Stability of Final Objective of the European Monetary Authorities

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Abstract

The objective of this paper is to study the monetary policy in the Euro zone and to determine if the final objective of the European monetary authorities correspond to an inflation target or to a Taylor's rule. To do this, we have estimated, following the Clarida, Gali and Gertler's methodology (1998), a reaction function for the European monetary authorities, for the period from 1990:1 to 2003:1. We try to know if the 1999:1 date, of the European currency, the Euro, and of the European Central Bank (EBC) entrance in function, has been constituting a break in the European monetary policy.

JEL N° E52, E58.

Key Words : Monetary policy, Inflation target strategy, Taylor's rule, Stability.

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1. Introduction

Since the 1st of January 1999, the European Central Bank (ECB) has taken responsibility for the monetary policy of the eleven then twelve countries, which have adopted the European currency, the euro. Central national banks have only become representatives of the ECB, in that they are in charge of the application of the single monetary policy, which is itself decided by the ECB which fix the intervention rates for all the euro zone.

The objective of this paper is to study the monetary policy of the European monetary authorities in the euro zone. We try in particular to know what is their monetary policy strategy and to characterise if this strategy correspond to an inflation target strategy. Moreover, we try to know if the 1999:1 date, of the European currency and of the ECB entrance in function, has been constituing a break in the European monetary policy.

A first part will analyse the question of knowing if the European monetary authorities really follow an inflation target strategy. To do this we have to define what an inflation target is. Then we have to present the factual and theoretical elements, which can let us believe, that the European monetary authorities are not only sensitive to inflation but also to the Growth Domestic Product (GDP) evolution. A study of the chronic of the intervention interest rates movement of the ECB is also provided.

A second part, refers to Clarida, Gertler and Gali's work (1998) and estimates a reaction function for the euro zone. We have to determine, for the 1990:1-2003:1 period, if the European intervention interest rates are sensitive to inflation and possibly to the GDP. So this means that we try to know if the European monetary policy follows an inflation target or a Taylor's rule and that our study will not be based on monetary aggregates in this European monetary policy strategy. This has to be done with keeping in mind that there could have been some breaks in the European monetary policy during this period.

2. Is the European monetary policy strategy an inflation target strategy?

2.1. An inflation target strategy definition

We have here to define what an inflation target strategy is. To be precise, it corresponds to a special monetary policy strategy, which features are following.

First, an inflation target strategy fix a final objective which consist in limiting inflation, defined as a particular prices index, to a fixed rate, for a pre-determined horizon in medium term generally of one year. This pre-determined final objective is a quantified objective, publicly announced and, then checkable by economic agents. The inflation rate chosen as a target by the monetary authorities can be justified, according to Bernanke, Laubach, Mishkin and Posen (1999), because of the nature of the money, which is a public good leaning against collective confidence. So, the inflation final objective provides prices stability, as long as private agents, which interactions correspond to prices fixation, fix their prices without taking inflation into account.

Moreover, inflation target strategy has for other feature, in a market economy, to use modern instruments used nowadays by central banks to directly fight against inflation, which is the target. This means, that the central bank which benefits of a large indicators range to anticipate inflation future evolution, doesn't

have an intermediate objective that it would have controlled upstream from the final objective. This monetary policy strategy of inflation target particularly rejects the historic role played by monetary aggregates. The only intermediate objective, which this strategy can include, is an expected inflation intermediate objective. Indeed, these expectations are easy to check for the central bank, transparent for the public and strongly correlated with the final objective.

A lot of countries have today adopt such a strategy like : New-Zeeland, Canada, United-Kingdom, Swede, Finland, ...

Our study of the monetary policy in the euro zone tries to determine if the European monetary authorities follow such a strategy. So we have in particular studied the final objective of the European monetary authorities. Indeed, we try to know if the European monetary authorities have a final objective for the monetary policy, which corresponds to an inflation target, and in that case, only takes into account inflation evolutions or if, in an other way, the European monetary authorities follow a rule based on the answer of the intervention interest rates to inflation and to output. This type of strategy is called a "Taylor's rule". It is different from the inflation target[1].

2.2. Do the European monetary authorities take output into account ?

The main objective of the ECB is to ensure price stability, according to article 105, alinea 1 of the European Community treaty. Price stability is defined as a rise of less than 2% in the Price Index for Consumption. It is therefore a precise, quantitative definition of price stability. Moreover, the governor's council took the decision to set the ECB's inflation objective at 2% rather than at 0, given the possible intervention of measuring bias in this inflation. On the other hand, nothing has been said concerning the occurrence of deflation. This strategy is in line with the definition of inflation targeting given by Bernanke, Laubach, Mishkin et Posen (1999), namely that: "Inflation targeting is a framework for monetary policy characterised by the public announcement of official quantitative targets (or target ranges) for the inflation rate over one or more time horizons, and by explicit acknowledgement that low, stable inflation is monetary policy's primary long-run goal".

In the case of the Central European Bank there seems to be no mention of any objective to stabilise production. However, article 105, alinea 1, of the Treaty, states that even beyond its principal objective of price stability, the Central European Bank should provide support for general economic policies in the European Community. Therefore, as defined in article 2 of the Treaty, it minds a durable and non-inflationary growth must be promoted.

Moreover, the ECB has announced that its strategy will also refer to an attentive exam of a large range of indicators to anticipate the future evolution of the European inflation. So we can expect that the ECB has a special interest on the GDP evolution as, possibly, an indicator of future inflation.

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[1] See Taylor's work (1993). The intervention interest rates in United-States are sensitive to an output-gap term which corresponds to the gap between the effective GDP and the potential GDP. The trend of the GDP represents the potential GDP which is reached when factors are full employed.

Referring now to the facts, we present here a chronic of the intervention interest rates movements of the ECB.

2.3. Chronic of the intervention interest rates movements of the ECB.

Table 1: Chronic of the intervention interest rates movements of the ECB

Date	8.4.1999	4.11.1999	3.2.2000	16.3.2000	27.4.2000	8.6.2000	31.8.2000	5.10.2000
Intervention rates	-0.5 pt 2.5%	+0.5 pt 3%	+0.25 pt 3.25%	+0.25 pt 3.5%	+0.25 pt 3.75%	+0.5 pt 4.25%	+0.25 pt 4.5%	+0.25 pt 4.75%

Date	10.5.2001	30.8.2001	17.9.2001	8.11.2001	5.12 2002	6.3.2003	5.6.2003
Intervention rates	-0.25 pt 4.5%	-0.25 pt 4.25%	-0.5 pt 3.75%	-0.5 pt 3.25%	-0. 5 pt 2,75%	-0.25 pt 2.5%	-0,5 pt 2%

For its first interventions, the ECB has proceeded to 0.5 point movements. The width of these movements corresponds to a wish to show strongly its intentions towards the markets in order that they can fix their expectations taking into account of the institutional changes that the euro and the ECB constitute.

In its first intervention in monetary policy, on the 8th of April 1999, the ECB reduced its main intervention rate by 0.5 point, from 3% to 2.5%. It also modified interest rates which form the corridor in the same proportion. The explanation for these figures is founded mainly in the worrying European economic situation. Wim Duisenberg, president of the ECB, declared that the decision taken by the European monetary authorities contribute to the making of an economic environment in which one can fully exploit the euro's considerable potential for growth taking into account that the expectation for growth had been increased everywhere. Finally, Duisenberg added that there had been a "deceleration" in the creation of new job openings. It appears then that these monetary policy measures have been influenced by real considerations, keeping in mind that the ECB's primary objective of price stability was challenged. Such an intervention does not correspond with a pure inflation target rule, according to which, the monetary policy would have been modified only after there had been some change in inflation.

The latter interventions, led by the ECB from the 4th of November 1999 to the 5th of October 2000, involved series of rises in the rate of refinancing, from 2.5% to 4,75%. These interventions have been done in a climate of recovery for economic growth, but also a period of worry as to the possibility of a rise in inflation in the near future. The elements that can explain these ECB rises in interest rate are various. Among them, the ECB has been sensitive to the growing salary claims in an economic growth context. Moreover the very important growth of the credit amount and of the M3 monetary aggregate have worried the ECB. Then, after October 1999, number of countries has exceeded the inflation target, which has been fixed at 2% in a yearly growth rhythm. In July 2000, all the euro zone countries have got more than 2% inflation rate. In this context, the growing oil prices, associated with the continuing fall in value of the euro against the dollar, possibly source of imported inflation, convinced the ECB to increase in many times its intervention rates.

On the contrary, the intervention of the 10th May 2001, after a long period of wait of the ECB, jammed between growing inflation and decreasing economic growth, has been a decrease of the European intervention interest rate. This choice would have been particularly strange in a context of a pure inflation target. Indeed, the

inflation rate was of 2,9% in April and of 3,4% in May 2001. So it is possible to think that this decision has been motivated by the slow down of the economic growth.

After this date, the ECB has continued to decrease its rates. It was at 2% in the 5th of June 2003. These decreases of the intervention rates try to sustain economic activity in a context of low inflation but upper the 2% target rate. Indeed the 5th of December 2002 and the 6th of March 2003 interventions have been taken place during an economic slow down and a rising unemployment period in Europe with a very important increase of the euro against the dollar, limiting the euro zone exports.

Finally, in order to know if the European monetary authorities follow a pure inflation target or, if they also take output into account in their final objective, we estimate a reaction function for the euro zone to determine which coefficients correspond to inflation and output variables.

3. Estimation of a reaction function for the European monetary authorities

We refer here explicitly to Clarida, Gertler and Gali's work (1998) who have estimated a reaction function for the Federal Reserve Bank of the United States. They have shown that the Fed Funds interest rates evolution can be summarized by an equation indicating that these rates are sensitive to movements of inflation towards a target, of GDP towards potential GDP, and to the level reached by these rates at the previous period. We try to know here if the European intervention rates evolution can be describe in the same way.

3.1. The data

The study has been done with European data[2], in quarterly frequency, extracted from Eurostat data base, for the period : 1990:1-2003:1

Inflation is measured using the Consumer Price Index, throughout all the euro-zone countries, with base 100 in 1990. Inflation has been studied annually, as Taylor suggested, so as avoiding it being affected by erratic variations.

The European GDP is given in volume, following an aggregation of national European data, which takes into account the respective importance of each country in the European GDP, as well as changes in the exchange rate of each national currency before January 1999.

As for the European interest rate, it corresponds to the ECB's European interest rate from day to day , labelled the "call for money" for the period after January 1999, and to a fictitious European interest rate, obtained by the same method as this used for the calculation of the European GDP, for the previous period, from January 1990 to December 1998. The national interest rates are aggregated, using the weight of each country in the European GDP.

Indeed, in order to be able of study sufficiently long time periods we are lead to create a fictitious series for the period before January 1999, taken as an average interest rate for this zone for the period before ECB's creation. In the same way, the European GDP or European inflation, also come from the aggregation,

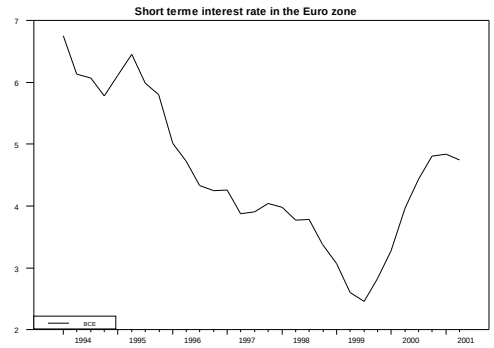
[2] Eleven then twelve countries in the euro zone.

respectively, of the output's data and of the inflation's data, which are obtained thanks to the twelve different monetary and budgetary policies. This aggregation[3] is a statistical necessity, but is also justified. First, after the Maastricht Treaty in 1992, most European countries have opted for convergent monetary policies, in the hope of satisfying the criteria of convergence, as defined by the Maastricht Treaty. Moreover, the monetary policy of the different European states was mostly constrained by being a part of the European Monetary System, and became very similar to the policies of other countries, particularly Germany.[4] The Mundell triangle explains that once free circulation of capital is in place, the rigid changes imposed by the European Monetary System leave no room for independent national monetary policies.

Moreover, as we will show it later, the Chaw test applied to a possible break attached to the ECB entrance in function and to the euro creation in 1999:1, rejects the structural break hypothesis.

3.2. The period of the study

The following graph presents the European short-term interest rates, controlled by the monetary authorities, evolution.



BCE= European short term interest rates controlled by the monetary authorities

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[3] A similar aggregation method, for the period before 1999 for the European data, has been used by Huchet-Bourdon (2002)

[4] Indeed, towards a simple regression with the ordinary least squares method, we find that the French interest rate or the Italian one (1990:1 - 1998:4) were largely influenced by the German interest rate.

So, we have :

- in the French case :

txfce = 0,41 + 1,07 txall
(1,98) (18,59)
R_2=0,91

- in the Italian case :

txita = 3,66 + 1,04* txall
(5,11) (9,35)
R_2=0,73

where : txall = German interest rate
txfce = French interest rate
txita = Italian interest rate

We can then think that the monetary policy of the European countries, as the French one or the Italian one, has largely been influenced by the German monetary policy.

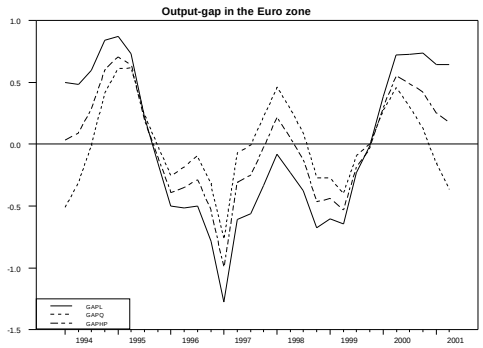
The analysis of this interest rate evolution shows two break points. The first one corresponds to the year 1993 and reflects the difficulties that have appeared in European countries with speculative attacks in exchange rate in the European Monetary System before it was widen. This has led us to begin our study at 1994:1 date.

Moreover, the second important break point, in the interest data, corresponds to the 11th of September 2001 terrorist attacks, where we can think that the ECB has largely reduced its intervention rate in order to sustain financial markets. We have then stopped our sample[5] at 2001:2 date.

3.3. The production gap

In order to establish which rule the ECB followed, we needed to define the output gap between the GDP and the potential production during this period. To achieve this, we have employed three different methods, namely using linear adjustment, quadratic adjustment, and finally, using Hodrick-Prescott's filter which smoothes the observed output, bearing in mind the criticism of this last method for being particularly sensitive to extreme dates of the sample. However, we have decided not to use the method, which estimates a production function, as this poses problems in terms of estimating capital stock and a labour offer function in the euro zone.

The three measurements that have been obtained from these methods are shown in the following graph:



with :

GAPQ=quadratic output-gap = difference of GDP from potential GDP, estimated as the byproduct of the regression of the GDP in its quadratic trend,

GAPL=linear output-gap = difference of GDP from potential GDP, estimated as the byproduct of the regression of the GDP in its trend,

GAPHP=output - gap estimated with the Hodrick-Prescott's filter.

By using these three methods, we have obtained three sets of roughly identical results ; especially similar are the results obtained from the methods using quadratic adjustment and Hodrick-Prescott's filter. The graph shows that the output-gap oscillates between 0 and ±1.5% over the whole studied period.

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[5] If we try to estimate a reaction function for the periods of 1990:1-2003:1, of 1994:1-2003:1,or of 1990:1-2001:2, we don't find any statistical pertinent reaction function and we never find again the reaction function, that we have obtained later for the 1994:1-12001:2 period. This confirms our choice to consider the year 1993 and September 2001 as break points in the monetary policy in the euro zone.

3.4. Method and estimation

We refer here to Clarida, Gertler, and Gali's work (1998). We try to estimate a reaction function for the European monetary authorities, which should have the same expression as the one these authors have found :

$r(t)=const +a (\pi(t)- \pi^*) + b\ gap(t) + r(t-1)$

with :

r(t) = short term interest rates controlled by the European monetary authorities,

const = a constant,

$\pi(t)$ = expected inflation measured in annual variation in order not to be submitted to erratic variations,

π^* = inflation target for the monetary authrities,

gap(t) = output-gap,

r(t-1)= differed interest rate.

We use here the General Moment Method on non differential series because they are stationary one[6]. This method is here a necessary one because of the explanatory variables, which are not exogenous, and, because of the variance-covariance matrix which is not scalar. As a consequences, the ordinary least square estimator is biased and the instrumental variables estimator is not asymptotively efficient. So we use the General Moment Method estimator[7].

The instruments, that we have used, are : a constant, the output-gap, the GDP deflator growth, the variations of the money aggregate M3[8], the interest rate spread (3 months-10 years) and the inflation. These instruments are employed at t-1 date for the exogenous variables and with a delay more for the endogenous variables, which are used, with a delay in the estimation.

The Sargan test, applied on the regressions, tells us that H0 hypothesis of the instruments validity is confirmed.

3.5. The results

We achieve the following results concerning the reaction function, which has been employed in the euro zone during the period from 1994:1 to 2001:2. It[9] would have been :

with linear gap :

$r(t) = 0{,}683 + 0{,}188(\pi(t-1)-\pi^*) + 0{,}318\ gapl(t-1) + 0{,}762\ r(t-1)$ (1)

(1,952)** (1,096) (1,783) (13,731) $\bar{R}_2 = 0{,}95$

** 5% significativity

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[6] The series are stationnary one at a 10% level. This comes, as Clarida, Gali and Gertler (1998) explain it, from the small size of the sample used.

[7] Again in reference to Clarida, Gali and Gertler's work (1998).

[8] Reference aggregate for the European monetary authorities.

[9] The reaction functions estimated with current or expected variables aren't statistically validated.

with r(t) = short term nominal interest rate controlled by the European monetary authorities,

π(t-1) = inflation at t-1 date,

π* = inflation target, that is 2% for the European monetary authorities,

gapl(t-1)= linear output-gap at t-1 date,

r(t-1)= short-term nominal interest rate controlled by the European monetary authorities, with a delay of one period.

The inflation and the output-gap terms aren't statistically significant. The equation is bad specified. The relevant equation of reaction function would then be:

r(t) = 0,394 + 0,513(π(t-1)-π*) + 0,695r(t-1) (2)

(1,940)** (3,836)* (9,752)* $\bar{R}_2 = 0,95$

* 1% significativity

So, it is a reaction function, which corresponds to a pure inflation target strategy.

with quadratic gap :

r(t) = 0,546 + 0,437(π(t-1)-π*) +0,481gapq(t-1)+ 0,688r(t-1) (3)

(3,107)* (3,228)* (3,049)* (9,965)* $\bar{R}_2 = 0,97$

with gapq(t-1) = quadratic output-gap at t-1 date.

It corresponds to a Taylor's rule.

with Hodrick-Prescott's gap :

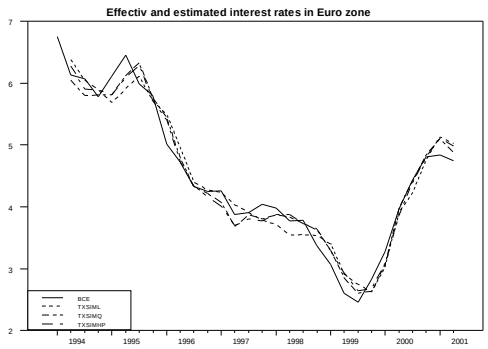
r(t) = 0,716 + 0,281(π(t-1)-π*) +0,438gaphp(t-1)+ 0,716r(t-1) (4)

(3,428)* (1,914)* (2,860)* (10,690)* $\bar{R}_2 = 0,97$

with gaphp(t-1) = output-gap obtained with the Hodrick-Prescott's filter at t-1 date.

It corresponds to a Taylor's rule.

The comparison between actual rates and estimated rates, obtained using the different rules, gives us the following graph:



BCE= effective interest rates in the euro zone,

TXSIMQ=estimated interest rates obtained with the Taylor's rule using the quadratic output-gap,

TXSIML= estimated interest rates obtained with the rule using the linear output-gap which is not significative, so that we have an inflation target,

TXSIMHP= estimated interest rates obtained with the Taylor's rule using the Hodrick-Prescott output-gap.

In the three cases, the estimated reaction functions seem to well describe the effective evolution of the interest rates in the euro zone. We can see that the three rules give quite similar results in periods of limited inflation and stable growth. These results are consistent with those obtained by Clarida, Gertler and Gali (1998) for the United States or with those of Verdelhan (1999) for the euro zone.

Many remarks can be done. First, if we do a Chaw test on each of the estimated equation for the 1999:1 date of the ECB entrance in function, we have then following values:

with linear gap :

$f=0,052<f_L=3,01$

with quadratic gap :

$f=1,80<f_L=2,82$

with Hodrick-Prescott's gap :

$f=2,65<f_L=2,82$

Thus the H0 hypothesis isn't rejected and the 1999:1 date can't be consider as a structural break in the European monetary policy. So the 1999:1 date, of the ECB entrance in function and of the euro creation would not have been a break in the monetary policy in the euro zone.

Moreover, we can note that the interest rates controlled by the monetary authorities in the euro zone is sensitive to the past inflation, to previous interest rate and, in two cases behind three to the output-gap[10]. So the European monetary authorities might follow a Taylor's rule. If we calculate the Schwartz criteria on the three estimated reaction functions, we have the following values :

with linear gap :
BIC = -2,42

with quadratic gap :
BIC = -2,73

with Hodrick-Prescott's gap :
BIC = -2,67

Thus, the Taylor's rule estimated with a quadratic output gap, is the one that better describe the European interest rates evolution in the euro zone.

Another result is that it appears that the monetary authorities smooth the interest rates evolution in order, as Fuhrer and Moore (1995) or Fuhrer (1997) or Clarida, Gali and Gertler (1998) said, to not cause erratic evolutions in interest rates, which in surprising the financial markets, would have disturbing effects in macroeconomic stability.

Moreover, it seems that the European intervention rates are sensitive, over the period studied, to the inflation taken at the prior quarter and not to the current inflation or to the expected inflation. In the same way, the output-gap, when it is statistically significant in the reaction function, appears with a delay of one quarter. This shows then that there is an inertia in the conduct of the European monetary policy.

4. Conclusion

The aim of our work here has been to show that the theoretical and empirical work, such as that carried out by Clarida, Gali and Gertler (1998) on the reaction functions of central banks, could be adapted easily, notably in the case of the monetary policy in the euro zone.

This, as expected, requires a strict inflation target, but some elements, as much institutional as theoretical, lead us to believe that it takes into account, at least implicitly, production targeting. The study of the chronicle of monetary policy decisions by the ECB confirms our doubts. From this would arise the need for a more detailed study based on the analysis of temporal series, as used by Clarida, Gali and Gertler (1998).

[10] We can note that the similarity between the evaluations of the output-gap obtained with the quadratic and Hodrick-Prescott method, is again apparent in the estimation of the rules.

The result is that the European monetary authorities follow a simple rule, namely a rule based on one or two large economic aggregates used as a target. Depending on the method of evaluation used to obtain the output-gap between GDP and the potential GDP, we do not obtain the same results. According to one method, the monetary authorities target solely inflation, but according to two others, the reaction function emerges combining inflation targeting and production targeting. That is a Taylor's rule. Another important result is that this reaction function seems to be stable over the period 1994:1-2001:2. Thus 1999:1, the date of the ECB entrance in function, doesn't constitute, according to the Chaw test, a structural break in the monetary policy of the European monetary authorities.

REFERENCES

Alban, T. (2000), Chapter II Méthodes d'estimation, Estimateurs des moments. In *Econométrie des variables qualitatives*, (Dunod, Ed). Paris.

Ball, L. (1997), Efficient Monetary Policy Rules, *NBER Working Paper* 5952: 1-22.

Bernanke B., Laubach T., Mishkin F.S., Posen A.S. (1999), Inflation, Targeting, Lessons from the International Experience, *Princeton University Press*, p. 382.

Cecchetti, S.G. (1998), Policy Rules and Targets : Framing the Central Banker's Problem, *FRBNY Economic Policy Review*, 4(2) : 1-14.

Clarida R., Gali J. and Gertler M. (1998), Monetary Policy Rules in Practice : Some International Evidence, *European Economic Review* 42 : 1033-1067.

Dormont B. (1999), Introduction à l'économétrie,

Ch V.3.2. Estimateur des variables instrumentales,

Ch V.3.3. Test d'exogénéité,

Ch V.3.4. Test de validité des instruments,

Ch V.4. Méthode des moments généralisés »,

in *Introduction à l'économétrie* (Montchrétien, Ed), Paris.

Favero.C and Giavazzi.F. (2000), Looking For Contagion : Evidence From The ERM, *CEPR Discussion Paper Series* 2591 : 1-8.

Fuhrer J. C. and Moore G. R. (1995), Monetary Policy Trade-offs and the Correlation between Nominal Interest Rates and Real Output, *American Economic Review* 85(1) : 219-239.

Fuhrer J. C. (1997), Inflation/Output Variance Trade-Offs and Optimal Monetary Policy, *Journal of Money, Credit and Banking* 29(2) : 214-234.

Huchet M. (2002) Does Single Monetary Policy Have Asymmetric Real Effects in EMU, *Journal of Policy Modeling* 25 : 151-178.

Le Bihan H., Cour Ph., Sterdyniak H. (1997), La notion de croissance potentielle a-t-elle un sens?, *Economie Internationale* 69(1) : 17-53.

Moutot Ph. (1999), Quelle règle pour la BCE? Commentaire, *Revue d'Economie Politique*, 109 (3) : 375-378.

Taylor J B. (1993), Discretion versus Policy Rules in Practice, *Carnegie Rochester Conference series on Public Policy 3*9 : 195-214.

Taylor J.B. (1999), The robustness and efficiency of monetary policy rules as guidelines for interest rate setting by the European central bank, Special Issue : Monetary Policy Rules, A Conference Organized by Sveriges Riksbank (Bank of Sweden) and the Institute for International Economic Studies, Stockholm University, *Journal of Monetary Economics* 43(3) : 655-679.

Verdelhan A. (1999), Taux de Taylor et taux de marché de la zone euro, *Bulletin de la Banque de France* 61 : 85-93.