Testing for the borrowed credibility hypothesis: Theory and evidence from the French disinflation strategy

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Abstract

This paper examines the credibility effect of the “hard franc” disinflationary policy implemented in France since 1983 on inflationary dynamics by means of a Square Root Kalman Filter approach. An interesting aspect of the analysis is the evidence that the “hard franc” policy had a significant impact on inflation persistence. Our results confirm the borrowed credibility hypothesis according to which the French authorities accelerated the disinflation process by importing German monetary policy credibility through the “hard peg” of franc-DM exchange rate.

Jel Classification :

Keywords : Franc fort, Inflationary Dynamics, Square Root Kalman Filter

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1. Introduction

The effectiveness of stabilization policies depends on the role of credibility factors. When rational private agents view the policymakers commitment to disinflating as credible, then expectations of lower inflation will quickly affect wage and price-setting behavior, reducing rigidities that characterize the inflationary process. Since inflationary expectations have a significant effect on current wage and price decisions, a reduction in the actual inflation may result[1]. In this context, the degree of inflation persistence or, put differently, the speed of disinflation can be viewed as an indicator of credibility because a speedier disinflation may be a visible sign of the seriousness of the authoritie commitment to disinflating.

The empirical literature pertaining to the effectiveness of regime changes on inflation persistence is expanding. Agénor and Taylor (1992) examine the existence of a credibility effect in the Cruzado stabilisation program implemented in Brazil in 1986. The results suggest that although the Cruzado Plan seems to have gained credibility rapidly, its impact on the inflationary process was less dramatic. Drazen and Masson (1994) show how the persistent unemployment effects of maintaining a fixed parity may lower rather than increase the credibility of a commitment to no devaluation in subsequent periods. Karfakis, Sidiropoulos and Trabelsi (2000) investigate the size and the diffusion effect of credibility factors of the stabilization program implemented in Greece in 1985. The results show that the Plan gained credibility rapidly, and its impact on inflationary dynamics was significant.

The socialist experience in France under the Presidency of Francois Mitterand had strong adverse effects, mostly because it increased labour costs, causing more inflation in the short run and less growth and an increase in the equilibrium rate of unemployment in the long run. The government reacted to that situation by expanding monetary and fiscal policies with the intention of pulling the economy out of recession. However, the situation was deteriorating. Inflation was running at 9%, the current account deficit deteriorated and France was forced to devaluate its currency three times between October 1981 and march 1983, and the unemployment rate was increasing. In the end, the socialist government was forced to change its policy. For the next few years, economic policy was aimed primarily at reducing inflation by pegging the franc to the D-mark. The “franc fort” policy was accompanied by an

[1] The imperfect credibility of disinflation programs depends on a variety of sources. First, the program itself may be internally inconsistent; that is not in line with other policies being pursued simultaneously. Second, the lack of credibility may also be associated with the reputational aspects of policymakers themselves (Barro and Gordon, 1983). The third aspect which relates to policymakers’ interactions with private agents emerges as a result of incomplete or asymmetric information about the ‘true’ intentions of the authorities’ commitment to disinflate.

austerity program which froze public spending and raised taxes in an attempt to achieve fiscal consolidation, and by structural policies aimed at improving market mechanisms. The commitment to a strong franc was reaffirmed by the conservatives, who were in power between 1986 and 1988, and further reasserted by the socialists when they returned to power in May 1988. By the end of the1980s, inflation came down to the level of its European Union partners, while unemployment remained high despite the high rates of growth. Although the reputation of the strong franc exchange rate policy was established, the high level of unemployment created a legitimate concern about its sustainability. Thus, agents feared that the government would eventually devalue the franc to mitigate the high costs of unemployment, and this led to a rise in interest rate differentials.

The purpose of this paper is to add to the literature by examining the size and the diffusion effects of the credibility factors of a tough policy (maintaining a fixed parity) in France on inflation persistence, by means of a Square Root Kalman Filter methodology. We argue that the relationship between long term interest rate differentials (taken as a measure of the credibility of the policy of fixed parities) and inflation persistence should change over time, since mounting unemployment in conjunction with the absence of a realignment was seen as lowering the credibility of the exchange rate policy which eventually affected the inflation dynamics.

The rest of the paper is organized as follows. Section 2 presents an overview of the French disinflation program. Section 3 sets up a game theoretical model for monetary policy in a two country framework. In Section 4 we discuss how the credibility variable is related to the exchange rate policy and present the econometric methodology used to estimate the effects of the "hard franc" exchange rate policy on the inflationary dynamics. Section 6 presents the results of the empirical analysis. Section 5 summarizes the main conclusions of the paper.

2. Overview of the French disinflation program

The French disinflation program, introduced after the third devaluation of the socialist government in March 1983, was aimed primarily at fighting inflation, running at 8% during that period. This disinflation program, called "competitive disinflation", consisted primarily of pegging the franc/mark exchange rate and importing credibility from a low inflation country, Germany (see, Blanchard and Muet, 1993; Cohen and Wyplosz, 1991). The harder the peg, the longer is the period of real appreciation of the franc and the faster the disinflation process and the convergence to the German inflation rate. In addition, over the last decade, French authorities have followed increasingly rigorous monetary and fiscal policies. Finally, this macroeconomic policy was accompanied, on the one hand, by structural policies aimed at improving market mechanisms and, on the other hand, by institutional changes aimed to improve the independence of the Central Bank and, consequently, the credibility of French monetary policy.

Figure 1 : Monthley Inflation Rates in %

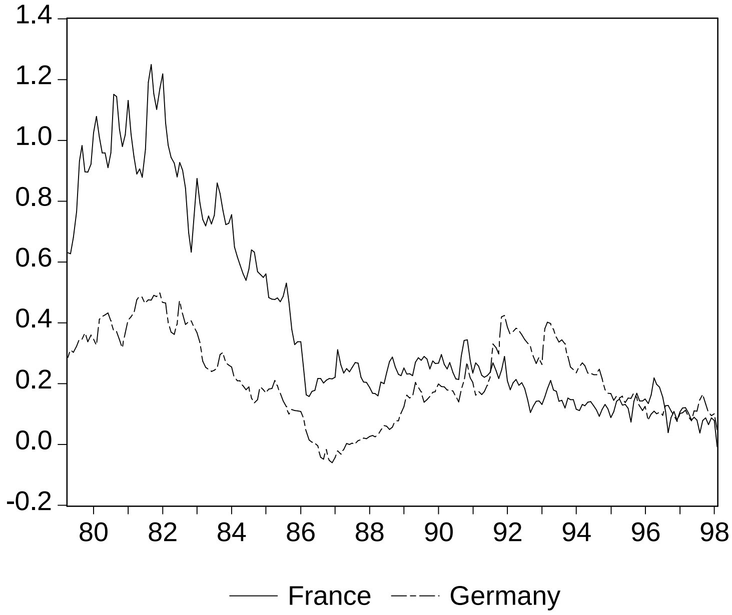
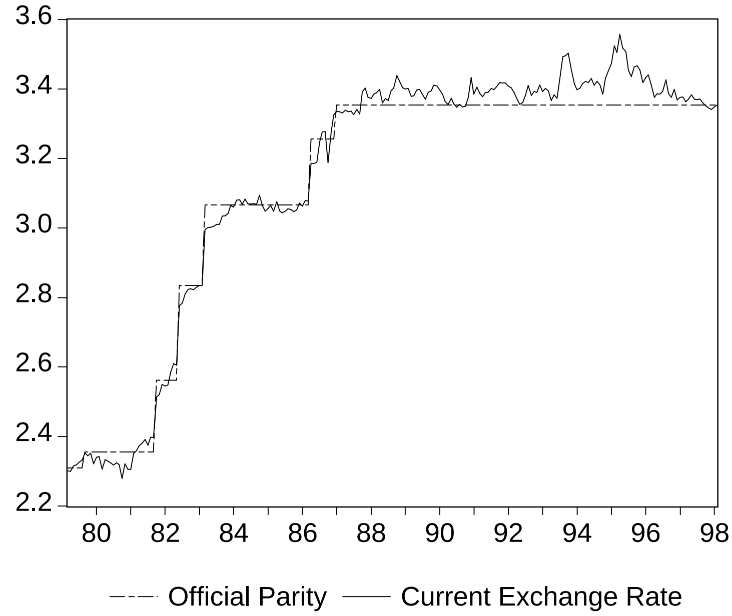


Figure 2 : D-Mark Exchange Rate of the French Franc



As we can see from Figure 1, inflation declined by mid-1980s. From 1986 to 1988, these disinflation gains were consolidated. Despite the two corrective devaluations, which used to offset partly the effects of past inflation differentials (Figure 2), the commitment to a low inflation and fiscal austerity remained the principal rule for the French government. As inflation started to decline, long-term interest rate differentials between the franc and the mark fell steadily and by the end of the period were eliminated (Figure 3). In the light of this evidence, we try to demonstrate theoretically and empirically that the *“borrowed credibility”* hypothesis, according to which the French authorities have accelerated the disinflation process by importing German monetary policy credibility through the “hard peg” of the franc/mark exchange rate, can indeed be confirmed.

3. Theoretical analysis

3.1. A model of monetary policy in an open economy

To formulate an integrated model that provides one possible explanation for the previously mentioned time-series characteristics of the French inflation data, we propose a reduced-form macroeconomic model in a two-country framework: a non hard-currency country (France) and a hard-currency country (Germany). For our purposes, it is suitable to consider a standard one-period model of credibility problems (cf. Kydland and Prescott, 1977; Barro-Gordon,1983). In the non hard-currency economy, the log of output y_t is given by a standard Lucas supply schedule:

$$y_t = \bar{y} + a(p_t - E_{t-1}p_t) + u_t , \qquad a > 0 \tag{1}$$

where $\bar{y}$ denotes the natural real output, p_t is the actual inflation rate, $E_{t-1}p_t$ is the rationally expected inflation by private sector, E is the expectation operator, and u_t a supply-side shock which is assumed to follow a random walk with drift:

$$u_t = g + xu_{t-1} + e_t , \qquad e_t \sim N[0, (1 - x^2)s_u^2 I] \tag{2}$$

where g is the average rate of output growth [2], the parameter x $(x > 0)$ determines the degree of autocorrelation in shocks and e_t is a normally distributed shock with zero mean and a variance of e_t varying with x so as to standardize the variance of u at s_u^2. The model is closed by introducing a stochastic version of the purchasing power parity condition:

$$p_t = e_t + p_t^* + h_t \tag{3}$$

where e_t is the rate of nominal exchange rate depreciation, p_t^* is the inflation rate of the hard-currency country, and h_t is a mean-zero shock with variance s_h^2. The inflation rate of the reserve currency country, p_t^* is assumed to be known when the private sector in the non-reserve currency country sets the expected inflation rate, $E_{t-1}p_t$, while h_t is not [3].

The aim of the non hard-currency country authorities is to minimize deviations of output, inflation rate and exchange rate depreciation from their target levels. The target level for output is assumed to be above the natural rate ($\hat{y} = k\bar{y} > 0$ with $k > 1$) reflecting the presence of some fixed distortions in the economy (e.g, labor market inefficiencies or deadweight loss of taxation), while the target levels of inflation and exchange rate depreciation are set equal to zero. Therefore, the loss function of the policymakers in the non hard-currency country takes the following form:

$$L_t = \frac{1}{2}\left[p_t^2 + l\,(y_t - \hat{y})^2 + f\,e_t^2\right] \tag{4}$$

where the parameters l ($l > 0$) and f ($f \geq 0$) reflect the policymaker's relative concern respectively for the output and the exchange rate variability. When f increases, then the policymakers of the non hard-currency country place a greater relative weight on exchange rate stabilization. Under a system of pegged exchange rates, the parameter f will be large and thus the third term of equation (4) will dominate the other two terms. Under floating

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[2] For simplicity, we assume that g is equal to zero.

[3] According to Berger et al. (2001), the shock h_t may be viewed as a change in the world relative demand for domestic goods, as a stochastic part of the monetary policy in the reserve currency country, or as a broad term for reserve country's business cycle spillovers onto the non hard-currency country.

rates, the nominal exchange rate is free to adjust, so that $f = 0$. Substituting equations (1) and (3) into equation (4) yields:

$$L_t = \frac{1}{2}p_t^{\,2} + \frac{l}{2}\left[\bar{y} + a\,(p_t - E_{t-1}p_t) + u_t - k\bar{y}\right]^2 + \frac{f}{2}(p_t - p_t^{*} - h_t)^2 \qquad (5)$$

where the last term denotes the costs of deviation of the non hard-currency inflation rate from the inflation rate of the hard-currency country. A pegged exchange rates system (i.e., a high value of f) induces policymakers in the non hard-currency country to choose an inflation rate close to the hard-currency country inflation rate, p_t^{*}. In the opposite, under floating rates, there is no cost to deviating from the hard-currency country inflation rate, since the exchange rate is free to adjust.

Consider now a one-shot Nash equilibrium. Inflation expectations are formed in the beginning of the period as private agents sign nominal wage contracts and before the occurrence of the current-period shock u_t. Subsequently, the economy is hit by shock u_t and thereafter, the authorities conduct monetary policy after observing the realizations of the shock. The hard-currency country is unconstrained by the pegged exchange rates and chooses its inflation rate as if it were a closed economy. For simplicity, in the following we assume that the hard-currency country chooses $p_t^{*} = 0$. On the other hand, the authorities of the non hard-currency country choose their inflation rate by minimizing the loss function (5), taking $E_{t-1}p_t$ and u_{t-1} as given, and after observing e_t. We obtain:

$$p_t = \frac{a\ l\,(k\bar{y} - xu_{t-1})}{1 + f + l\,a^2} + \frac{l\ a^2 E_{t-1}p_t}{1 + f + l\,a^2} - \frac{a\ l\ e_t}{1 + f + l\,a^2} + \frac{f\,h_t}{1 + f + l\,a^2} \qquad (6)$$

The private sector's inflationary expectations are determined by taking the mathematical expectation of equation (6). This yields

$$E_{t-1}p_t = \frac{a\ l\,(k\bar{y} - xu_{t-1})}{1 + f} \quad , \qquad (7)$$

where private sector is assumed to expect the shock u_t in time t using information about the observed shock in the previous period [4]. Substituting equation (7) into equation (6), the time-consistent rational expectations equilibrium is found as

$$p_t = \frac{a\ l\,(k\bar{y} - xu_{t-1})}{1+f} - \frac{a\ l\ e_t}{1+f+l\,a^2} + \frac{f\,h_t}{1+f+l\,a^2} \qquad (8)$$

where the equilibrium inflation rate in each period is determined by four factors: $a\,l\,k\bar{y}/(1+f)$, the permanent inflationary bias due to the discretionary policy which is decreasing with f; $a\,l\,e_t/(1+f+l\,a^2)$, the part of inflation due to output stabilization in the present period; $a\,l\,xu_{t-1}/(1+f)$, the temporary inflationary bias due to past stabilization policy, and $fh_t/(1+f+l\,a^2)$, the part of inflation due to the stabilization of changes in the stochastic part in the hard-currency country's monetary policy.

3.2. Inflation dynamics

The model provides an explanation for the influence of the choice of the exchange rate regime on the inflation dynamics through its influence on the inflation persistence. Using equation (8) and the fact that from equation (2) $xu_{t-2} = u_{t-1} - e_{t-1}$, yields :

$$p_{t-1} = \frac{a\ l\,(k\bar{y} - xu_{t-1})}{1+f} + \frac{f\,h_{t-1} - a\ l\ e_{t-1}}{1+f+l\,a^2} - \frac{a\ l\ e_{t-1}}{1+f} \qquad (9)$$

From equations (8) and (9), the covariance of p_t and p_{t-1} [5]

$$\mathrm{cov}(p_t, p_{t-1}) = E[(p_t - \bar{p})(p_{t-1} - \bar{p})] = x\left(\frac{a\,l}{1+f}\right)^2 s_u^2 \qquad (10)$$

[4] The presence of the variable u_{t-1} in equation (7) shows that equation (2) is a convenient way of capturing inflation persistence in this model. A similar way is also used by Bleaney (2001). For alternative approaches, to inflation persistence, see Alogoskoufis and Smith (1991) and Agenor and Taylor (1992).

[5] For simplicity and without loss of generality, we assume here that supply and demand shocks have the same variance, $s_u^2 = s_h^2$ and the shocks are non correlated, $E(u_{t-1}e_{t-1}) = E(e_t e_{t-1}) = E(h_t u_{t-1}) = E(h_t e_{t-1}) = 0$.

where $\bar{p}$ is the unconditional mean inflation, which amounts to $\bar{p} = l\,a\,k\,\bar{y}/(1+f)$. Thus, a higher preference of authorities for a system of pegged exchange rates (higher f) reduces the average inflation rate. The unconditional variance of p_t is :

$$\mathrm{var}(p_t) = \left[x^2 + \frac{(1+f)^2(1+x^2)}{(1+f+l\,a^2)^2} + \frac{f^2(1+f)^2}{(a\,l)^2(1+f+l\,a^2)^2}\right]\left(\frac{a\,l}{1+f}\right)^2 s_u^2 \qquad (11)$$

Finally, using equations (10) and (11), the correlation coefficient r between p_t and p_{t-1} which measures the degree of inflation persistence (i.e., $p_t = r\,p_{t-1}$) is given by [6]

$$r = x\left\{x^2 + \frac{(1+f)^2\left(f^2+(a\,l)^2+(1-x^2)\right)}{(a\,l)^2(1+f+l\,a^2)^2}\right\}^{-1} \qquad (12)$$

As can be inferred by equation (12), the value of the parameter f affected by the non hard-currency country authorities to the exchange rate stabilization is connected to the degree of inflation persistence r. Taking the first derivative of r with respect to, f in equation (12), we obtain:

$$\frac{\partial r}{\partial f} = -\frac{2(1+f)\left\{f^3 + f(1+2f)(1+l\,a^2) + a^4 l^3(1-x^2)\right\}/(a\,l)^2(1+f+l\,a^2)^3}{\left\{x^2+(1+f)^2\left(f^2+(a\,l)^2+(1-x^2)\right)/(a\,l)^2(1+f+l\,a^2)^2\right\}^2} < 0 \qquad (13)$$

This result suggests that the choice of a more constraining exchange rate regime (or a hard peg) by the authorities of a non hard-currency country vis-à-vis to a hard-currency (i.e., the higher parameter f) tends to reduce the degree of inflation persistence (i.e., the lower parameter r) leading to a speedier disinflation process. Consequently, the decrease of r may be interpreted as an indicator of credibility because the speedier disinflation is a visible sign of the seriousness of the authorities commitment to desinflate.[7]

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[6] In other words, $r_{p_t, p_{t-1}} = \mathrm{cov}(p_t, p_{t-1}) / \mathrm{var}(p_t)$

[7] An extensive literature emphasizes also that the credibility is a key ingredient reducing the costs of disinflation. See, Boschen and Weise (2001).

4. Econometric Methodology

In this section, we will present the econometric methodology used to estimate the credibility effects on the degree of inflation persistence. In a first step, we explain our choice of the variable which will be taken as a measure of credibility, and then we present the estimation process of the degree of the inflation persistence with varying coefficients using a square root iterative Kalman filter approach.

4.1. Estimating the credibility variable

Since long-term interest differentials are influenced by private agents' expectations regarding current and future economic policies, we use the interest differential relative to Germany as a measure of the perceived credibility of France's pledge to maintain a fixed parity against the mark. Let $R_{t,n}$ and $R^*_{t,n}$ be respectively the French and German long term interest rate in period t on an asset which matures in period $t+n$. Then, according to the expectations theory of the term structure, $R_{t,n}$ equals a weighted average of the current and anticipated short term interest rates; that is

$$R_{t,n} = (1/n)\sum_{i=0}^{T} E_t r_{t+i} \tag{14}$$

Assuming that the uncovered interest parity ($r_t - r^*_t = E_t \Delta e_{t+1}$) holds, we obtain :

$$R_{t,n} - R^*_{t,n} = (1/n)\sum_{i=0}^{T} E_t (r_{t+1+i} - r^*_{t+1+i}) = (1/n)\sum_{i=0}^{T} E_t \Delta e_{t+1+i} \tag{15}$$

This expression shows that the long term interest rate differential is driven by the expected exchange rate changes which are then determined by the spread between the current exchange rate and the official parity. If an overvaluation of the franc is perceived by the agents as not being credible in the face of an accumulated loss of competitiveness as occurred in January 1987 or an increase in unemployment, exchange rate expectations are revised upwards, leading to an increase in the expected domestic inflation rate which is reflected in the interest rate differential. Consequently, the long term interest rate differential (reported in

Figure 3) embodies information about the credibility effects conveyed by the observed seriousness of the authorities commitment to desinflating.

Figure 3 : Long-Term Interest Rate Differential

4.2. Estimating the inflation dynamics

Having determined the long term interest rate differential as the proxy of the credibility variable, we model the inflation process as follows:

$$p_t = ?_t \, p_{t\text{-}1} + c + u_t \;, \qquad u_t \sim N(0, s_u^2) \qquad (16)$$

$$r_t = g r_{t\text{-}1} + d \, C_t + v_t \;, \qquad v_t \sim N(0, s_v^2) \qquad (17)$$

where we assume that the inflation rate, p_t, is driven by AR(1) process and the time-varying coefficient of inertia, r_t, is driven by a ARX(1) process, c is a constant term and $C_t \left(\equiv -(R_t - R_t^*)\right)$ is the credibility variable. Equation (16) represents the measurement equation and equation (17), the transition equation. According to the theoretical model presented in Section 3, the higher credibility is, the lower is the persistence effect and thus the coefficient d is negative. In other words, the persistence coefficient r_t should fall after the implementation of the program. To estimate the time-varying parameters of the above model, we use an algorithm which solves the numerical problems affecting the standard

Kalman filter algorithm and the related information filter and smoothing algorithms (see, Carraro and Sartore, 1987). This algorithm uses a square root method and an iterative framework where information and covariance filter and smoothing are sequentially run. The square root iterative algorithm includes three blocks related to covariance, information and smoothing filters. The structure of the filter includes the following steps:

i. Choose initial values for r_0, s^2_u, s^2_v

ii. Run the square root information filter for *n* observations.

iii. Run the covariance filter from *n+1* to *T*, with initial conditions determined by the previous steps.

iv. Run the smoothing filter from *T* to *0* to obtain $\{r_{t/T}\}_{t=1}^{T}$, the residual sequences $\{\hat{u}_t, \hat{v}_t\}_{t=1}^{T}$ and estimates of the initial conditions r_0 and P_0, where P_0 is the covariance matrix of the initial state vector ($r_{0/-1}$).

v. Use the estimated values of r_0, P_0, s^2_u and s^2_v to run the covariance filter.

Then iterate the previous steps (iii-v), until the algorithm converges.

5. Empirical Analysis

The empirical analysis is carried out using monthly data on domestic and German consumer prices, and domestic and German long-term bond yields over the period 1979(3)-1998(2). The ML estimates of the relative inflation model (16-17) are reported in Table 1. The results indicate that the credibility variable is positive and statistically significant, suggesting that a decrease in credibility (i.e. a rise in interest differentials) increases the degree of persistence of the inflationary process. Figure 4 shows the behavior of the inflation persistence coefficient r_t. The coefficient peaked in the early part of the EMS, reflecting the strong expansionary policies followed by the socialists and the lack of commitment to a fixed parity. Thereafter, the persistent coefficient reversed its upward trend and started to decline gradually for the rest of the period, reflecting the effectiveness of the strong franc policy. In turn, following Drazen and Masson (1994), we split the sample period into four sub-periods. The first one ending in 1982, the second one extending to the end of 1986, the third one runs to August 1992 and the final one thereafter. In the first (1979:01-1982:12) and third (1987:01-1992:08) sub-periods, higher unemployment is associated with higher interest differentials, reflecting the possibility of realignment. In the second sub-period (1983:01-1986:12), when the authorities were attempting to signal a change in their priorities and gaining credibility for a "hard currency" policy, a higher unemployment rate is associated with lower interest differentials.

TABLE 1 : Estimation Results of Inflation Process (16) - (17)

	Model I		**Model II**	
	$p_t = r_t p_{t-1} + c + u_t$ $r_t = g\ r_{t\text{-}1} + d\ C_t + n_t$		$p_t = r_t p_{t-1} + c + u_t$ $r_t = g\ r_{t\text{-}1} + d_1 (D79) C_t + d_2 (D83) C_t + d_3 (D87) C_t + d_4 (D92) C_t + n_t$	
Coefficients	Estimates	t - ratio	Estimates	t - ratio
c	0.0075	(1.240)	0.168	(11.51)
g	0.666	(169.93)	0.7656	(650.62)
d	- 0.0566	(- 4.55)	-	-
d_1	-	-	- 0.0313	(- 51.115)
d_2	-	-	- 0.0271	(-24.768)
d_3	-	-	- 0.0327	(- 5.220)
d_4	-	-	0.0626	(1.689)
s_e^2	0.0109		0.0087	
s_x^2	0.0001		0.0001	
Estimation Period	1979: 01 – 1998: 12		1979: 01 – 1998: 12	
Observations	228		228	

For each sub-period we create a dummy variable which takes on the value one during that period and zero elsewhere. Each dummy is then multiplied by the interest rate differential and the inflation model for France is estimated over the whole sample.

The ML estimates shown in Table 1 show that the credibility variable is negative and statistically significant during the first three phases. It is worth noting that the size of the credibility coefficient is smaller in the second phase, indicating that the franc fort policy gained more credibility during the initial stage of its implementation.

Figure 4 : Inflation Persistence (I)

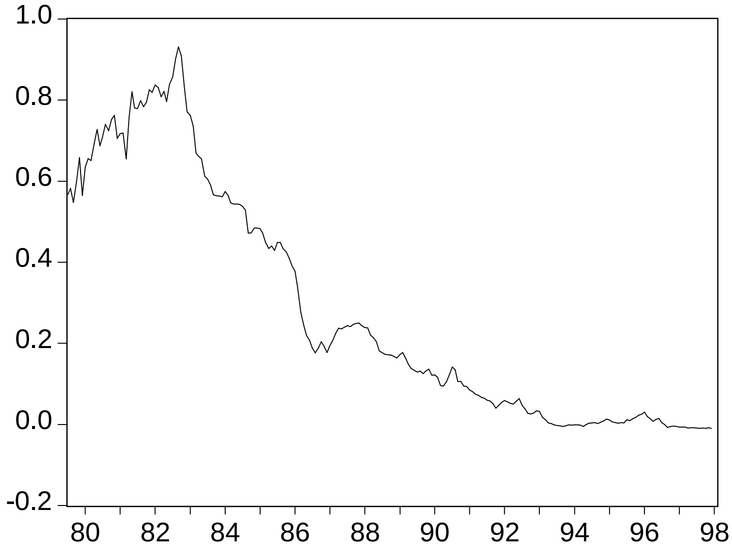
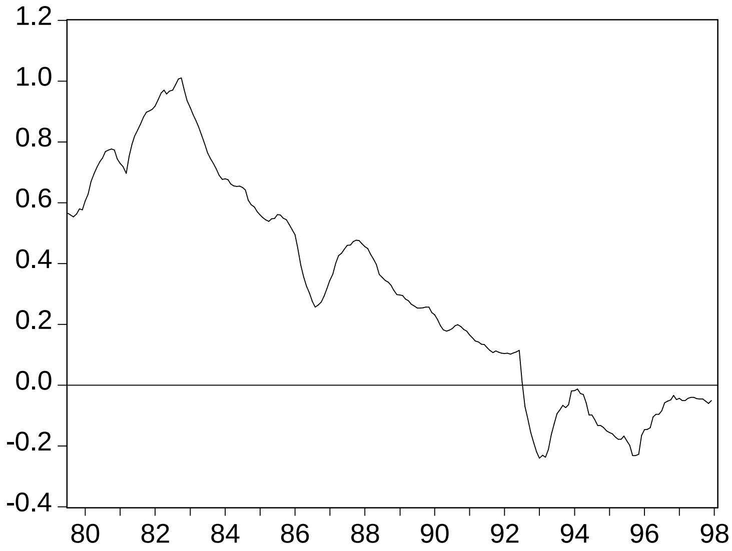


Figure 5 : Inflation Persistence (II)



In the third phase the coefficient takes a larger value, showing that, in an environment with mounting unemployment and absence of a realignment, the credibility of fixed parities is declining. In the last phase, the coefficient becomes negative and not highly significant, suggesting the establishment of credibility as reflected in the interest rate convergence between the franc and the mark. These results confirm the borrowed credibility hypothesis according to which the French authorities have accelerated the disinflation process by importing German monetary policy credibility through the “hard peg” of the franc/mark exchange rate. In sum, the franc fort policy implemented in France since 1983 seems to have gained credibility rapidly, and its impact on the inflation persistence was significant.

6. Concluding Remarks

This paper examines the impact of the “hard franc” policy implemented in France from 1983 on the inflationary dynamics by means of a square root Kalman filter. An interesting aspect of the analysis is the evidence that the stabilisation policy adopted gained credibility immediately and its impact on the inflation persistence was significant. Our empirical results confirm the borrowed credibility hypothesis according to which the French authorities have accelerated the disinflation process by importing German monetary policy credibility through the “hard peg” of the franc/mark exchange rate.

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