the Riefler-Burgess doctrine. It was believed that banks were reluctant to borrow and they only did it if the level of their reserves was deficient. This triggered that during many years the monetary base and borrowing moved procyclically. That is to say, the Fed
believed that increased aggregate borrowing signalled a restrictive policy even if the monetary base and money stock accelerated. Following this reasoning, it increased the purchases in the open market and decrease the discount rate for those periods of increased aggregate borrowing, and it did just the opposite when the situation was the contrary.

4.1.1 1925-1929

Before starting with the analysis of the results, I advise the reader to pay keen attention to the relations described between the discount rate, the short-term rate of reference and the levels of inflation, not only for the interwar period, but also since 1958, because they are important to understand what the impulse responses display.

Looking already into the period under analysis, at the April 1925 meeting for the Governors Conference it was expressed the concerns which would continue for the rest of the decade; credit to securities brokers and dealers. They feared speculative borrowing. Consequently, some reserve banks increased the discount rate later, as the open market account was thought to be too small to have a significant effect on bank reserves. It is seen in chart 1.2 that since the beginning of 1926 inflation rose, probably due to the gold inflows once discount rates were increased. The Taylor rule is briefly signalling higher rates around mid-1925 with low levels of inflation or even mild deflation. However, soon, from the second half of 1925 to the beginning of 1926, it suggests a lower rate than the discount rate and the call loans rate. Once inflation increased in 1926, in part due to the depreciation of the pound and the consequent inflow of gold, the Taylor rule indicates higher rates until the first half of 1927, despite being in recession that year. The Fed carried out open market purchases in May 1927 because of the recession, and they continued in July. However, they were offset by a decline in borrowing and also in the reported gold stock.

Strong’s view of supporting the pound with lower rates dominated. By the end of 1927 Strong had complete authorization to offset gold flows without limit. From 1927 to 1929 the Fed sterilized gold inflows, preventing monetary expansions. During those years of sterilization there was deflation (Chart 1.1). Fed
members were misled by the lower levels of discounts and borrowing, believing that policy was already expansive. For the period from mid-1927 to the beginning of 1929 the Taylor rule suggests lower rates than the discount rate and the call loans rate, and to the end of 1929, lower rate only than the call loan rate. During this period of deflation, the discount rate was higher in real terms, but the members of the Fed did not distinguish between real and nominal terms. On the other hand, the spread between the discount rate and the stock exchange call loans rate became significantly large since the beginning of 1928. Given the increase in credit to brokers, the Fed thought that its policies were expansive and because of this fact, rates were not reduced and open market purchases decreased. During 1928, the Federal Reserve sterilized part of the net gold outflow but not enough and the monetary base declined. Thus, when New York stopped sterilizing gold losses, discounting increased significantly but the monetary base continued to fall. Discounting and bank credit were in the highest levels of the three last years.

Comparing now the narrative with the results obtained from the impulse response analysis, the response of CPI inflation to an OMOs shock (Figure 1.B), until approximately mid-1927, is initially positive, but negative after 2 months. From 1927 to the end of 1929, it becomes negative, coinciding with the period in which the Fed was sterilizing gold inflows during those years, impeding the money supply to increase as it would have in normal conditions. This figure shows, for the entire interwar period, that when the Fed purchased in the open market, initially it contributed to increase inflation, but as discounting decreased at the same time and gold flows were sterilized, open market operations were offset and its initial positive effect was ephemeral. Looking at the discount rate shock (Figure 1.A), inflation response is positive during this period, but diminishing in the beginning of 1926, when the discount rate, unlike for the rest of the subperiod, is roughly at the same level as the call loans rate and above or close to the Taylor rule (Chart 1.1 and 1.2). This positive effect may be also capturing that an increases in the discount rate attracted more gold and consequently, money supply increased. The response of CPI inflation is becoming more positive since 1928, when the spread between the discount and call loans rate is becoming larger. When looking at the shock to the new variable (Figure 1.C), C-D, the response of CPI inflation is
negative for the second half of 1925 and between 1928-1929. In both cases, the economy was in deflation and the spread is positive. This fact could mean that rates were too high, as the Taylor rule suggests. Consequently, a bigger difference, meaning a higher call loans rate in relative terms with the discount rate, would have tightened the economy even more. The response is positive from the beginning of 1926 to the beginning of 1927, a period without deflation but a narrow spread and with rates below the Taylor rule. Apparently, rates could have been higher, in order to obtain lower levels of inflation. Strong did not have fully authorization to sterilize gold flows in this period, and therefore, the money supply behaved more naturally, as it was not intervened. Paying attention to an M1 shock (Figure 1.D), it shows that an increase in the money supply is positive, but during the period in which gold inflows were accelerating, but the Fed was offsetting them (1927-29), would have increased inflation more than in the rest of the period.

Focusing now on the response of IPI, a shock to the discount rate (Figure 1.E) has firstly a positive response, but it becomes negative after 2 months. A shock to OMOs (Figure 1.F) has initially a negative effect but it becomes positive after 2 months. Regarding a shock to C-D (Figure 1.G), the response is positive for the second half of 1925, and negative in 1926 and 1927. Since then, the response is positive again, coinciding the positive periods with those of a positive spread in C-D. Also, this positive response occurs during years of deflation, meaning, the spread was contributing to increase loans and growth. Last, a shock to M1 (Figure 1.H) shows mostly a negative response between 1928-1929, years of deflation and sterilization of gold inflow. From 1925 to 1927, the response is mostly positive, but initially negative in 1925 and part of 1926. Regarding the impulse responses of M1, a shock to the discount rate (Figure 1.I) and to C-D (Figure 1.K) has a negative response, although for the last figure, it becomes positive after 2 months. The logic behind Figure 1.K may be that an increase in the spread triggered initially a fall in the money supply, but given the profit prospects for banks, they borrowed more and consequently, the money supply rose. When the shock is to OMOs (Figure 1.J) the response is positive as expected\(^9\). There is, however, a positive peak in 1929

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\(^9\) As the response for these last three shocks is the same (with just small variations) for the entire period, these results will not be commented again.
that as it will be seen in the next subsection, belong to the moment in which the Fed perceived indications of a recession. Accordingly, open market purchases were carried out, although not enough, because as observed in Figures 1.F and 1.B, they were not able to increase inflation or output. In the last case, at least, initially.

4.1.2 1929-1933

“...[O]n December 31, 1928, the Board adopted a resolution that blamed the spread between discount rates and rates for stock exchange loans for the temptation to borrow from the Fed and lend to help buy or carry securities.” (Meltzer 2003, p. 237)

The Fed spent 1929 trying to reduce bank lending to brokers, as it was thought to be speculative credit, but most of the lending came from corporations and other nonbanks. Hence, the Fed was not successful in reducing call rates. Previous to the crash on October 23, call rates had already started to decrease and by that date, they were around 6%. However, the Fed refused to reduce the discount rate.

Once the spread became larger in the beginning of 1928, the Taylor rule suggests a lower rate (being even negative) than the discount rate, but it increases rapidly since the beginning of 1928 (Chart 1.2). By the end of year it is already suggesting higher rates, being in August of 1929 almost equal to the call loans rate. IPI growth rates were significantly high during this year, what explains the behaviour of the Taylor rule. Yet, this is a period of deflation, as the sterilization of gold was avoiding the monetary base to increase. Thus, as the demand of credit augmented, banks increased borrowing and at the same time, the call loans rate. That is to say, as the money market was getting tight because of the sterilization of gold, but the demand of money was high given the profitable opportunities and the growth of the economy, credit continued to flow, although each time at higher rates. This happened until the rates were too high. At the end of November 1929 the Fed noted that there was being a liquidation of credit against securities and this could suppose a serious threat to business stability, having already in mind that there were indications of a business recession. As short-term rates had fallen and were expected to fall further, and discounting increased, the Fed approved limited purchases in the open market. Later, industrial production, stock of money, monetary base and borrowing fell. Fed governors thought that the open market purchases had failed to revive the economy. Actually, the Fed had failed to offset
the decline in borrowing by purchasing less than it should, but the members of the Fed thought that the purchases had already permitted banks to repay borrowing as borrowing levels had declined. Bank failures along with the increasing demand of the public for currency, contributed to contract the money supply.

By the end of 1930, the members of the Fed were thinking about how much to sell in the open market as they considered that policy was easy, since banks were keeping twice the level of excess reserves of the previous year. However, the reason was related to bank failures, the higher demand of currency and the lack of profitable opportunities from the positive spread as in previous years. This fact offset the inflow of gold at the beginning of the year. Later, as the inflow of gold did not decrease interest rates, the governors decided to purchase together with the gold inflow from April to June of 1931, but the rise in currency holding and excess reserve counteracted the effect. In 1932, gold outflow started again, as well as a higher demand for currency. The Glass-Steagall Act of April 1932 and threats of additional legislation led the Fed to purchase in the open market. Signs of improvements were soon recognized but as the purchases stopped, the improvements quickly disappeared and gold outflow continued. Thus, it was thought that the program has failed. As short-term rates were historically low, the members of the Fed thought that policy was easy, not being aware that in real terms, given the levels of deflation, real rates were high. Not further purchases were done. The System kept an inactive role during the next months. From time to time, as in January 1933, the System sold in the open market, in order to keep excess reserves close to $500 million. In the beginning of 1933 short-term rates increased, but the Fed failed by discounting at higher rates than the market (Charts 1.1 and 1.2), when it should have set the discount rate below the short-term rates.

Since the crash in October 1929, the Taylor rule suggests lower rates (actually negative rates) until 1935, due to the decline in output and the levels of deflation since 1930 (Chart 1.2). This coincides with the fact that the discount rate is most of the time above short-term rates (Chart 1.1), and all of them are above inflation levels. Going back to the impulse responses analysis, it is observed that the response of inflation to a discount rate shock (Figure 1.A) in 1929 is initially
positive, coinciding with the large spread between the discount rate and the call loans rate. Between 1930-1933, the negative or zero response coincides with the fact the discount rate in real terms is higher than represented because of the deflation, and that it is above both, inflation levels and the call loans rate. After 6 months, the response becomes slightly positive.

Looking at the shock to OMOs (Figure 1.B), the response of inflation is initially positive but negative after 2 months, signalling that as the Fed purchased securities in 1930, 1931 and 1932 (although sometimes in small amounts), but it stopped purchasing shortly after, believing that that action had failed, the effects disappeared very quickly. The purchases were offset either by gold outflows or the higher demand of currency. Paying attention to the shock to C-D (Figure 1.C), from 1930 to 1933 included, CPI inflation is responding positively to an increase in the difference between the call rate and discount rate, unlike in the last subperiod, under a deflationary situation. The difference is that now the spread is negative. It seems that a positive spread, (what would have meant a decrease in the discount rate or an increase in the short-term rates) would have supposed an increase in inflation, since banks would have had the opportunity of getting profits from discounting and lending afterwards at higher rates. Related to the last statement, the highest positive peak during this period is around the beginning of 1933, coinciding with the rise in the short-term rates. However, the Fed did not allow them to be above the discount rate. Last, while the response of inflation to an M1 shock (Figure 1.D) is positive from 1928 to 1930, from 1930 to 1933, it is mostly negative, except for a delayed positive response between the second half of 1931 and first half of 1932. The stagnation of business, bank failures, the increase in currency and reserves holdings and the gold outflow could have contributed to this mostly negative response; without forgetting the negative spread. The positive response between 1931 and 1932 could correspond to gold inflows and the pressures that the Fed received to purchase in the open market.

The response of IPI to a discount rate shock (Figure 1.E) is the same as in the previous sub-period, except for the fact that from 1930 to 1932 it does not become negative after some months. Gold inflows and open market purchases could be the reason, along with the great decrease in the discount rate. The shock
to OMOs (Figure 1.F) has a pattern alike to the response of inflation to an OMOs shock (Figure 1.B). Now, the response is positive since the beginning, but it seems that the Fed changed the way in which it purchased in the open market since the end of 1928. This fact could be a point in favour of those authors (Friedman, Schwarz, Bordo and Hetzel) who argued that the death of governor Strong supposed a change in the policies of the Fed. However, this change occurs only for a couple of years and it does not apply for the other instruments of the Fed, which is in line with Wicker (1965), Wheelock (1989, 1990) and Brunner and Meltzer (1968), who claimed that policies were already ineptly administrated with Strong. For the shock to C-D (Figure 1.G), the response is initially positive in the beginning 1930, but it becomes negative after 1 month. For the rest of the subperiod, the negative response is stronger, just when the discount rate starts to be at the same level or above the call loans rate, and in a period of deflation (Charts 1.1 and 1.2). Contrary to the previous subperiod, a shock to M1 (Figure 1.H) has a positive response from 1930-1932, (brief open market purchases and gold inflows for those years) becoming negative in the second half of 1932 and having a negative peak in 1933, when the Fed sold securities in the open market.

4.1.3 1933-1939

The last part of the interwar period, from 1933 to 1941 is characterized by the inaction of the Fed and the Treasury taking most of the responsibility of the monetary policy. The Fed open market account and the discount rate hardly changed during this period, and the variations in the monetary base were due to changes in gold stock and the devaluation of the dollar in 1934. Marriner S. Eccles, who became governor of the Board in 1934 believed that the Fed should keep market rates low (Chart 1.1) in order to facilitate private spending and government finance. Also, he thought that the growing volume of reserves at member banks could mean a threat of future inflation. Thus, reserve requirement ratios became the main instrument of the Fed during these years. In October and November of 1933 the Fed made the last purchases in the open market and it would not purchase again until April 1937.
There was a strong recovery from the crisis in the second quarter of 1933. Because of this, the Taylor rule is indicating a momentary much higher rate around mid-1933 (Chart 1.2). In 1934, Roosevelt bought gold and silver in order to raise prices. The base and money stock increased. Also that year, he carried out a devaluation up to 60% of the gold. It is seen in Chart 1.1 how inflation increased enormously in that period, going from a deep deflation to high rates of inflation, being even above the call loans rate and the discount rate. At the same time, the Taylor rule suggests higher rates since that moment. As the president had acquired the gold held by the Federal Reserve banks previously, this devaluation supposed a $2 billion profit which was used to set up the Exchange Stabilization Fund (ESF), used to retire national banknotes and finance industrial loans. This devaluation supposed an increase in prices and flow of gold into the country. The ESF also was used to buy bonds, in order to keep rates low and finance the deficit. In August 1935 as reserves rose and there was fear of future inflation, the Fed decided to increase the reserve requirements ratio. As reserves had increased, discounting decreased and hence, the discount rate could exert little influence, or at least it was what the members of the Fed thought. This first increase in the reserve requirement ratio had little effect because of the gold inflow. Given the fear of speculative gold inflows and increase in the monetary base, the Treasury sterilized gold inflows between December 1936 and July 1937. Just in this period, it is seen how there is deflation again (Chart 1.1). There were two further increases in the reserves requirement ratio in January and May of 1936. Later, and together with the sterilization, there was an increase in bond yields, what supposed the restart of the Fed purchases in the open market in order to lower short-term rates and indirectly, long-term rates. The increases in the reserves requirement ratio along with contractive fiscal policies, made the money stock to fall and create a recession by May of 1937. Thus, in September 1937 more open market purchases were undertaken and the Treasury desterilized part of the gold inflows. It is seen a recovery of the inflation levels for the end of the year. The Fed now proposed to manage OMOs in response to the level of excess reserves instead of the amount of borrowing. By 1938, again the purchases in the open market were in small quantities as rates were low and it was believed that the monetary policy was easy. However, deflation came back again for the end of the year and the Fed had to
reduce reserve requirements ratios, while the Treasury continued to desterilize the gold sterilized in previous years.

From 1934 to 1939 the impulse response of inflation to a discount rate shock (Figure 1.A) is always positive, but becoming negative after 2-3 months. This time, the discount rate is below inflation levels most of the time and the Taylor rule suggests higher rates. Also, it is still above or at the same level as the call loans rate. The response of inflation to an OMOs shock (Figure 1.B) is the same as in the last subperiod. Given the Fed hardly used open market operations, this response points out that the few purchases undertaken were not enough to increase inflation. For the shock to C-D (Figure 1.C), the response is initially negative between 1934 and part of 1935 (deflation period). Then, it becomes positive after 2 months. For the rest of the subperiod, the response is positive since the beginning. During these years the difference between rates is zero or negative, but both of them are below inflation most of the time, what did not contribute to reduce it. Regarding the shock to M1 (Figure 1.D), the response of inflation is initially negative (except for 1939, coinciding with the Treasury desterilization of gold) and becomes slightly positive after 3-5 months.

In the case of the impulse responses of IPI, shocks to the discount rate and OMOs (Figures 1.E and 1.F) are similar to the last subperiod, with a initial positive and posterior negative response for the discount rate shock, and positive for the OMOs shock. The response of IPI to a C-D shock (Figure 1.G) is positive, as both rates are below inflation and they were not high enough. However, it becomes negative after 2 months, above all in 1937, due to the recession and the negative or zero spread. Regarding a shock to M1 (Figure 1.H), the response is mostly negative from 1933 to the end of 1935. It turns to be positive since the 1936, when more Fed restarted to purchase in the open market, and the Treasury desterilized gold flows.

### 4.1.4 Instruments and residuals

The response of C-D to a discount rate shock (Figure 1.L) has a positive response that becomes negative or zero after approximately 9-10 months, from 1925 to the end of 1929. This is the period in which the discount rate is below the call loans
rate. From 1930 to the end of 1937 the initial response is negative, becoming positive after approximately 6-8 months between 1930 and 1934, and 1-2 months from 1934 to the end of 1937. This happen while the discount rate is above the call loans rate. Since the end of 1937 when both rates are the same, the response is negative. The interpretation behind this is that the increase in the discount rate led to a relative higher increase in the call loan rate in the first part of the sample, and this pattern reversed since then, when the Fed and the Treasury tried to keep short-term rates low, in order to finance government spending. The response of C-D to an OMOs shock (Figure 1.M) is negative for the whole period, although for 1928 the response becomes positive after 2-4 months. It is representing that the purchases in the open market decreased short-term rates and consequently, the spread, but as the purchases did not last long, in 1928 it was not enough to reduce the spread after some months. Last, the response of OMOs to a discount rate shock (Figure 1.N) is negative for the whole period, as it would be expected.

In order to discover whether there are external factors which are not captured by the model, and therefore, could be determining the results already analysed, I evaluate the posterior mean of the standard deviation of the residuals. There is an increase in the residuals of the IPI equation from 1932 to the end of 1935. During these years IPI could be responding to fiscal policies and the devaluation of the dollar in 1934 (Figure 1.O). The residuals of the inflation equation are higher from 1925 to 1929 and from 1932 to 1936 (Figure 1.O). For the first period inflation may be responding to gold flows, while for the second period, apart from that, inflation could be responding to factors as those commented for IPI. For both cases, it is understandable that since 1932-33 the residuals increase, as the Fed is relegated to the backseat and those variables are not responding to the instruments of the Fed included in the model. For M1, there is a peak in the end of 1929, probably related to the crash, bank failures and holdings of currency, and between the end of 1932 and beginning of 1933, when there were more bank failures (Figure 1.O). Apart from those peaks, the residuals are constant for the entire period.
For the C-D equation the increase in the residuals appear between 1928 and 1930 when the difference between rates is the largest and the Fed was unable to reduce the call loans rate because other institutions were giving credit (Figure 1.P). Regarding OMOs equation, the behaviour of the residuals is similar to the C-D equation, but they start to decrease in 1932 (Figure 1.O). OMOs during this period were used several times for offsetting gold flows. Last, the discount rate residuals show three peaks in the end of 1929, end of 1931 and beginning of 1933 (Figure 1.O). Therefore, it seems that the residuals of the final targets increase once the Fed is relegated to the backseat, suggesting that other variables which are not the instruments of the Fed, could be driving the results of that period. An exception is found in the residuals of inflation at the beginning of the period. According to the narrative, gold flows could be an important factor determining its behaviour. For the residuals of the instruments occurs just the opposite. Their residuals are higher while the Fed is managing monetary policy. This suggests that the members of the Fed were also targeting other variables, which according to the narrative, could be gold or bank reserves.

4.2 1958:I-2007:IV

For this second period, although the narrative is divided in subperiods as in the last section, the results are presented jointly for the benefit of the fluidity of the story behind them. Before initiating the analysis in 1958, I review the knowledge of the Fed since 1950, in order to establish the monetary policy framework for this second period. From 1950 to 1960, the Fed still believed that policy was easy if interest rates were low, even though M1 be decreasing; OMOs gained more relevance than discounting, the main target was free reserves, and bank borrowing was used as an indicator. Money growth did not receive attention despite it was thought to cause inflation in the long run. Still, they did not differentiate between real and nominal rates and continued to apply procyclical policies. In 1952 banks borrowed relatively large amounts from the discount window, taking advantage of the spread between the discount rate and lending or open market rates. In 1954 the federal funds emerged again, as it had been inactive since the late 1920s.
“At the August 23 1955 FOMC meeting Martin raised two issues: whether the discount rate should be a penalty rate, and whether it should lead or follow market rates... Following the meeting... in mid-September; the discount rate was a penalty rate.” (Meltzer 2009a, pp. 127-128). “The Board reconsidered the role of discounting in its 1957 Annual Report... The Board, at last, recognized that when one bank repaid its borrowing, another might be forced to borrow, so that aggregate reserves did not decline. And it recognized that increased borrowing offset open market sales and that the attitude of member banks toward operation with borrowed resources varies from bank to bank... The Board found no conflict between discounting and open market operations. Market and discount rates were interdependent. By raising the discount rate above the market rate, the System encouraged banks to adjust by selling securities instead of discounting. Short-term rates rose, reinforcing an open market policy of sales.” (Meltzer 2009a, p. 78).

4.2.1 1958-1970

Already for the period under analysis, there was a recession in 1957-1958. It was the beginning of the called stagflation. In 1958, the president asked to make price stability an explicit goal of economic policy. The Great Inflation was underway during the 60s, sustained by rapid money growth to finance the government budget and the government spending for the Vietnam War. One of the problems of the Fed for this period is that it acted to reduce inflation only until unemployment rose. Given the unpopularity of inflation once it appeared after 1965, emphasis shifted between those two goals.

Free reserves were increasing in 1960 and the Fed interpreted it as easy policy. As the economy slowed, discount rates decreased and free reserves and federal funds rate rose. During 1961-62, free reserves target was questioned and for the first time there was a target for the T-bill rate. On January 1962, an increase in ceiling rates was approved. When the Fed began to control interest rates during those years, the problem was that they contained less information about the market position. “Instead of the market being a window through which we can observe indications of private actions that might call for policy changes, we have made it—in part at least—a mirror of our own intentions with respect to rates”. (Meltzer 2009a,
In 1963 free reserve targets was abandoned and more attention was dedicated to the federal funds rate and less to the T-bill rate. In early 1965, the first of several errors in order to control inflation was made, when the president’s Economic Report announced the need for further expansion, even though signs of strength had already appeared. The same year, the federal funds rate became again higher than the discount rate. Since the Fed targeted a short-term rate, to prevent a change on it when the deficit increased, the Fed had to allow the monetary base to increase. Fiscal policy contributed to inflation with the president Johnson’s large deficits in 1967-68. Before Martin left the Fed in January 1970, the Fed had adopted growth money as a policy indicator and instructed the manager to change money market conditions if money growth deviated from a 2% annual rate. When Burns became chairman of the Fed, the manager in charge of the OMOs lost much of his autonomy and the “tone and feel policy” ended forever. Money growth became the target and the FOMC would take decisions based on a total reserves target. Money and bank credit growth were used as target rather than as projection, meaning, the manager would change the federal funds rate when he missed the target. As the procedure began raising federal funds rate, the System ended up supplying more reserves, in part to prevent the failure of the Treasury financing. Thus, the FOMC soon gave up on monetary control. Higher rates supposed higher unemployment, and Burns disliked the result. By August 2, wage and price controls were imposed. Also the gold window was closed, and the currency was allowed to float.

“In short, the simple Keynesian model as applied in the late 1960s had three major flaws. It did not generally distinguish between nominal and real interest rate changes. It presumed that the government could permanently reduce the unemployment rate by permitting the inflation rate to rise. And it did not distinguish between one-time price level changes and maintained rates of price change. Each of these errors continued throughout the 1970s.” (Meltzer 2009a, p.490)

4.2.2 1971-1980

This decade started with a freeze in prices and later, in interest rates, rates charged on mortgages, and consumer credit. Burns believed that in order to achieve full recovery without inflation, it was necessary to increase profits and
lower wages growth, as it was understood that cost-push by unions was causing inflation. Another three phases of price controls were extended until 1973. Although in the beginning they decreased inflation, once finished, inflation increased even more. In the end, the public lost credibility on these controls.

During these years, it was usual to target growth in monetary and credit aggregates, setting at the same time lower and upper bounds on the federal funds rate. Before the elections in 1972, it is said that Burns was pressured by the government in order to increase growth and decrease unemployment. Once the elections passed and the administration loose price and wage control, there was an inflationary outbreak coming from those expansionary policies. In 1973, member bank borrowing rose to levels not reached since 1921 and the discount rate rose only in August 1973. It is seen in Chart 2.2 that the differential between the discount rate and federal funds rate is quite large from 1972 to 1975. The Fed was also targeting the growth of reserves against private deposits during this period. The procedure contributed to increase inflation as the staff estimated the growth of reserves and the level of federal funds rate consistent with the desired growth of money. Several times, they did not match and the band on federal funds rate had to be changed. In the end, the manager maintained the federal funds rate and exceeded the reserve target. As inflation increased, the federal funds rate and the discount rate reached levels never seen before. However, such was the spread between both rates that member bank borrowing increased significantly, contributing to the growth of the monetary base. It seems that along with the excessive monetary and fiscal expansion of 1972; the removal of price controls in 1973, the devaluation of the dollar after 1971, poor harvest abroad and the increases in oil prices, added to the rise in inflation. Beginning in 1975, borrowing declined and the federal funds rate came down rapidly, as it is appreciated in Chart 2.2. The FOMC continued to use the federal funds rate as it principal target during this decade. “This period is unique in that the Fed controlled the funds rate so closely that market participants could identify most changes in the funds rate target on the day they were first implemented by the Fed, and these changes were reported by the market participants in the financial press the following day” (Meltzer 2009b, p. 892).
By October 1978, inflation had become a political issue as public opinion saw it as a major problem. In December 1978, the oil-producing countries decided to raise prices again. Inside the FOMC, more arguments started to appear regarding how to control inflation and how this could reduce employment at the same time. Other concern was that the lack of credibility was damaging the effect of raising the federal funds rate, as the public expected that the Fed would not continue its restrictive policies and prices would increase again. Mark Willes claimed “We can in fact have less inflation without more unemployment in 1980 if we have policies in 1979 that are...firmly held to so that people really believe we are going to follow through on them” (FOMC Minutes, February 6, 1979, 19) (Meltzer 2009b, p.940). In August 1979, Volcker became chairman of the Fed.

4.2.3 1980-1990

At his confirmation hearing in August 1979, Volcker already distinguished between real and nominal interest rates and expressed inflation as his main concern. He, following Milton Friedman, accepted that inflation could not be reduced unless money growth declined relative to growth of real output. The FOMC used a federal funds rate target and announced objectives for growth of M1 and M2 in order to reduce money growth. For that task, Volcker targeted nonborrowed reserves. However, they also paid attention to total reserves, so as to move the target for nonborrowed reserves.

“Monetarists criticized the procedures at the time, arguing that they made both interest rates and money growth more volatile. Growth of the money stock depends on reserve growth (or the monetary base). By holding to a fixed value (or growth) of nonborrowed reserves, banks had to borrow any deficiency to meet required reserves on deposits outstanding two weeks earlier, thereby increasing total reserves. ...Further, keeping the discount rate as a penalty rate slightly above the average federal funds rate, would reduce borrowing. Most often, the Fed subsidized borrowing in 1979-82 by allowing a wide spread, 4 or 5%, between the average federal funds rate and the discount rate. This encouraged borrowing and weakened control of money” (Meltzer 2009b, p. 1028).

“The initial implementation of the policy change was discouraging. M1 growth for October reached a 14% annual rate, far above the 4.5% target for the fourth quarter.
Axilrod estimated that bank borrowing reached $3.1 million, twice the FOMC’s estimate. The federal funds rate rose to 17 to 18%, far above the FOMC’s range and the highest rates ever recorded to that time... [T]he FOMC telephone conference chose to keep to the nonborrowed reserve path and allow the federal funds rate to stay at 15% or above. That meant that borrowing would remain high... The result was a shift back to an interest rate target, keeping the ceiling at 15% and satisfying the demand for reserves by permitting banks to borrow from the discount window at less than the market rate.” (Meltzer 2009b, p.1038)

The attitude change on the FOMC was apparent once despite the recession of 1980, it favoured slower money growth. However, although by March the discount rate was increased, the action was insufficient and late. Heavy borrowing continued because of the subsidy of around 4 percentage points. Banks could get profits obtaining reserves from the discount window and lending.

Twelve years after Friedman’s insistence on the effect of expectations, the Fed accepted that it could not permanently reduce unemployment by increasing inflation. It was now also claimed that low inflation increased employment. The recession of 1980 and the posterior decrease in the discount rate in July avoided that the credibility on the Fed augmented. Policy tightened sharply in the spring of 1981, when the FOMC continued to increase the federal funds rate despite the recession and the unemployment rate near 8% in the fall. Market participants recognized that the Fed was fighting inflation. Thus, credibility increased. This was a turning point. By October, CPI inflation decreased quickly. The speed of the fall surprised the Fed. In part, it was ameliorated by the dollar appreciation undergone from 1980 to 1985. In 1982, the FOMC finished targeting nonborrowed reserves, and Volcker clearly began to shift to an interest rate target. He did not trust on M1 anymore.

“On these money growth targets, in substance, I don’t care. I think either of these two sets of numbers [5.5 and 6.5%] will make no difference, virtually, in what we actually do... [W]e are within the limits of the growth targets anyway”. (Meltzer 2009b, p. 1114). “I, frankly, cannot live in these circumstances, given what is going on in the money markets, with violent moves in short-term rates in either direction. It would just be so disturbing in terms of expectations, market psychology, and fragility
that it’s just the wrong policy, period, during this particular period.” (Meltzer 2009b, p.1115)

Shortly later, Volcker targeted borrowing to around $500-$600 million, in order to prevent a raise in the interest rate. Thus, the System returned to the target used in 1920s and the basis for the free reserves target in the 1950s and 1960s. Policy became discretionary based on Volcker’s judgment. Despite inflation had decreased significantly by the end of 1982, it was still high and it created again skepticism about the Fed task in reducing it. In 1983-84, long-term rates increased again. As a consequence, inflationary expectations proxied for by bond rates replaced money as intermediate target. Later, Greenspan concerns and focus on shaping the expectational environment would turn Volcker’s experiment into a new monetary standard. A renewed rise in bond rates in the spring of 1984, tested Fed’s compromise to fight inflationary expectations. Again, in 1984, Morris pointed out that the differential between the federal funds rate and the discount rate was of 2 percentage points and borrowing had reached $1 billion. He proposed to increase the discount rate 1 percentage point but Volcker replied that it would mean “an explosion in Washington”. Thus, during these years, many increases in the discount rate did not arrive because of the pressure of the administration.

When Greenspan replaced Volcker in August 1987, he set a narrow band around a federal funds rate target, which was adjustable depending on inflation and stable growth. In 1987, there was another inflation scare due to the depreciation of the dollar.

4.2.4 1990-2007

After the recession in 1990, the FOMC followed a “soft recovery” strategy and Greenspan focused on reducing expected inflation by reducing bond rates rather than just focusing on them during inflation scares. However, concerns of inflation appeared in mid-1990 when Iraq invaded Kuwait and oil prices raised. Another inflation scare was faced in the beginning of 1993. However, the Fed kept raising the federal funds rate during the next months until February 1995. “By the end of the decade, financial market had stopped associating high real growth with a resurgence of inflation. The Fed had defeated the “bond market vigilantes””. (Hetzel 2008, p. 205). By 1998, falling unemployment rate and low inflation created
expectations about an increase in the federal funds rate. However, low world growth perspectives led to lower the federal funds rate. Thus, the FOMC exacerbated an unsustainable rise in equity prices. From mid-1997 through mid-1999, the FOMC changed its procedures and it raised rates when resource utilization rates were high. Greenspan believed that monetary policy should counter irrational expectations. He did not increase the federal funds rate again until February 2000 because he did not consider inflation as a threat. He believed that productivity growth was restraining inflation. As inflation and unemployment fell together after 1995, Greenspan explained:

“The lack of pricing leverage has once again concentrated the minds of business people on the need to increase productivity. . . [E]conomic experience appears to be running full circle, back to the early 1960s: a period of low-inflation and strong productivity growth. . .[L]ower inflation historically has been associated with faster growth of productivity. . . Lower inflation and inflation expectations reduce uncertainty in economic planning and diminish risk premiums for capital investment” (Hetzel 2008, p.231).

After the Asia crisis, the FOMC began to raise the federal funds rate. The equity market began its rise in 1995 until its peak in early 2000. After its peak, the NASDAQ began a prolonged fall in September 2000 and investors lost a significant amount of wealth. Growth rates of consumption fell and the economy weakened. In January 2001, the Fed decreased rates but it did it late and slow, thus, policy was contractionary by then. The characterization for the last years of the Greenspan era is that the FOMC pursued its basic expected inflation/growth gap procedures but raised its implicit inflation target from price stability to low inflation. In 2001, policy followed the lean-against-the-wind pattern, whereby the FOMC raises (lowers) the funds rate in a persistent, measured way if the economy grows above (below) trend.

4.2.5 Results

4.2.5.1 Impulse response analysis

For the impulse response functions analysis of this second period, I will only analyse the results obtained with the Del Negro and Primiceri’s algorithm with 1 lag. The results obtained with the K-P’s algorithm with 1 lag, are very
similar, but there are three variations\textsuperscript{10}. Thus, doubts arise as to whether the variation in the results obtained with 2 lags and the K-P’s algorithm\textsuperscript{11} are because of the new algorithm or the different number of lags. Therefore, I will claim certainty only over those results which are equal or akin regardless of the algorithm and lags used. They will be signalled with a star in order to recognize easily how reliable those results are.

Chart 2.1, apart from representing the Taylor rule with actual data and the federal funds rate, it also include a Taylor rule with forecasted values for output and inflation. That Taylor rule does not cover the whole period, as the data as been taken from Romer and Romer (2004). This exercise is carried out just to compare if there are significant differences between the actual and forecasted Taylor rule and to take into account whether those differences could have made the members of the Fed to apply certain policies, misguided by mistaken forecasts. Yet, it will not suppose any problem for the analysis here as to how the instruments of the Fed interacted with its targets or regarding the “good luck or good policy” debate, being both goals related. The reason is that for both analysis, only actual data works. That is to say, regardless of what the members of the Fed thought they were doing, actually, they did something, and the goal here is to discover if that something was a good or bad policy by its impact on the economy, not by how the decision was taken. Inevitably, if the Fed had the wrong data, it is likely that it applied a bad policy.

Looking at Chart 2.1, it is seen that from 1958 to 1970 the federal funds rate tracks the Taylor rule quite close. The discount rate and the federal funds rate are above inflation most of the time (Chart 2.2). Regarding the spread between both rates, there are two large gaps between 1965-66 and another one starting in the late 1968 until mid-1970. Since then, the Taylor Rule is above the federal funds rate during the whole decade, being quite close only in the end of 1972 and mid-

\textsuperscript{10} Appendix, section 2.1

\textsuperscript{11} One pattern observed in the results with this algorithm is that for the beginning of the sample, impulse responses figures show much greater or lower posterior means than for the rest of the period. It seems that priors from the invariant VAR of only 39 observations are having a more significant impact with the K-P’s algorithm, and the posterior mean for those first years is somehow distorted.
From 1973 to 1975 and from 1979 to 1981, according to the forecasted Taylor rule, the member of the Fed had wrong forecasts, which could have led them to not increase the federal funds rate enough. In Chart 2.2, it is observed that from the end of 1970 to mid-1972 the inflation rate is above the federal funds rate and discount rate, alternating these last two to be one above the other. From mid-1972 to end-1974, inflation is below the federal funds and discount rate, but in this case, the differential between both of them is getting larger and larger since the end of 1972. From end-1974 to mid-1977 the situation is similar to the one from 1970 to 1972. From mid-1977 to 1980, the federal funds rate is tracked quite close by the discount rate, but since end-1979 the differential between them becomes larger again. Most of the time during these last three years, both rates are above inflation. After 1980, the Taylor rule is below or close to the federal funds rate, and federal funds and discount rate are above the inflation rate, almost the entire decade, except for some short periods between 1980-82. Already in the beginning of the 1990s, the federal funds rate is below the Taylor rule, when inflation is above the discount and federal funds rate. Since 1994 the Taylor rule is below the funds rate until 2002, when inflation is below both rates and the spread between them is relatively narrow, but still positive. From there on, the federal funds rate is again below the Taylor rule except for a short period in mid-2006. These years the federal funds rate is below inflation until 2005 approximately. After 2005, it is above. Regarding the discount rate, it is mostly above inflation and the federal funds rate since the end of 2003. It is below inflation and the funds rate in 2002.

*The response of inflation to an F-D shock* (Figure 2.C) until 1968 is almost zero, coinciding with the period in which the spread between the rates is zero or negative. It is observed a small peak around 1960-61, when the federal funds rate is around the levels of inflation. Around 1968, when the spread becomes large the response is becoming more and more positive. This spread occurs when the Fed began to consider money growth as an indicator, and in order to maintain certain rates of growth, short-terms rates were allowed to increase. The funds rate began to decrease around the date in which Burns started to dislike those high rates as commented previously. It becomes less positive around mid-1972, just when inflation is below both rates and the discount rate was above the federal funds
rate. However, soon the response of inflation to an F-D shock has another positive peak until the end of 1974, when despite inflation being below the rates, the spread between them is quite large. Later, although inflation is above both rates, the discount rate is mostly above the federal funds rate until mid-1977. Since mid-1977, both rates are very close and above inflation until the end of 1979. This coincides with the impulse response function signalling a significant decrease in the positive response until that date. In the end of 1979, the response becomes more positive, just when the spread is becoming larger again, as well as in 1980-81, coinciding also with the periods in which sometimes inflation is above the federal funds and discount rate. This positive response is considerable reduced between 1981-82, when both rates are above inflation and at the same time, they are almost equal. Here is when the Fed applied tighter policies despite the recession. However, in the second half of 1982 and 1983-1984 the spread becomes large again and another positive peak emerges until the beginning of 1985. Since then, the response goes to zero and even negative for the period 1985-86, exactly when the spread is small or zero and both of them are above inflation. In the end of 1986, the spread began to be significantly large again, what explain the last positive peak, which lasts until 1990. However, this large spread does not have the same positive response as in the 1970s. Since 1990 the positive response begins to decrease until mid-1992 approximately. Since then, the response of inflation is negative until the end of the sample. It could be expected that at least in 2001 and 2002, or even 2003, the response of inflation was positive given inflation is above the discount and federal funds rate, or from 1994 to 2000, when despite not being large, the spread between the funds and the discount rate is positive. However, it does not happen.

After obtaining these results and encouraged by them, I discovered some literature which sheds light on the behaviour of F-D. In the Federal Reserve Bulletin of November 1994, Clouse (p.965), apart from supporting the fact that a larger spread led to higher borrowing and that that relationship was quite stable until 1980, given the failing-bank situation during the 1980s and 1990s, he says: “...changes became evident during the 1980s in the willingness of healthy institutions to turn to the discount window. Many banks apparently became more reluctant to
turn to the window for fear of provoking market concerns about their financial condition. The greater reluctance to borrow weakened the historical relationship between the discount borrowing and the spread of the federal funds rate over the discount rate”. Also, “This reluctance became acute during the economic downturn in the 1990-1991…” (Clouse 1990, p.969). Kasriel and Merris (1982) add that the Fed, before 1979, did not pay attention to the borrowed reserves and the relation between the discount window and funds rate. Pearce (1993) shows that the relationship between borrowing and the spread changed under different target regimes. Thus, from January 1975 to October 1979, under a federal funds rate targeting, there was a strong non-linear relationship between the spread and borrowing, by which a larger spread led to higher borrowing, but only up to certain extent\(^\text{12}\). From October 1979 to October 1982 under a nonborrowed reserve targeting procedure and a lagged reserve accounting, the relationship is weakened and the amount of borrowing decreased. Last, after October 1982, under a borrowed reserves targeting procedure and a contemporaneous reserve accounting, the relationship is even weaker and borrowing decline was more pronounced.

\[\text{The response of M1 to a F-D shock}^* \text{ (Figure 2.K) is very similar to last figure.}\]

Thus, for those years with an increase in the differential and the birth of new profitable opportunities, banks increased their borrowing and lending, increasing M1. Since 1986, as already commented, there is another large spread. However, as with F-D, now the response is not as positive as in the other cases\(^\text{13}\). For the first half of the 1990s, the response is similar to the period between 1958-1965. The common pattern here is that the federal funds rate and discount rate are relatively almost at the same level. Since 1995, when the spread is positive again, the response becomes more positive. Surprisingly, since 2003, although the discount rate is above the federal funds rate, and even above inflation since 2004, the response of M1 is becoming more and more positive.

\[\text{12 Peristani (1991) found an S-shaped pattern analysing the period 1959-1988. Thus, although the spread led to higher borrowing, when the difference was around 4\%, borrowing, hardly, if some, increased.}\]
\[\text{13 Figure 3.K (Appendix, section 3), shows even an initially negative response since 1985, although it turns positive shortly after.}\]
The response of M1 to an OMOs shocks* (Figure 2.J), as expected, has a positive effect for the entire period. The positive peaks occur when the federal funds rate and discount rate are at similar levels. This could signal that when the Fed observed low borrowing at the discount window, it purchased more in the open market, in order to control the federal funds rate. This hypothesis is reinforced by the response of F-D to an OMOs shock (Figure 2.M)\textsuperscript{14}, where the positive peaks coincide with periods of a small (positive or negative) or zero spread between rates. It seems that despite this pattern, the Fed extended its purchases a little more for the spread between 1969-1971. In 1990 the spread did not avoid the purchases of the Fed due to the recession, what roughly coincides again with Figure 2.J, in which it is observed a change since the 1980s, when despite having positive spreads in the periods 1986-1990 and 1994-2000, it seems that, likewise, the Fed purchased significantly in the open market. This would be related to the decrease in borrowing commented above in the literature about F-D.

The response of inflation to an OMOs shock (Figure 2.B) is negative until mid-1967 with the negative peak coinciding with the negative spread between 1960-1962. Thus, not only did banks prefer not to use the discount window, but also the Fed did not offset it by purchasing in the open markets. That could have contributed to decrease inflation. Since then, in line with the figures analysed previously, the positive peaks occur for those periods when the spread was large. This means that despite the banks were already borrowing, taking advantage of that spread, likewise, the Fed purchased (although, perhaps in a relative lower proportion than when the spread was zero or negative) in the open market, contributing even more to increase inflation.

All the results above would explain the response of inflation to a discount rate shock* (Figure 2.A), which is not what one would expect. Its response is negative until 1966, period in which the discount rate is either above or equal the Federal funds rate, and as it was seen, when the Fed did not compensate it with

\textsuperscript{14} Although, this effect is not clear, as the opposite reasoning could be applied when the model includes 2 lags (Figure 4.L and 4.M), OMOs impact is more likely to be capture with 1 lag. Hence, I consider the results with 1 lag more reliable in this case.
open market purchases. Since then, it becomes positive either because when the
spread is narrow or negative, the Fed offset the rises in the discount rate by
increasing its purchases in the open market (although in those cases the positive
response is reduced), or because when the spread was positive, the Fed
exacerbated the amount of borrowing at the discount window with more
purchases. This is also confirmed by Figure 2.I, where the response of M1 to a
discount rate shock* is positive for the entire period, pointing out that despite the
increase in the discount rate, M1 still was raising because of the purchases in the
open market.

Analysing the response of inflation to an M1 shock* (Figure 2.D), it is negative
almost for the whole period, not being the expected result. The negative peaks
(except for that between 1960-1962) occur some time after the maximums of the
federal funds rate. Hence, it is hiding some specification problem, because it seems
to be capturing the following: when there are maximums in the federal funds rate
(Chart 2.2), which normally coincide with large spreads, it is when M1 is in its
highest levels. Since then, rates are lowered but the higher supply of money is
already in the market, whereby, it is a matter of time that prices increase. When it
happens, money supply has already begun to decrease (this is what the model is
capturing here), as positive spreads have disappeared. Thus, the relationship M1-
CPI may need more lags to capture the right effect. Beyond that possible
explanation, the behaviour changes since mid-1998, and the response is initially
positive, although after 2 quarters, it goes to zero or slightly negative.

The response of IPI to an F-D shock* (Figure 2.G) is, for almost the entire
period, negative and proportional to the levels of the federal funds rate. The lowest
peaks coincide with the highest federal funds rates. This relationship appears to be
broken since the 1990s. For the discount rate shock (Figure 2.E), the response of
IPI is positive until 1965 and then, it becomes negative. Apparently, when the Fed
did not purchase in the open market during the first years of the period, despite
the spread was negative, the discount rate was not avoiding the growth of IPI.
Since then, as in the last figure, the negative peaks occur around the highest peaks
of the federal funds rate. For this case, however, the impact is not proportional as
in the last figure, since the beginning of the Volcker’s era. Regarding the response of IPI to an OMOs shock* (Figure 2.F) is initially negative but it becomes positive after 2 quarters until 1965. It is the same for the posterior periods, but now the initial response become more and more negative, and after 2 quarters, it hardly reaches positive values. The response for this impulse response is not the expected. Thus, either some misspecification of the model or some reasoning behind, which is not within my knowledge, could explain the negative response. The response of IPI to an M1 shock* (Figure 2.H) is initially negative, but after 3-4 quarters the response becomes positive, although this only starts to happen since 1966 approximately. Since then, the initial negative response diminishes until disappearing in the end of 1987. Those initial or belated positive peaks occur when the spread is almost zero or negative. Again, the initial negative response could be a delayed effect, pointing out the necessity of more lags, at least to capture the right behaviour of M1.

Last, the discount rate* shock to F-D (Figures 2.L) has a positive response for the whole period, showing that when the Fed increases the discount rate, the federal funds rate increases more in relation to the discount rate. The response of OMOs to a discount rate (Figure 2.N) shock is negative. This is in contradiction with what was argued regarding the simultaneous increases in both, the discount rate and open market purchases. Nonetheless, Figure 3.N shows a different behaviour, which is in line with that statement. Yet, I cannot claim certainty in this case.

Briefly, it is observed a change of regime around the beginning of the 1960s, when the Fed began to target the federal funds rate. The other change of regime, although not represented in the impulses responses of the instruments, but in the spread, is between 1980-1990. Since then, although the figures of the instruments mostly maintain their sign and shape, they happen under different circumstances to those analysed in the previous periods. The change in banking sector behaviour seems the most likely explanation.

4.2.5.2 Residuals

For the residuals of the IPI equation, it is observed an increase just at the beginning of the sample, which quickly disappears. From there on, the residuals
maintain roughly the same levels, being slightly higher in the 1970s and the first half of the 1980s. For the inflation equation, the residuals increase in the 1970s and the beginning of the 1980s. This is a period in which money growth or some type of reserves measure is targeted. The residuals decrease until 2000, to increase again until the end of the sample. For the M1 equation, the residuals start to increase in the second half of the 1970s, remain at roughly the same levels until 2005 and then, they rise again. While for the behaviour of IPI, external shocks could have determined the results at the beginning of the sample and slightly during the 1970s and part of the 1980s, residuals of the inflation equation show clearly that external shocks could have driven the results in the 1970s and since 2000. The same is applicable for M1. Bank reserves and behaviour, expectations, fiscal policies and political pressures are factors which are not in the model and could be potential factors influencing the results.

For the equations of the instruments of the Fed, also the 1970s seems a period in which external shocks could have influenced their behaviour, namely, the Fed was responding to other variables apart from IPI, CPI and M1. Likewise, there is a small peak around 2000, and the residuals of the OMOs and discount rate equation start to increase again since 2005. For the new variable F-D, around 1983-85, the residuals decrease significantly and they remain there until the end of the sample.

In conclusion, it seems that either changes on the targets of the Fed or/and expectations and behaviour changes of the private agents could be the ones showing up in the posterior mean of the deviation of the residuals. Therefore, they could be behind some of the observed regimes changes.

### 4.3 Counterfactual

It has been seen in the impulse response analysis that both instruments of the Fed, OMOs and the discount rate, have not had any regime switch through the second period, except for the first 7-10 years. However, the new variable created, F-D, seems to present a quite dynamic behaviour with inflation, IPI and M1. While it has been observed that during the 1970s, the difference between the discount rate and the funds rate was not managed adequately as it increased inflation, around 1990, the sign of the response in Figure 2.C is the opposite, negative. Hence, it
seems that policies did not change and it was the banking sector or other private agents that modified its behaviour. In order to support this hypothesis and discover whether or not, different policies were applied for both periods, in this section I carry out a counterfactual analysis. For that task, I have used the posterior mean of the average value of the parameters between 1995 and 1999, representing Greenspan’s policies, and the same between 1971 and 1977 for Burns’s policies. These values are used to simulate new values for the rest of the parameters and for the other periods of the sample. Thus, the new values obtained for the parameters can be interpreted as those which would have been observed, had those policies been applied for the rest of the sample. In this case, and unlike other works, which draws the average of the posterior distribution of the monetary policy rule equation, meaning, the federal funds rate equation, here I draw the average values for the OMOs, discount rate and F-D equations.

In this type of analysis, the Lucas’ critique arises as expectations and the behaviour of the private agents could have changed, had policies been modified at some point. However, given the Bayesian framework, in which policy is random and the model presents stochastic time variation of policy, the issue is hugely mitigated. Apart from that, I have included a new variable in the model, which is intended to capture expectations about inflation. A new posterior distribution will be created for this variable every time that I introduce the new averaged values of Greenspan and Burns’ policies. Thus, new expectations about inflations will be created for each counterfactual exercise. This new variable is inspired in Goodfriend (1993, pp.5-6), where he explains that the long-term yields should be a sum of the short-term rates with a variation, perhaps between two or three percentage points, plus the expected inflation. Thus, when long-term rates increase more than the short-term rates, it is because the expectations about inflation are higher. Consequently, the variable for inflation expectations is built as follow: Firstly, it is taken the difference of the short-term rate (3-months Treasury Bill rate) between period t and period t-1, and the same for the long-term rate (10-years government bonds yields). Once I have the difference of both rates, I use the difference of those two values. Now, I can measure when the long-term rate has increased or decreased more than the short-term rate, and hence, I can capture
inflation expectations. This variable is located in the fourth position of the VAR, before M1 and after F-D. As it was commented, for Volcker and Greenspan's mandate, they targeted long-term rates in order to control inflation.

The results obtained from this exercises are showed in the Figures 5.A (Greenspan counterfactual) and 5.B (Burns counterfactual). The responses of CPI to an F-D shock with Burns’s and Greenspan policies are very similar. It is observed that with Burns those positive values are more positive than with Greenspan’s policies, and those periods where the response is negative, Burns’s policies would have decreased inflation less. Apart from that, there is no significant difference between both figures and I cannot argue that there has been a change of policies since the 1980s or 1990s, despite Figure 2.C shows a change of regime for those years. For the rest of the impulse response analysis, figures are all almost identical for both counterfactuals. These results lean in favor of the “good luck” hypothesis. However, as it has been seen, it is likely that the change in banking behaviour is the reason of that “good luck”.

The same counterfactual was carried out with the period 1960-65, when Martin was the chairman of the Fed, but the results are alike, what casts doubts about the possible responsibility of the “good policy” hypothesis for that period.

5 What lessons can we learn?

Once the picture of monetary policy in U.S. for the last century has been taken, there are some recognizable patterns about the instruments of monetary policy and intermediate and final targets.

How does the discount rate work? For the interwar period it had a mixed effect on inflation. One of the reasons why the discount rate increased inflation is because it attracted more gold and consequently, the monetary base increased. The second reason depended on its position in relation to the levels of the call loans rate. From 1925 to 1930 the discount rate was below the call loans rate, what offered profitable opportunity for banks and could trigger an increase in money growth. From 1930 to 1939 the situation is just the opposite; the discount rate is above
short-term rates and it exerted deflationist pressures. However, in Figure 1.A, those deflationist pressures are only showing up from 1930 to 1934. Since 1934, the response of inflation to a discount rate shock, is initially positive, but becomes negative after 2-3 months, why? The dollar depreciation and inflows of gold determined the levels of inflation, counteracting the deflationist discount rate effect. A clear example of the deflationist pressures exerted by the discount rate and the influence of gold flows is that when the Fed sterilized gold inflows between December 1936 and April 1937, with the discount rate at the same level as short-term rates, deflation appeared again (Chart 1.1 and 1.2). Why was there deflation between 1927 and 1929, despite the discount rate being quite below the call loans rate? As in the example just exposed, the Fed was sterilizing gold inflows and impeding money supply to increase. In general, when the Fed did not sterilize them, the discount rate seems to have exerted a negative impact on inflation while being above the call loans rate, and inflationary pressures when it was below.

If we think of the discount rate as a tool to manage inflation, the Fed used it correctly in 1925 and from 1927 to the beginning of 1930, as they were period of deflation and the discount rate had a positive impact on inflation, while it was kept below the call loans rate (Figure 1.A). For 1926, the impact on inflation was positive, even though it was already around 4%. From 1930 to 1934, given the levels of deflation, the discount rate was mismanaged, as it should have been below the call loans rate and other short-term rates. Figure 1.A shows it was not contributing to increase inflation. Since 1934, the discount rate was having the right impact given the levels of inflation (except for the first half of 1937 and 1939), because although it could have contributed to attract more gold in the beginning, afterwards, it would have counteracted that effect. When those gold inflows were sterilized in 1937, the discount rate should have been below short-term rates, because with both forces acting at the same time, they exerted deflationist pressures (Chart 1.1 and 1.2). Regarding how the discount rate affected output, although initially the response of IPI to a discount rate is positive (Figure 1.E), it becomes negative after some months. It could be a delay in the transmission mechanism or the fact that the model only has two lags. In any case,
the discount rate was managed properly for IPI, as it did not decrease it during the years of recession (1928-1930 and 1937).

For the second period, except from 1958 to 1965, the discount rate is having a positive impact on inflation. As it was already commented, the positive peaks coincide with the largest spreads and with the periods in which the Fed purchased more in the open market. Thus, the level set for the discount rate was not restraining inflation, except in the beginning of the period. From 2004 to 2007, the discount rate is, as from 1958 to 1965, above the federal funds rate and inflation. However, the impact is still positive (Figure 2A). Apart from blaming the purchasing in the open market, the residuals of the equation of inflation and the discount rate undergo an increase during these last years. Hence, there may be some external shocks driving this positive effect. Regarding IPI, it has been seen that independently of the spread, increasing the discount rate reduced output (Figure 2.E) except for the first years, when the residuals of the IPI equation are high.

How does the spread between the short-term rate of reference and the discount rate work? In this case, this variable is directly related to the discount rate and the results obtained from both variables have to be used jointly, in order to determine what could have been or not a good policy.

From 1925 to 1930, when the difference between rates is positive, its impact on inflation is positive except from 1925, and from 1928 to the end of 1929 (Figure 1.C). This negative impact, beside of being influenced by the sterilization of gold inflows and the consequent fall in the monetary base, there is a possibility, as commented in section 3.2, that the call loans rate was too high during those years of deflation (Chart 1.1 and 1.2). Subsequently, the demand of money may have stopped because the economy could not endure those high rates. From 1930 to 1934, although the spread is negative, the response of inflation is positive because it is a period of deflation. Thus, had the discount rate been lowered or the call loans rate increased, profitable opportunities would have triggered more borrowing, lending and an increase in money growth. The same applies for the period 1934-1939, despite the levels of inflation. The reason is that inflation during those years
were been maintained positive because of the dollar depreciation and gold inflows, but once the Fed sterilized them as in 1936-37, deflation came back quickly. During most of the interwar period, the impact of the spread on output was initially positive, but it became negative later for many periods. What means that a decrease in the discount rate or increase in the call loans rate would have increased output initially given the profitable opportunities for banks. However, later, depending on other circumstances, the possible high rates would have reversed this positive effect. A proof of that, it is that the positive responses which did not turn negative in Figure 1.G, are those happening with positive spreads. As before, it also could be a delay in the transmission mechanism or the fact that the model only has two lags.

Summarizing, the spread between rates results show that it was being correctly applied since 1934, except for those years of deflation in 1937 and 1939. Thus, although the discount rate was correctly used in 1925 and from 1927 to the end of 1929, the rates were high given the deflation levels, and the spread could not exert inflationary pressures (Together with the gold sterilization, which is not proved here). Consequently, both variables analysed jointly, show only good policies, by the moment, for 1935, 1936 and 1938.

For the second period, without the gold influence, the impact of this variable is much clearer. Thus, when the spread was large, the impact on inflation was positive, even though most of the time, inflation was already considered high. Those periods in which both rates were below inflation but the discount rate was above the federal funds rate, the positive effect was diminished. Why from 1995 to 1998 when the spread is positive, its impact is negative? Why the positive response in the mid-1980s is lower despite the spread being larger than in past occasions? A change in private agents behaviour is likely to be triggering that banks did not take advantage of this spread, according to the authors exposed above. Regarding the impact of the spread on output, it seems that as the federal funds rate increased, regardless of its difference with the discount rate, it had a more negative impact on IPI.
Summarizing and complementing with the discount rate results, it seems that up to now, only, although not sure, between 1958 and 1965 good policies may have been applied, as the spread was no contributing to increase inflation.

How do OMOs work? For the interwar period OMOs increased IPI and M1 (Figures 1.F and 1.J). For inflation, although initially positive, OMOs had a negative impact after 2-3 months. From 1927 to 1930, the response of inflation was totally negative. Given the levels of deflation for the interwar period, I can conclude that OMOs were not correctly administrated because they did not help to overcome those deflationary periods. For the rest of the interwar period, purchases were not enough either in quantity or in length of time and, as seen in Figure 1.B, and their effects were ephemeral. Since 1934, OMOs were hardly used. For the second period, a shock to OMOs has mostly a positive impact on inflation and M1 (Figures 2.B and 2.J), but just the opposite for IPI (Figure 2.F). For the two first cases, the positive peaks occur when the spread is large. As commented above, the Fed exacerbated the increase in inflation for those periods in which borrowing was high because of the large spread, by providing banks with more reserves. Also, when borrowing was scarce, the Fed provided more reserves by purchasing in the open market. In both cases, the goal was to accomplish the interest rate targeted. As explained in section 3.2, the Fed could have been providing reserves without the only limit of the demand of money, not being able to restrain it when it was necessary. The clearest proof is seen during the 1970s, although is not the only one.

For the interwar period, comparing the Taylor rule with the results interpreted here as good or bad policies, the Taylor rule in any moment is followed by the discount rate or the call loans rate (Chart 1.2), pointing out that policy was wrong for the whole period. The results presented here only support the good policies of the Fed for 1935, 1936, first half of 1937 and 1938, if looking at the discount rate and its spread with the call loans rate, but adding the conclusions for OMOs, the fact that the Fed was inactive for those years being relegated to the backseat and that the gold inflows were helping to increase the money supply despite the restrictive policies of the Fed as claimed by Friedman and Schwartz (1963) and
Orphanides (2004b), I coincide entirely with the Taylor rule in supporting the bad policy hypothesis.

For the second period, whereas the Taylor rule signals good policy for the 1960s, 1980s, most of the 1990s and 2000, 2001 and 2005, the conclusions reached from the results above, coincide with the Taylor rule, perhaps, only for the first half of the 1960s. The results cast doubts about the good policy hypothesis for those years. They support the bad policy for the second half of 1960s, the 1970s and the first half of the 1980s, although these periods undergo an increase in the standard deviation of the residuals and bad luck could be part also of those results. From approximately the end of the 1980s to the end of the sample, since the counterfactual shows that the Fed did not change its policies, but the results offer a regime switch in the spread, the good luck hypothesis applies. Notwithstanding, it is likely that the cause of that good luck is the different behaviour of the banking sector.

Unlike Primicery (2005), who only uses unemployment, inflation and the federal funds rate in its model, I have included the instruments of the Fed and the spread between rates. He concludes that the change in policies is not different between periods pre- and post-Volcker, and any regime switch is observed. According to the counterfactual I obtain the same conclusion, however, I do observe a regime switch with my new variable.

Leaving the good policy good luck debate, the results observed with the new variable could disentangle a problem that has been in the literature for years. Apparently, many authors have obtained that a shock to the federal funds rate has, at least initially, a positive response of inflation. It has been argued that missing variables and the consequent lack of information in VARs are the consequence of that called “price puzzle”. According to the results obtained here, it has been seen that most of the increases in the federal funds rate were accompanied by large spreads in relation to the discount rate. This fact led to an increase in money growth and inflation. Hence, there may not be price puzzle, but a real positive relation between the increase in the federal funds rate and inflation, given the existence of that spread.
6 Conclusions

This paper has intended to be a first step in order to comprehend, up to certain extent, the interaction between the instruments of the Federal Reserve and its intermediate and final targets, from the early creation of the Fed to the period before the Great Recession. Further, this paper also intends to contribute to the “good luck or good policies” debate. For that task, a TVC-BSVAR as been used, applying the algorithms already used in Primiceri (2005) and Koop and Potter (2011). In order to have a better understanding of the results obtained, they have been contrasted with a narrative review of the history of the Federal Reserve.

Summing up, the results obtained from the impulses response functions analysis and the standard deviation of the residuals, which have been complemented with a counterfactual exercise and the narrative review, show that the Fed was following bad policies during the interwar period. For the second period, the results cast doubt about the good policy hypothesis for the beginning of the 1960s. The bad policy hypothesis applies from the second half of the 1960s to the mid-1980s (although the bad luck hypothesis could be contributing as well). Since then, although the results support the good luck hypothesis, it seems that a change in the behaviour the banking sector could have been the responsible for that good luck. Yet, that change in behaviour could have been triggered by some actions of the Federal Reserve, but the model is unable to capture it. These results, although far from being conclusive, present strong arguments regarding the relation among the discount rate, the federal funds rate, OMOs and inflation. Increasing the federal funds rate is not enough to decrease inflation. The increase in the funds rate should be accompanied by discount rate increases, avoiding positive spreads, as they will provide profitable opportunities for banks and consequently, the increase in borrowing and monetary base. In addition, purchasing securities during the periods of positive spreads exacerbated the increases in inflation. This fact could be the cause of the “price puzzle”. In the case of aiming to reduce output, indeed, it is sufficient with increasing short-term rates.

These results leave open questions for future research. Which is the role of the banking sector in transmitting the monetary policies carried out by the Fed
into the real economy? Could bank expectations and knowledge determine the impact of monetary policy regardless of the Fed intentions and to what extent? Should we change the federal funds rate as intermediate target? If so, which would be the price of such change? And last, seen the importance of the gold flows for the interwar period or the possibility that fiscal policies could have driven partially the results during the 1970s, is it that monetary policy can easily lose relevance and its extent of impact before the influence of other factors or it was simply that monetary policy was mismanaged?
References


FIGURES 1/PERIOD 1 (Koop and Potter algorithm) 2 lags

Impulse response of CPI inflation:

1.A

CPI RESPONSE TO DISCOUNT RATE SHOCK

1.B

CPI RESPONSE TO OMOs SHOCK
Impulse response of IPI

1.E

IPI RESPONSE TO DISCOUNT RATE SHOCK

1.F

IPI RESPONSE TO OM0S SHOCK
Impulse response of M1:

1.1

M1 RESPONSE TO DISCOUNT RATE SHOCK

M1 RESPONSE TO OMOs SHOCK
Impulse response of C-D:

1.K

M1 RESPONSE TO C-D SHOCK

1.L

C-D RESPONSE TO DISCOUNT RATE SHOCK
1. M

Impulse response of OMOs:

1. N
Posterior mean of the deviation:

1.0

1.1P
FIGURES 2/PERIOD 2 (Del Negro and Primiceri algorithm) 1 lags

Impulse response of CPI inflation:

2.A

CPI RESPONSE TO DISCOUNT RATE SHOCK

2.B

CPI RESPONSE TO OMOs SHOCK
2.C

CPI RESPONSE TO F-D SHOCK

2.D

CPI RESPONSE TO M1 SHOCK
Impulse response of IPI:

2.E

2.F
Impulse response of M1:

2.1
2.K

Impulse response of F-D:

2.L
2.M

Impulse response of OMOs:

2.N
Posterior mean of the deviation:

2.0

Posterior mean of the standard deviation of residuals in Industrial Production Index equation

Posterior mean of the standard deviation of residuals in Inflation equation

Posterior mean of the standard deviation of residuals in M1 equation

2.0

Posterior mean of the standard deviation of residuals in F-D equation

Posterior mean of the standard deviation of residuals in OMOs equation

Posterior mean of the standard deviation of residuals in Discount rate equation
FIGURES 2.1/PERIOD 2 (Koop and Potter algorithm) 1 lags

2.1.B

CPI RESPONSE TO OMOs SHOCK

2.1.E

IPR RESPONSE TO DISCOUNT RATE SHOCK
FIGURES 2.1/PERIOD 2 (Koop and Potter algorithm) 2 lags
Impulse response of CPI:

3.A

CPI RESPONSE TO DISCOUNT RATE SHOCK

3.B

CPI RESPONSE TO OMOs SHOCK
3.C

CPI RESPONSE TO F-D SHOCK

3.D

CPI RESPONSE TO M1 SHOCK
Impulse response of IPI:

3.E

3.F
Impulse response of M1:

3.1

M1 RESPONSE TO DISCOUNT RATE SHOCK

3.1

M1 RESPONSE TO OMOs SHOCK
Impulse response of F-D:

3.K

F-D response to discount rate shock

3.L
Posterior mean of the residuals:

3.0

3.0

Posterior mean of the standard deviation of residuals in Industrial Production Index equation

Posterior mean of the standard deviation of residuals in Inflation equation

Posterior mean of the standard deviation of residuals in M1 equation

3.0

Posterior mean of the standard deviation of residuals in F-D equation

Posterior mean of the standard deviation of residuals in OMOs equation

Posterior mean of the standard deviation of residuals in Discount rate equation
FIGURES 4 – COUNTERFACTUAL

4.A

CPI RESPONSE TO F-D SHOCK (GREENSPAN)

4.B

CPI RESPONSE TO F-D SHOCK (BURNS)
CHART 1.1

Short-term rates and CPI inflation

- Discount rate
- Stock exchange call loans rate
- Bankers' acceptances rate
- 3M T-Bills
- CPI YoY
CHART 2.2

*Federal funds rate vs. Inflation*

- **Discount Rate**
- **Federal Funds Rate**
- **CPI Inflation**