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Essahbi Essaadi, Zied Ftiti

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GATE Groupe d'Analyse et de Théorie Économique
UMR 5824 du CNRS
93 chemin des Mouilles – 69130 Écully – France
B.P. 167 – 69131 Écully Cedex
Tél. +33 (0)4 72 86 60 60 – Fax +33 (0)4 72 86 60 90
Messagerie électronique gate@gate.cnrs.fr
Serveur Web : www.gate.cnrs.fr

The transition period before the inflation targeting policy

Zied FTITI*and Essahbi Essaadi†

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Abstract

In this paper, we study the inflation dynamics in an industrial inflation-targeting country (New Zealand). Our objective is to check if the inflation targeting policy has a transition period or not. Loosely speaking, we try to give some response to the famous debate: if the inflation targeting is a framework or a simple monetary rule. For this purpose, we use a frequency approach: Evolutionary Spectral Analysis, as defined by Priestley (1965-1996). Then, we detect endogenously a structural break point in inflation series, by applying a non-parametric test. This is the first time that this method is used in the case of inflation-targeting countries. Our main finding is that the adoption of the inflation-targeting policy in New Zealand was characterized by a transition period before the adoption of this framework. This period was characterized by many radical reforms, which caused a structural break in the New Zealand inflation series. These reforms were made to lead back the inflation close to the initial target. In addition, these reforms increased the transparency and the credibility of the monetary policy. We conclude from our frequency analysis that the inflation series becomes stable in long-term after the adoption of the inflation targeting. This can be a justification of the effectiveness of this policy to ensure the price stability.

Key-words: New Zealand, Inflation Targeting, Spectral Analysis and Structural Change.
JEL : C16, E52, E63.

1 Introduction

For many decades, central banks have adopted an exchange rate policy to ensure price stability. Since the demise of the Bretton-Woods fixed exchange rate system, there has been widespread desire to avoid excessive volatility in the exchange rates of the world's major currencies, which causes high inflation volatility. Other

*Corresponding author: ftiti@gate.cnrs.fr, GATE (Research Group On Analysis and Economic Theory), UMR-CNRS n°5824, University of Lyon and University of Tunis (ISG-FIESTA) 93, chemin des Mouilles - B.P.167 69131 - ECULLY cedex Téléphone +33(0) 472 86 60 60 Télécopie +33(0) 472 86 60 90

†essahbi.essaadi@univ-lyon2.fr, University of Lyon and University of Tunis (ISG-UAQUAP)

alternative solutions are failed, for example the target of the monetary aggregate at the end of the seventies. In this period, inflation was an intractable problem. After the breakdown of these systems, a number of Central banks began to concentrate efforts to manage inflation. At this moment, at the end of the 80s, a new policy was born, which acts directly on inflation rate. It is the "inflation targeting policy (ITP)". New Zealand was the first country that adopted it in March 1989. Its official application started in February 1990. This new policy was considered as the best way to ensure price stability. Today, several countries apply inflation targeting policy. The practice of this policy preceded its theory, which come later: Svenson (1999,2000), Walsh (1998), Woodford (2003) and Gionnoni and Woodford (2003). As a result, most studies are interested in the monetary policy rule of this policy. Other studies were concentrated in the pre-period of IT. So, this lateness in theory arose some debate like the proper definition of ITP and its effectiveness. To answer to these questions, we suggest that if the inflation targeting is a framework, there is a transition period to this policy. If this policy is a simple rule, so it doesn't exist any transitory period to prepare the implementation of this policy. In our knowledge, this paper is the first attempt to focus at the same time on two periods : before and after inflation targeting adoption. Our objective is to check if the IT policy is a framework or a simple rule and to check to the effectiveness in this policy. In this paper we are interested in New Zealand because it is the first country that adopted inflation targeting (IT) in full manner.

This paper has some empirical and theoretical contribution to IT theory. Empirically, this is the first study on inflation targeting policy, which can identify endogenously one break point. In addition, the frequency analysis gives us information about the stability nature after the IT adoption. If inflation stability has a long-term character during the period of IT, so we can conclude that the inflation targeting is a successful policy. If it is a short time, we conclude that the IT policy had a transitory effect on inflation series. The theoretical contribution consists in our analysis result and interpretation. Indeed, we proved some institutional reforms before the IT adoption in the case of New Zealand. So, we conclude that that the inflation targeting is a framework. The objective of these reforms is to bring back the inflation level close to the initial target that caused a structural break point in this period. These institutional reforms prepare the implementation of this policy.

The paper is organized as follows. Section 2 is an empirical analysis. Section 3 consists of data and results. Then, section 4 concerns interpretations. The last section encompasses the conclusion.

2 Empirical Analysis

2.1 Theory of the evolutionary spectrum

In this section, we start with the definition of the evolutionary spectrum proposed by Priestley (1965). Then, we present the estimation method of the evolutionary spectrum (Priestley, 1965, 1988). At the end, we present the test that we defined

based on the test presented by Subba Rao (1981) and the extension of Ahamada & Boutahar (2002).

2.1.1 Definition

The theory of the evolutionary spectrum of Priestley (1965) is concerned with the non-stationary process that is defined as follows:

$$X_t = \int_{-\pi}^{\pi} A(w)e^{iwt}dZ(w), \tag{1}$$

where, for each w, the sequence $A_t(w)$is a time dependent and has a generalized Fourier transform whose modulus has an absolute maximum at the origin. $\{dZ(w)\}$ is an orthogonal process on $[-\pi, \pi]$ with $E[dZ(w)] = 0$, $E[|dZ(w)|] = d\mu(w)$ and $\mu(w)$ a measurement. Without loss of generality, the evolutionary spectral density of the process $\{X_t\}$is defined by $h_t(w)$ as follows:

$$h_t(w) = \frac{dH_t(w)}{dw}, -\pi \leq w \leq \pi, \tag{2}$$

where $dH_t(w) = |A_t(w)|^2 d\mu(w)$. The variance of X_t at t is:

$$\sigma_t^2 = Var(X_t) = \int_{-\pi}^{\pi} h_t(w)dw. \tag{3}$$

2.1.2 Estimation of the evolutionary spectrum

According to Priestley (1965), the estimation of the evolutionary spectrum is performed by using two windows $\{g_u\}$ and $\{w_v\}$.
Without loss of generality, $\widehat{h_t}(w)$ is constructed as follows:

$$\widehat{h_t}(w) = \sum_{v \in Z} w_v |U_{t-v}(w)|^2, \tag{4}$$

where $U_t(w) = \sum_{u \in Z} g_u X_{t-u} e^{-iw(t-u)}$. We choose $\{g_u\}$ and $\{w_r\}$ in the following way:

$$g_u = \left\{ \begin{array}{cc} 1/(2\sqrt{h\pi} & if|u| \leq h \\ 0 & if|u| > h \end{array} \right| \tag{5}$$

$$w_v = \left\{ \begin{array}{cc} 1/T' & if|v| \leq T'/2 \\ 0 & if|v| > T'/2 \end{array} \right|. \tag{6}$$

In this paper, we take $h = 7$ and $T' = 20$. We opt for this choice, as do Priestley (1995), Artis et al. (1992), Ben Aissa & Ahamada (2004) and Ahamada & Boutahar (2002). According to Priestley (1988), we have $E(\widehat{h}(w)) \approx h_t(w)$, $var(\widehat{h}(w))$ decreases when T' increases.
$\forall(t_1, t_2), \forall(w_1, w_2)$, $cov(\widehat{h_{t_1}}(w_1), \widehat{h_{t_2}}(w_2)) \approx 0$, if one of the two conditions (i) and (ii) are satisfied.

$$(i) \quad |t_1 - t_2| \geq T', \qquad (ii) \quad |w_1 \pm w_2| \geq \pi/h. \tag{7}$$

2.2 Test detecting structural break

The test that we will present is carried out from the test of Subba Rao (1981). This test consists of checking the stability of the spectral density around a reference value. The approach requires the preliminary choice of a reference value k around which are supposed to fluctuate the values of the spectral density. This test was used by Artis et al. (1992), but they didn't provide a rigorous justification for the choice of the value K. We base this limit on the proof of Ahamada & Boutahar (2002). This proof allows us to resolve the problem of the choice of the reference value . Now, we will present the test.

Let $\{X_t\}$ be a non-stationary process that represents the inflation date for each country in this study. According to Priestley (1965), it has an evolutionary spectral density $h_t(w)$. Let $\{(t_i)\}_{i=1}^{I}$be a set of size I representing the time scale in which the elements satisfy the condition (i) given in (2.5). According to Priestley and Subba Rao (1969), $h_{iw} = log(h_{ti}(w))$ and $Y_{iw} = log(\widehat{h_{t_i}}(w)$, where $\widehat{h_{t_i}}(w)$is an estimator of $\{h_{t_i}\}(w)$ according to equation (4).

$\mu_w = \frac{1}{I}\sum_{i=1}^{I} Y_{iw}$ $\hat{\sigma}_w^2 = \frac{1}{I}\sum_{i=1}^{I}(Yiw - \mu_w)^2$ and $S_r^w = \frac{1}{\hat{\sigma}_w\sqrt{I}}\sum_{i=1}^{r}(Yiw - \mu_w)$ when $r = 1, ..., I$ According to Priestley (1988), we have:

$$Y_{iw} \approx h_{iw} + e_{iw}, \tag{8}$$

The sequence $\{e_{iw}\}$ is approximately independent and identically distributed normally. Stable frequency concept implies that, for all $w \in [-\pi, \pi]$, we say that w is a stable frequency of the process $\{X_t\}$ if the value of the evolutionary spectral density evaluated at w is independent of time. In other words, $h_t(w) = c_w$ is a time independent constant. Then, a process is stationary if its spectral density is independent of time, and therefore if all frequencies are stable.

The test T_w that detects the structural break in inflation series consists of testing the null hypothesis of the stability of w at the significance level α, i.e. $Pr(T_w > C_\alpha)$[1]. We will adopt the proof of Ahamada & Boutahar (2002) to determine the limited distribution of T_w based on the theorem of Ploberger & Kramer (1992). According to this approach, the test T_w consists of detecting the maximum value of S_r^w. This test is presented as follows:

$$T_w = max_{r=1,...,I}|S_r^w|, \tag{9}$$

The methodology of the test presented up to now has some advantages. It can detect the unstable frequencies and the date from which they emerge. Indeed, if the instable frequency is close to zero, then the observed regime-shift concerns the long-term, otherwise it is about an instability concerning the middle- or short-term.

[1] $C_{0.1=1.22}$, $C_{0.05=1.36}$ and $C_{0.01=1.63}$.

3 Data and Results

3.1 Data

The data were collected from the consumer price index (CPI) of all items from the IMF International Financial Statistics (IFS) database. The inflation data for all the countries,π, are calculated from the CPI, as:

$$\pi = Ln\frac{CPI_t}{CPI_{t-1}} \tag{10}$$

The period of studies is 1980 Q1- 2007Q1. We opt of the choice of New Zealand because it is the first country that adopted the ITP.
The choice of this period is due to two reasons. On one hand, the evolutionary spectral analysis needs a large number of observations. On the other hand, we need to compare our result with some other research on this topic, which uses the same period.

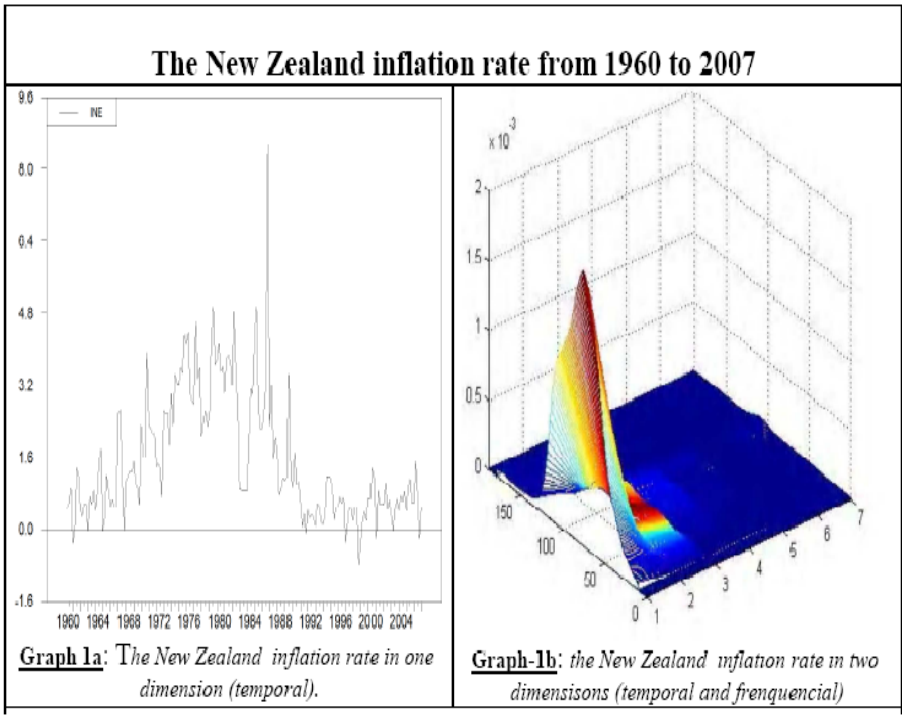
3.2 Results

Date of Break							
New Zealand (NZ)		1988Q3					
NZ Inflation mean	0.0216		0.0062				
frequency of Break	$\pi/20$	$4\pi/20$	$7\pi/20$	$10\pi/20$	$13\pi/20$	$16\pi/20$	$19\pi/20$

The table summarize the result of the identification of the break point of New Zealand inflation series and the its frequencies of occurrence.
The result show the existence of one break point just one years before the inflation targeting adoption. it appears very important result. So that's why, we analysis this result with the economic event occurred in this period to check if it's the result of the inflation targeting policy or no.

4 Interpretation

A table 1 summarizes the results. As we show in table and the following graphic. Our methodology allows us to identify an endogenously break point in New Zealand inflation series. In addition to this advantage, this methodology gives information about the stability (instability) character. In this section, we try to analyse the economic facts occurring in this period of study to show if our results are significant.



Graph 1a: *The New Zealand inflation rate in one dimension (temporal).*

Graph-1b: *the New Zealand inflation rate in two dimensisons (temporal and frenquencial)*

The result of Table shows one structural change in the New Zealand (NZ) inflation dynamic. The break point occurred in the third quarter of 1988. Thus, the NZ inflation rate has two different experiences: the first from January 1960 to the third quarter of 1988 and the second from this date up to now. We try to explain the economic events during this period to check whether this structural change was due to the inflation-targeting policy. During the period prior to 1988, NZ had an experience of volatile and high-level inflation rates. This was explained by some economic events. Indeed, at the beginning of 1960, the quarterly inflation rate had a level of 2%. At the beginning of 1967, the NZ inflation rate started to increase gradually. It reached a peak of 5% at the beginning of the 1970s. This was explained by some economic events. Indeed, after the Second World War, the principal trade partner was the United Kingdom. So, the integration of the United Kingdom into the European Community in 1973 ended its economic relations with New Zealand. This action represented a cultural and economic shock for New Zealand. It caused a contraction in the actual production and unevenness due to the loss of private income ensured by the Britannic market. These factors reduced the New Zealand economic growth and increased the inflation rate. In addition to this fact, the oil shock, which occurred in 1973, aggravated the situation. It reached the bed of economic growth and high inflation rate in New Zealand.
The inflation stabilization was considered as a serious problem. Both monetary and political authorities tried to find new instruments and new economic policies to cure this problem. They made, in the 1970s, a wage and price control system. This policy didn't succeed in reducing inflation. At the beginning of the 1980s, they introduced a new policy, which consisted of a general blockade of wages, prices,

interest rate, rent, dividend and exchange rate, but didn't succeed in stabilizing inflation. The successive failures of these systems caused the collapse of the political regime. The Labour Party won the legislature in 1984 and 1987. This political party came to power with an idea to act directly on inflation.

Indeed, starting from 1985, much radical reform was undertaken. These reforms were favorable to create successfully a disinflation environment. Indeed, after a 20% devaluation of the New Zealander dollar that put an end to foreign exchange market crises, decisions succeeded at a fast pace. In 1985, NZ abandoned the fixed exchange rate and allowed currency floating. So, the monetary policy became the only instrument to cure inflation. At the same time, they renounced the price and wage control. They involved the liberalization of capital accounts, banking liberalization, deregulation of interest rates, abolition of subsidized credit to interest groups/borrowers, removal of state guarantees for all private credit etc. Also, we find the liberalization of foreign investment to the effect that they had virtually no restrictions on foreign investment. In addition, they introduced the liberalization of international goods and services trade, the deregulation of product markets, the rationalization of competition policy and the instauration of goods and services tax in 1986 at the rate of 10%. In 1989, the Reserve Bank of New Zealand becomes independent.

All these reforms contributed to increasing the confidence degree from the public to the labour party. This confidence is resulted by the winning of the election in 1987. All these reforms contributed to the progress of the inflation rate decrease. So, these were the reasons that contributed to the progress ensuring the falling inflation rate from 1985 to 1988, as indicated by Figure 1 (inflation decreased by 9 percentage points after March 1985). According to Hodgettes & Clements (1989), we can say that the fall of inflation starting in 1985 was due to domestic influences, including gains and wage growth, and the firming exchange rate was revealed as having the strongest contribution to disinflation over the whole of 1988. We suggest that these reforms are an objective of the preparation of an inflation-targeting climate.

We conclude to the idea of the inflation targeting climate preparation because, in 1985, the New Zealand Reserve Bank received the instruction to act directly on inflation. In early April 1988, Roger Douglas (Brash, 2000) said "we should get inflation down to a range of 0 to 2% per annum". We can conclude from the citation of the Minster of Finance that the inflation-targeting climate was prepared and that is the date on which the ITP can be established. This date coincides with the date of structural change in the inflation dynamic that we find. So, it is the date of cut of the higher inflation rate. In this case, we can justify our result by the theoretical conclusion of Artus (2004), who said, "The inflation targeting is relevant when the initial inflation to stabilize is near to the target range". Thus, we justified this conclusion empirically. Indeed, it is completely logical to find a period that we name the "period of IT preparation climate". This period is characterized by some radical reforms to establish a disinflation environment with the objective of having a lower inflation level. Then, we can adopt the ITP to ensure this level throughout the period. We suggest that these reforms must increase to a

degree of confidence on the actions taken by the policy-makers. This is the case of New Zealand when, six months after this announcement, it gains its independence. Our result appears very significant. Indeed, a recent debate exists about the date of ITP adoption that we must consider. Indeed, Fracasso et al. (2003) consider the date of April 1988 as the date of the official adoption of IT in the case of New Zealand. Bernanke and Mishkin (1997) consider April 1989 as the official date. Plantier and Scrimgeours (2002) say that the date of the official adoption of ITP is February 1990. We suggest that, whatever the date of adoption, the break point that occurred in the third quarter of 1988 was owing to the inflation-targeting policy. This point occurred because the case of New Zealand had an experience of a high inflation rate before this policy. So, the inflation rate must remain at a lower level near to the target range.

From this analysis, we justify the ITP causing a change in the inflation dynamic. This analysis contributes to the theoretical literature of inflation targeting because we define in this paper the notion of a "climate preparation period" occurring before the adoption of this policy. Artus (2004) and Lee (1999) call it the disinflations environment, but they don't provide any empirical justification. In this period, we will prepare all the success conditions for this policy. In addition, our analysis proves some responses to the debate of inflation targeting as a framework or a simple rule. According to our analysis, it is clear that the ITP is a framework. The second important result provided by our empirical methodology is given by the frequency interpretation (shown in Table). The result and graphic show a frequency of stability ensured since 1989. Our test suggests that the stability has a long-run character. This is an attempt result. Indeed, the inflation targeting had a medium-term objective of price stability. In the case of New Zealand, the first PTA was fixed in 1989 and had a three-year horizon; after that, the New Zealand reserve bank modified the PTA according to the economic evolution to satisfy the objective of a low inflation rate. However, in 1993, the objective fixed by the first PTA was prolonged to the end of 1995, so it ensured the continuity in the price stability at the medium-term inflation rate reached long-term price stability. That is the reason we can say that ITP was a successful policy in the case of New Zealand.

5 Conclusion

In this paper, we apply the evolutionary spectral analysis during ex-ante and ex-post inflation targeting. The objective of this study is to examine the behaviour of inflation few years before and after the date of inflation targeting adoption. Indeed, most of the studies on this subject focus in the post inflation-targeting period. However, if the inflation targeting was a Framework we must consider the prior period of inflation targeting. If inflation targeting is a discretionary policy, it is consistent to start study until the date of adoption. We use evolutionary spectral analysis to study the New Zealand inflation series. Our finding appears very interesting. Indeed, we identify a break point in the inflation series occurred in the third quarter of 1988 (just before the official adoption). This result is supported by the analysis events that occurred at this period. It is explained by the existence

of some radical reforms, which aim at remaining the level of inflation close to the initial target. So, these reforms build a disinflationary environment. So we name this transition period to inflation targeting as "the Climate Preparation of inflation targeting policy". Other important result concerns the analysis frequency. Indeed, we find that the inflation series had a long-term stability after the inflation targeting adoption. The result reflects the effectiveness of inflation targeting policy. Our analysis has some limitations. Indeed, our empirical approach cannot detect various break points. So, it is possible for the existence of other break points after the inflation targeting policy that remain inflation in a high level, but this method can not detected it. Some other question appears very important which we must handle in future studies: if we can generalise this result to all inflation targeting countries. Is it the case of the emerging inflation targeting countries?

References

Ahamada I., Boutahar M. (2002), " Tests for covariance stationarity and white noise, with application to Euro/US Dollar exchange rate ", *Economics letters*, 77, 177-186.

Artis M. J., Bladen-Hovell R., Nachane D.M. (1992), " Instability of Velocity of Money, a New Approach Based on the Evolutionary Spectrum ", *Cepr discussion paper*, N°735.

Artus P. (2004), " Le targeting (ciblage) d'inflation par les Banques centrales des PECOs est-il une bonne idée ? ", *Flash CDC-IXIS*, n° 2004-06.

Ben Aissa. M.S and Ahamada. I (2004), " Changements structurels dans la dynamique de l'inflation aux États-Unis : Approches non paramétriques", *Annales d'économie et de statistique*, no77, pp. 157-172.

Bernanke B.S., Mishkin F.S. (1997), " Inflation targeting: a new framework for monetary policy ", *Journal of Economic Perspectives*, 11, pp.97-116.

Fracasso A., Genberg H, Wyploz C. (2003), " How does central banks write? An evaluation of inflation reports by inflation targeting central banks", *Geneva Reports on the World Economy Special report 2*, International center for monetary and banking studies, centre for Economic Policy Research and Norges Bank.

Gionnoni M and Woodford M. (2003), " Optimal inflation targeting rules" , *NBER working paper*, No 9939.
Hodgetts B., Clements R. (1989), " Causes of the fall in inflation ", Reserve Bank of New Zealand Bulletin, vol. 63 No.1, 52/3 September.

Lee J. (1999), " Inflation targeting in practice: Further Evidence ", *Contemporary Economic policy*, (ISSN 1074-3529), vol 17, No3, 332-347.

Plantier C.L., Scrimgeours D. (2002), " Estimating Taylor rule for New Zealand with time varying neutral real rate ", *Discussion Paper Reserve Bank for New Zealand*, DP 2002/06.

Ploberger W. and Krämer W. (1992), "The CUSUM Test whith OLS Residuals", *Econometrica*, 60, pp. 271-285.

Priestley M. B. (1965), "Evolutionary Spectra and Non-Stationary Processes", *Journal of Royal Statistical Society*, B 27, pp. 204-237.

Priestley M. B. (1969), " A Test for Non-Stationarity of Time Series ", *Journal of Royal Statistical Society*, 31, pp. 140-149.
Priestley, M. B. (1981), " Spectral Analysis and Time Series ", *Academic Press,*

New York.

Priestley M. B. (1988), " Non-Linear and Non-Stationary Time Series Analysis", *Academic Press, London*.

Priestley M. B. (1996), " Wavelets and time-dependent spectral analysis ", *Journal of Time Series Analysis*, 17, 1, pp. 85-103.

Subba Rao T. (1981), "A cumulative sum test for detecting changes in time series", *International Journal Control*, 34, 285-293.

Svensson L. (1999), " Inflation Targeting as a Monetary Policy Rule", *Journal of Monetary Economics*, vol. 43, pp. 607-654. 4.3.

Svensson, L. (2000), "Open-Economy Inflation Targeting", *Journal of International Economics*, February, 655-79.

Walsh C. L. (1998), "Monetary Theory and Policy", *MIT Press, Cambridge*.

Woodford M. (2003), "Interest and Prices: Foundations of a Theory of Monetary Policy", *Chapitre III, Princeton University Press, Princeton, New Jersey*.