Bureau d'économie théorique et appliquée (BETA)
UMR 7522

Documents de travail

« Monetary hyperinflations and money essentiality »

Auteur

Alexandre SOKIC

Document de Travail n° 2007–**21**

Juin 2007

Faculté des sciences économiques et de gestion
Pôle européen de gestion et d'économie (PEGE)
61 avenue de la Forêt Noire
F-67085 Strasbourg Cedex

Secétariat du BETA
Christine DEMANGE
Tél. : (33) 03 90 24 20 69
Fax : (33) 03 90 24 20 70
demange@cournot.u–strasbg.fr
http://cournot2.u–strasbg.fr/beta

CNRS CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE
Nancy-Université Université Nancy 2
ulp UNIVERSITÉ LOUIS PASTEUR STRASBOURG

Monetary hyperinflations and money essentiality

Alexandre Sokic[1]
Ecole Supérieure du Commerce Extérieur, PULV, 92916 Paris La Défense, France
E-mail: alexandre.sokic@devinci.fr

June 2007

Abstract

This paper aims at drawing new guidelines for investigation of monetary hyperinflation analysis. We propose a MIUF optimizing model and show that monetary hyperinflation can occur as a perfect foresight competitive equilibrium path only when money is essential in the sense of Scheinkman (1980). This result emerges without any ad-hoc assumption implying the inclusion of friction in the adjustment of some nominal variable. It suggests that monetary hyperinflation analysis under perfect foresight requires abandoning the Cagan money demand and adopting a demand for money respecting money essentiality.

JEL classification: E31, E41

Keywords: monetary hyperinflation, seigniorage, inflation tax, money essentiality

[1] L'auteur remercie Meixing Dai pour ses remarques intéressantes.

1. Introduction

This paper addresses the issue of the replacement of Cagan money demand for the analysis of monetary hyperinflation. Cagan money demand is the cornerstone of Cagan's (1956) model widely used in the literature to study hyperinflation both theoretically and empirically. It has been designed to explain monetary hyperinflation i.e. speeding up inflation driven by exploding nominal stock of money and government needs for seigniorage. Buiter (1987) seriously challenged the model by showing that under perfect foresight it was unable to produce monetary hyperinflations. Since Kiguel (1989) it is well known in the profession that Cagan model needs to combine rational expectations with a partial adjustment mechanism in the monetary market. However, this is very unsatisfactory because it is hard to justify the persistent presence of maladjustments costly for the agents in a hyperinflationary context.

We propose new guidelines for investigation of monetary hyperinflation[2] based on a perfect foresight optimizing model with money-in-the-utility-function (henceforth called MIUF model) drawing on Brock (1975) model. We show that modelling monetary hyperinflation with perfect foresight requires that money is essential to the system in the sense of Scheinkman (1980). Cagan model can be considered as a special case of the MIUF model but Cagan money demand doesn't satisfy the money essentiality requirement.

The paper is organized as follows: section 2 presents the MIUF model and shows that monetary dynamics depends on money essentiality; section 3 relates money essentiality to money demand inelasticity and shows that modelling monetary hyperinflation with perfect foresight requires money essentiality; section 4 summarizes the results.

2. Monetary dynamics and money essentiality

The optimizing monetary model considered in this paper assumes a continuous time model where the economy consists of a large number of identical infinitely-lived forward looking households endowed with perfect foresight. Population is constant and its size is normalized to unity for convenience. There is no uncertainty. Each household has a non-produced constant endowment $y > 0$ of the non-storable consumption good per unit of time.

In the money-in-the-utility-function model the role of money as a medium of exchange is assumed to be captured by introducing real money balances into the household utility function. The set up draws on Sidrauski (1967) and Brock (1975).

The representative household faces at time 0 the following optimization problem:

$$\max_{c,m} \int_0^\infty \left[u(c_t) + v(m_t)\right] e^{-\delta t} dt \, , \tag{1}$$

subject to

$$c_t + \dot{m}_t = y - \tau_t - \pi_t m_t \; . \tag{2}$$

[2] Our point should be distinguished from that of other works as Brock (1975), Obstfeld and Rogoff (1983), Vazquez (1998), Barbosa and da Cunha (2003), Gutierrez and Vazquez (2004) dealing with speculative hyperinflations. Speculative hyperinflation, in the terms of Obstfeld and Rogoff (1983), is a hyperinflation not driven by money growth, but a hyperinflationary price level bubble driven by self-fulfilling expectations.

The instantaneous utility function is additive and separable in c_t, the household's consumption at time *t*, and $m_t = \frac{M_t}{P_t}$ his holdings of real monetary balances, *M* is the nominal stock of money, *P* is the price level. The functions *u* and *v* are increasing in their arguments and strictly concave. δ is the rate of time preference, π_t the inflation rate, and τ_t is a lump-sum tax assumed to be constant.

The first-order condition yields the Euler equation:

$$u''(c_t)\dot{c}_t = -v'(m_t) + u'(c_t)(\pi_t + \delta), \tag{3}$$

The optimum solution must also obey the transversality condition:

$$\lim_{t\to\infty}\left[u'(c_t)e^{-\delta t}m_t\right] = 0. \tag{4}$$

The equilibrium condition in the goods market is

$$y = c_t + g, \tag{5}$$

where *g* is the constant government expenditure. Using (5) the first-order Euler condition can then be written as:

$$\frac{v'(m_t)}{u'(y-g)} = \pi_t + \delta. \tag{6}$$

Condition (6) requires that at each moment the nominal rate of interest *i*, defined as

$$i \equiv \delta + \pi, \tag{7}$$

be equal to the marginal rate of substitution of consumption for money. The latter Euler equation and the transversality condition (4) can be re-written, after normalizing the constant value of $u'(y-g)$ to unity for convenience, as:

$$v'(m_t) = \pi_t + \delta, \tag{8}$$

$$\lim_{t\to\infty} e^{-\delta t}m_t = 0. \tag{9}$$

The constant per capita government budget deficit *d* is financed by issuing high-powered money:

$$d = g - \tau = \frac{\dot{M}_t}{P_t} = \dot{m}_t + \pi_t m_t. \tag{10}$$

Substituting the value of π extracted from Euler equation in the latter expression leads to:

$$\dot{m} = d - \left(v'(m) - \delta\right)m. \tag{11}$$

The differential equation (11) provides a complete characterization of real per-capita money balances dynamics which will be studied by using the technique of phase diagram on $[0;+\infty[$. Calculating the limits of $\dot{m}$ at the boundaries provide useful information on the dynamics:

$$\left.\begin{array}{l}\lim\limits_{m\to+\infty}\dot{m}=+\infty\\ \lim\limits_{m\to 0_+}\dot{m}=d-\lim\limits_{m\to 0_+}mv'(m)\end{array}\right\}. \qquad (12)$$

From (12) we see that monetary dynamics analysis requires the distinction of two cases depending on whether $\lim\limits_{m\to 0_+}mv'(m)$ is zero or strictly positive. The latter distinction is basically a discussion about money essentiality. Scheinkman (1980) related the condition $\lim\limits_{m\to 0_+}mv'(m)>0$ to the essentiality of money i.e. the fact that "money is very necessary to the system". The definition of money essentiality relates to the evolution of inflation tax collected by government when the rate of inflation explodes. Money is considered as essential if the inflation tax collected by the government does not tend to zero when the rate of inflation explodes. From (10) we see that seigniorage obtained by printing money can be decomposed into two components, the change in the real stock of money and the inflation tax πm which can be written, according to Euler equation (8):

$$\pi m=\left(v'(m)-\delta\right)m=mv'(m)-\delta m\,. \qquad (13)$$

Then, when the rate of inflation explodes we have

$$\lim_{m\to 0_+}\pi m=\lim_{m\to 0_+}mv'(m)\,. \qquad (14)$$

We can conclude that when $\lim\limits_{m\to 0_+}mv'(m)>0$ then $\lim\limits_{m\to 0_+}\pi m>0$ and money is essential.

3. Money essentiality, money demand inelasticity and monetary hyperinflation

Money essentiality is closely related to the inelasticity of the demand for money with respect to the cost of holding money. Euler equation (8) combined with nominal interest rate definition (7) implicitly define a demand for money as a function of the nominal interest rate *i*. The strict concavity of *v* ensures that *m* and *i* are related in a negative fashion.

The function $s(m)$ measuring the cost of money services can be defined according to

$$s(m)=mi=m\left(\delta+\pi\right)=mv'(m)\,. \qquad (15)$$

The first derivative of $s(m)$ is

$$s'(m)=i\left(1+\frac{m}{i}\frac{\partial i}{\partial m}\right)=i\left(1-\frac{1}{|\varepsilon|}\right). \qquad (16)$$

where ε represents the elasticity of the money demand with respect to the nominal interest rate. If the money demand is interest-rate inelastic, $|\varepsilon|<1$, then $s'(m)<0$.

Since $s(m) \geq 0$ and $s'(m) < 0$ when the money demand is inelastic, it follows that $\lim_{m \to 0_+} s(m) = \lim_{m \to 0_+} mv'(m) > 0$. Thus, when money demand is interest rate-inelastic, money is essential.

Combining equations (11) and (15) the differential equation describing monetary dynamics becomes

$$\dot{m} = d + \delta m - mv'(m) = d + \delta m - s(m) . \tag{17}$$

Proposition 1. *Monetary hyperinflations can be generated only if money is essential and if the maximum value of money services is higher than the real value of government deficit (* $\lim_{m \to 0_+} mv'(m) = \lim_{m \to 0_+} s(m) > d$ *).*

Proof: A monetary hyperinflation path is represented in the phase diagram by a path converging to a zero value of real cash balances.

First step: money is essential
When $\lim_{m \to 0_+} mv'(m) > 0$, limits in (12) become:

$$\left[\begin{array}{l} \lim_{m \to 0_+} \dot{m} = d - \lim_{m \to 0_+} s(m) = d - \lim_{m \to 0_+} mv'(m) \begin{cases} > \\ = 0 \\ < \end{cases} \text{if} \quad \lim_{m \to 0_+} s(m) \begin{cases} < \\ = d \\ > \end{cases} \\ \lim_{m \to +\infty} \dot{m} = +\infty \end{array} \right] . \tag{18}$$

Moreover, the variations of the phase curve are:

$$\frac{\partial \dot{m}}{\partial m} = \delta - s'(m) > 0 . \tag{19}$$

Therefore, the phase curve representing the dynamics of (17) in the phase diagram is strictly increasing starting from $\lim_{m \to 0_+} \dot{m}$ and going to $\lim_{m \to +\infty} \dot{m} = +\infty$.

Figure 1 represents the phase diagram[3] corresponding to the case[4] when $\lim_{m \to 0_+} s(m) > d$ implying that $\lim_{m \to 0_+} \dot{m} < 0$. As $s'(m) < 0$, $\lim_{m \to 0_+} s(m) > d$ states that the maximum value of money services (given by $\lim_{m \to 0_+} s(m)$) is higher than the real fiscal deficit. Since $\lim_{m \to +\infty} \dot{m} = +\infty$, the curve $\dot{m}$ is increasing and crossing the horizontal axis only once at the unique steady state m^*. All paths originating at the right of m^* are hyperdeflationary paths that can be ruled out because violating the transversality condition (9). All paths starting to the left of m^* are hyperinflationary paths since the

[3] The precise shape of the phase diagram depends on the second derivative of $\dot{m}$ with respect to *m*. Then, other shapes than that depicted could be possible. However, as we are interested in the qualitative properties of (17) the important point is that the phase curve is a strictly increasing one on $]0;\infty[$.

[4] The two alternative cases, $\lim_{m \to 0_+} s(m) < d$ and $\lim_{m \to 0_+} s(m) = d$, lead to phase curves entirely above the horizontal axis and imply hyperdeflationary paths that can be ruled out because they violate transversality condition (9).

level of per-capita money balances decreases continuously as time goes by, and then, according to (8), the inflation rate explodes. Moreover, these hyperinflationary paths are monetary hyperinflations because along these paths the rate of growth of the money supply explodes. Rewriting government budget constraint (10) as:

$$\frac{\dot{M}}{M} = \frac{d}{m}, \tag{20}$$

we see that along these paths of continuously declining m, given that $d > 0$, the growth rate of money supply increases continuously.

Second step: money is not essential

When $\lim_{m \to 0_+} mv'(m) = 0$, limits in (12) become:

$$\left.\begin{array}{l} \lim_{m \to 0_+} [\dot{m}] = d - \lim_{m \to 0_+} mv'(m) = d > 0 \\ \lim_{m \to \infty} [\dot{m}] = +\infty \end{array}\right\}. \tag{21}$$

According to these limits, whatever the variations of $\dot{m}$ in $]0;\infty[$, it is obvious that no monetary hyperinflation can be generated since there is no path converging to a zero value of real cash balances. This completes the proof.■

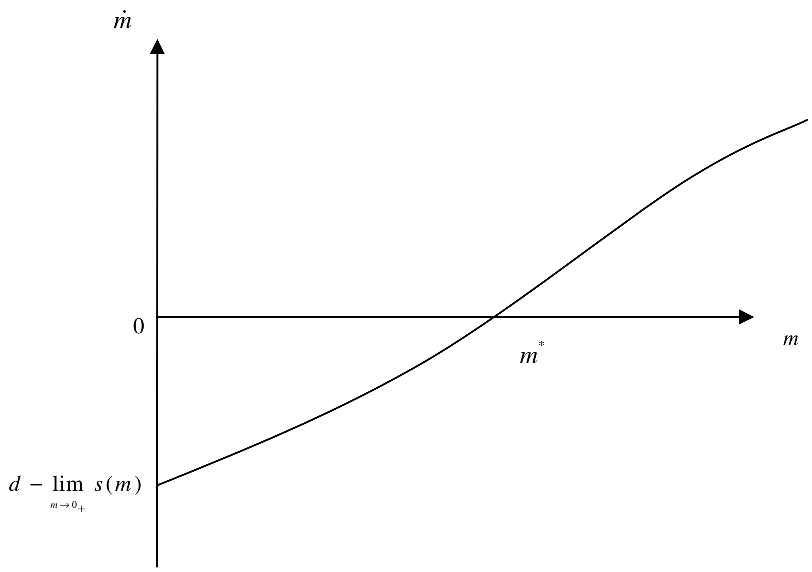

Figure 1: Monetary dynamics when $\lim_{m \to 0} mv'(m) = \lim_{m \to 0} s(m) > d$

In the context of speculative hyperinflations issue, Obstfeld and Rogoff (1983) ruled out hyperinflationary paths similar graphically to those originating at the left of the steady state on Figure 1 on grounds that such paths would not be feasible because the real stock of money would eventually become negative. Barbosa and Cunha (2003) contested that approach by arguing that on such hyperinflationary paths when the real quantity of money reaches zero hyperinflation would have wiped out the value of money, the opportunity cost of holding money would have become infinite, and the economy would no longer be a monetary economy. We follow the point made by Barbosa and Cunha (2003) and consider the monetary hyperinflation paths of Proposition 1 as perfect foresight competitive equilibrium paths.

Proposition 2: *Cagan money demand does not comply with money essentiality.*

Proof: The Cagan ad-hoc model relying on the Cagan money demand can be considered as a special case of the MIUF model developed here. Similarly as Kingston (1982), one can easily verify that using a utility function for money services *v(m)* defined as,

$$v(m) = \alpha^{-1}(1+\gamma+\alpha\delta-\log m)m \quad \text{for all } 0 < m < e^{\gamma+\alpha\delta}, \tag{22}$$

in the Euler equation (8) will found the famous semi-logarithmic Cagan money demand ($\log m = \gamma - \alpha\pi$ where γ is a constant and α a positive constant) and the current MIUF model will resume in the inflationary finance Cagan model. However, such a utility function for money services doesn't comply with money essentiality requirement since for utility function given by (22) $\lim_{m\to 0_+} mv'(m) = 0$. Then it won't allow the modelling of monetary hyperinflation as stated in Proposition 1.■

Modelling monetary hyperinflation under perfect foresight requires assuming money essentiality. This implies abandoning the Cagan money demand for the analysis of monetary hyperinflation in a perfect foresight environment.

4. Conclusion

We consider a MIUF model where money growth relies on the government need for seigniorage revenues. Monetary dynamics depend on money essentiality in the sense of Scheinkman (1980). Money essentiality is closely associated to the inelasticity of money demand with respect to the cost of holding cash balances. The model allows the development of monetary hyperinflations paths only when money is essential and the maximum value of money services is higher than the fiscal deficit. This suggests that modelling monetary hyperinflation under perfect foresight may require firstly money essentiality. This result may give an alternative to the standard Cagan's model failing with perfect foresight. It emerges without any ad-hoc assumption implying the inclusion of some friction in the adjustment of some nominal variable.

Cagan ad-hoc model can be considered as a special case of our model. However, Cagan money demand doesn't comply with money essentiality requirement. This issue has a strong empirical content. As most of the hyperinflation empirical investigations rely on the Cagan model with rational expectations, it could cast doubt on these empirical studies. The results obtained in this paper suggest that monetary hyperinflation analysis with perfect foresight would require abandoning Cagan money demand and adopting a demand for money respecting money essentiality.

References

Barbosa, F.H. and A.B. Cunha (2003), " Inflation tax and money essentiality ", *Economics Letters* 78, 187-195.

Brock, W. (1975), " A Simple Perfect Foresight Monetary Model ", *Journal of Monetary Economics* 1, 133-150.

Buiter, W. (1987), " A Fiscal Theory of Hyperdeflations? Some Surprising Monetarist Arithmetic ", *Oxford Economic Papers* 39, 111-118.

Cagan, P. (1956), " The Monetary Dynamics of Hyperinflation ", in: M. Friedman, ed., Studies in the Quantity Theory of Money, Chicago, 25-117.

Gutierrez, M.J. and J. Vazquez (2004), " Explosive Hyperinflation, Inflation Tax Laffer Curve and Modelling the Use of Money ", *Journal of Institutional and Theoretical Economics* 160, 311-338.

Kiguel, M. (1989), “ Budgets Deficits, Stability and the Monetary Dynamics of Hyperinflation “, *Journal of Money, Credit and Banking* 21, 148-157.

Kingston, G.H. (1982), “ The Semi-log Portfolio Balance Schedule is Tenuous “, *Journal of Monetary Economics* 9, 389-399.

Obstfeld, M. and K. Rogoff (1983), “ Speculative Hyperinflations in Maximizing Models: Can We Rule Them Out “, *Journal of Political Economy* 91, 675-687.

Scheinkman, J. (1980), “ Discussion “, in: Kareken J. and Wallace N., eds., Models of Monetary Economies, Minneapolis, Federal Reserve Bank of Minneapolis, 91-96.

Sidrauski M. (1967), “Rational Choice and Patterns of Growth in a Monetary Economy”, *American Economic Review Papers and Proceedings*, 57, pp. 534-544.

Vazquez, J. (1998), “ How High Can Inflation Get During Hyperinflation? A Transaction Cost Demand for Money Approach “, *European Journal of Political Economy* 14, 433-451.

Documents de travail du BETA

2000–**01** *Hétérogénéité de travailleurs, dualisme et salaire d'efficience.*
Francesco DE PALMA, janvier 2000.

2000–**02** *An Algebraic Index Theorem for Non–smooth Economies.*
Gaël GIRAUD, janvier 2000.

2000–**03** *Wage Indexation, Central Bank Independence and the Cost of Disinflation.*
Giuseppe DIANA, janvier 2000.

2000–**04** *Une analyse cognitive du concept de « vision entrepreneuriale ».*
Frédéric CRÉPLET, Babak MEHMANPAZIR, février 2000.

2000–**05** *Common knowledge and consensus with noisy communication.*
Frédéric KŒSSLER, mars 2000.

2000–**06** *Sunspots and Incomplete Markets with Real Assets.*
Nadjette LAGUÉCIR, avril 2000.

2000–**07** *Common Knowledge and Interactive Behaviors : A Survey.*
Frédéric KŒSSLER, mai 2000.

2000–**08** *Knowledge and Expertise : Toward a Cognitive and Organisational Duality of the Firm.*
Frédéric CRÉPLET, Olivier DUPOUËT, Francis KERN, Francis MUNIER, mai 2000.

2000–**09** *Tie–breaking Rules and Informational Cascades : A Note.*
Frédéric KŒSSLER, Anthony ZIEGELMEYER, juin 2000.

2000–**10** *SPQR : the Four Approaches to Origin–Destination Matrix Estimation for Consideration by the MYSTIC Research Consortium.*
Marc GAUDRY, juillet 2000.

2000–**11** *SNUS–2.5, a Multimoment Analysis of Road Demand, Accidents and their Severity in Germany, 1968–1989.*
Ulrich BLUM, Marc GAUDRY, juillet 2000.

2000–**12** *On the Inconsistency of the Ordinary Least Squares Estimator for Spatial Autoregressive Processes.*
Théophile AZOMAHOU, Agénor LAHATTE, septembre 2000.

2000–**13** *Turning Box–Cox including Quadratic Forms in Regression.*
Marc GAUDRY, Ulrich BLUM, Tran LIEM, septembre 2000.

2000–**14** *Pour une approche dialogique du rôle de l'entrepreneur/managerdans l'évolution des PME : l'ISO comme révélateur ...*
Frédéric CRÉPLET, Blandine LANOUX, septembre 2000.

2000–**15** *Diversity of innovative strategy as a source of technological performance.*
Patrick LLERENA, Vanessa OLTRA, octobre 2000.

2000–**16** *Can we consider the policy instruments as cyclical substitutes ?*
Sylvie DUCHASSAING, Laurent GAGNOL, décembre 2000.

2001–**01** *Economic growth and CO2 emissions : a nonparametric approach.*
Théophile AZOMAHOU, Phu NGUYEN VAN, janvier 2001.

2001–**02** *Distributions supporting the first–order approach to principal–agent problems.*
Sandrine SPÆTER, février 2001.

2001–**03** *Développement durable et Rapports Nord–Sud dans un Modèle à Générations Imbriquées : interroger le futur pour éclairer le présent.*
Alban VERCHÈRE, février 2001.

2001–**04** *Modeling Behavioral Heterogeneity in Demand Theory.*
Isabelle MARET, mars 2001.

2001–**05** *Efficient estimation of spatial autoregressive models.*
Théophile AZOMAHOU, mars 2001.

2001–**06** *Un modèle de stratégie individuelle de primo–insertion professionnelle.*
Guy TCHIBOZO, mars 2001.

2001–**07** *Endogenous Fluctuations and Public Services in a Simple OLG Economy.*
Thomas SEEGMULLER, avril 2001.

2001–**08** *Behavioral Heterogeneity in Large Economies.*
Gaël GIRAUD, Isabelle MARET, avril 2001.

2001–**09** *GMM Estimation of Lattice Models Using Panel Data : Application.*
Théophile AZOMAHOU, avril 2001.

2001–**10** *Dépendance spatiale sur données de panel : application à la relation Brevets–R&D au niveau régional.*
Jalal EL OUARDIGHI, avril 2001.

2001–**11** *Impact économique régional d'un pôle universitaire : application au cas strasbourgeois.*
Laurent GAGNOL, Jean–Alain HÉRAUD, mai 2001.

2001–**12** *Diversity of innovative strategy as a source of technological performance.*
Patrick LLERENA, Vanessa OLTRA, mai 2001.

2001–**13** *La capacité d'innovation dans les regions de l'Union Européenne.*
Jalal EL OUARDIGHI, juin 2001.

2001–**14** *Persuasion Games with Higher Order Uncertainty.*
Frédéric KŒSSLER, juin 2001.

2001–**15** *Analyse empirique des fonctions de production de Bosnie–Herzégovine sur la période 1952–1989.*
Rabija SOMUN, juillet 2001.

2001–**16** *The Performance of German Firms in the Business–Related Service Sectors : a Dynamic Analysis.*
Phu NGUYEN VAN, Ulrich KAISER, François LAISNEY, juillet 2001.

2001–**17** *Why Central Bank Independence is high and Wage indexation is low.*
Giuseppe DIANA, septembre 2001.

2001–**18** *Le mélange des ethnies dans les PME camerounaises : l'émergence d'un modèle d'organisation du travail.*
Raphaël NKAKLEU, octobre 2001.

2001–**19** *Les déterminants de la GRH des PME camerounaises.*
Raphaël NK AKLEU, octobre 2001.

2001–**20** *Profils d'identité des dirigeants et stratégies de financement dans les PME camerounaises.*
Raphaël NKAKLEU, octobre 2001.

2001–**21** Concurrence Imparfaite, Variabilité du Taux de Marge et Fluctuations Endogènes.
Thomas SEEGMULLER, novembre 2001.

2001–**22** *Determinants of Environmental and Economic Performance of Firms : An Empirical Analysis of the European Paper Industry.*
Théophile AZOMAHOU, Phu NGUYEN VAN et Marcus WAGNER, novembre 2001.

2001–**23** *The policy mix in a monetary union under alternative policy institutions and asymmetries.*
Laurent GAGNOL et Moïse SIDIROPOULOS, décembre 2001.

2001–**24** *Restrictions on the Autoregressive Parameters of Share Systems with Spatial Dependence.*
Agénor LAHATTE, décembre 2001.

2002–**01** *Strategic Knowledge Sharing in Bayesian Games : A General Model.*
Frédéric KŒSSLER, janvier 2002.

2002–**02** *Strategic Knowledge Sharing in Bayesian Games : Applications.*
Frédéric KŒSSLER, janvier 2002.

2002–**03** *Partial Certifiability and Information Precision in a Cournot Game.*
Frédéric KŒSSLER, janvier 2002.

2002–**04** *Behavioral Heterogeneity in Large Economies.*
Gaël GIRAUD, Isabelle MARET, janvier 2002.
(Version remaniée du Document de Travail n°2001–**08**, avril 2001).

2002–**05** *Modeling Behavioral Heterogeneity in Demand Theory.*
Isabelle MARET, janvier 2002.
(Version remaniée du Document de Travail n°2001–**04**, mars 2001).

2002–**06** *Déforestation, croissance économique et population : une étude sur données de panel.*
Phu NGUYEN VAN, Théophile AZOMAHOU, janvier 2002.

2002–**07** *Theories of behavior in principal–agent relationships with hidden action.*
Claudia KESER, Marc WILLINGER, janvier 2002.

2002–**08** *Principe de précaution et comportements préventifs des firmes face aux risques environnementaux.*
Sandrine SPÆTER, janvier 2002.

2002–**09** *Endogenous Population and Environmental Quality.*
Phu NGUYEN VAN, janvier 2002.

2002–**10** *Dualité cognitive et organisationnelle de la firme au travers du concept de communauté.*
Frédéric CRÉPLET, Olivier DUPOUËT, Francis KERN, Francis MUNIER, février 2002.

2002–**11** *Comment évaluer l'amélioration du bien–être individuel issue d'une modification de la qualité du service d'élimination des déchets ménagers ?*
Valentine HEINTZ, février 2002.

2002–**12** *The Favorite–Longshot Bias in Sequential Parimutuel Betting with Non–Expected Utility Players.*
Frédéric KŒSSLER, Anthony ZIEGELMEYER, Marie–Hélène BROIHANNE, février 2002.

2002–**13** *La sensibilité aux conditions initiales dans les processus individuels de primo–insertion professionnelle : critère et enjeux.*
Guy TCHIBOZO, février 2002.

2002–**14** *Improving the Prevention of Environmental Risks with Convertible Bonds.*
André SCHMITT, Sandrine SPÆTER, mai 2002.

2002–**15** *L'altruisme intergénérationnel comme fondement commun de la courbe environnementale* ***à la*** *Kuznets et du développement durable.*
Alban VERCHÈRE, mai 2002.

2002–**16** *Aléa moral et politiques d'audit optimales dans le cadre de la pollution d'origine agricole de l'eau.*
Sandrine SPÆTER, Alban VERCHÈRE, juin 2002.

2002–**17** *Parimutuel Betting under Asymmetric Information.*
Frédéric KŒSSLER, Anthony ZIEGELMEYER, juin 2002.

2002–**18** *Pollution as a source of endogenous fluctuations and periodic welfare inequality in OLG economies.*
Thomas SEEGMULLER, Alban VERCHÈRE, juin 2002.

2002–**19** *La demande de grosses coupures et l'économie souterraine.*
Gilbert KŒNIG, juillet 2002.

2002–**20** *Efficiency of Nonpoint Source Pollution Instruments with Externality Among Polluters : An Experimental Study.*
François COCHARD, Marc WILLINGER, Anastasios XEPAPADEAS, juillet 2002.

2002–**21** *Taille optimale dans l'industrie du séchage du bois et avantage compétitif du bois–énergie : une modélisation microéconomique.*
Alexandre SOKIC, octobre 2002.

2002–**22** *Modelling Behavioral Heterogeneity.*
Gaël GIRAUD, Isabelle MARET, novembre 2002.

2002–**23** *Le changement organisationnel en PME : quels acteurs pour quels apprentissages ?*
Blandine LANOUX, novembre 2002.

2002–**24** *TECHNOLOGY POLICY AND COOPERATION : An analytical framework for a paradigmatic approach.*
Patrick LLERENA, Mireille MATT, novembre 2002.

2003–**01** *Peut–on parler de délégation dans les PME camerounaises ?*
Raphaël NKAKLEU, mars 2003.

2003–**02** *L'identité organisationnelle et création du capital social : la tontine d'entreprise comme facteur déclenchant dans le contexte africain.*
Raphaël NKAKLEU, avril 2003.

2003–**03** *A semiparametric analysis of determinants of protected area.*
Phu NGUYEN VAN, avril 2003.

2003–**04** *Strategic Market Games with a Finite Horizon and Incomplete Markets.*
Gaël GIRAUD et Sonia WEYERS, avril 2003.

2003–**05** *Exact Homothetic or Cobb–Douglas Behavior Through Aggregation.*
Gaël GIRAUD et John K.–H. QUAH, juin 2003.

2003–**06** *Relativité de la satisfaction dans la vie : une étude sur données de panel.*
Théophile AZOMAHOU, Phu NGUYEN VAN, Thi Kim Cuong PHAM, juin 2003.

2003–**07** *A model of the anchoring effect in dichotomous choice valuation with follow–up.*
Sandra LECHNER, Anne ROZAN, François LAISNEY, juillet 2003.

2003–**08** *Central Bank Independence, Speed of Disinflation and the Sacrifice Ratio.*
Giuseppe DIANA, Moïse SIDIROPOULOS, juillet 2003.

2003–**09** *Patents versus ex–post rewards : a new look.*
Julien PÉNIN, juillet 2003.

2003–**10** *Endogenous Spillovers under Cournot Rivalry and Co–opetitive Behaviors.*
Isabelle MARET, août 2003.

2003–**11** *Les propriétés incitatives de l'effet Saint Matthieu dans la compétition académique.*
Nicolas CARAYOL, septembre 2003.

2003–**12** *The 'probleme of problem choice' : A model of sequential knowledge production within scientific communities.*
Nicolas CARAYOL, Jean–Michel DALLE, septembre 2003.

2003–**13** *Distribution Dynamics of* CO_2 *Emissions.*
Phu NGUYEN VAN, décembre 2003.

2004–**01** *Utilité relative, politique publique et croissance économique.*
Thi Kim Cuong PHAM, janvier 2004.

2004–**02** *Le management des grands projets de haute technologie vu au travers de la coordination des compétences.*
Christophe BELLEVAL, janvier 2004.

2004–**03** *Pour une approche dialogique du rôle de l'entrepreneur/manager dans l'évolution des PME : l'ISO comme révélateur …*
Frédéric CRÉPLET, Blandine LANOUX, février 2004.

2004–**04** *Consistent Collusion–Proofness and Correlation in Exchange Economies.*
Gaël GIRAUD, Céline ROCHON, février 2004.

2004–**05** *Generic Efficiency and Collusion–Proofness in Exchange Economies.*
Gaël GIRAUD, Céline ROCHON, février 2004.

2004–**06** *Dualité cognitive et organisationnelle de la firme fondée sur les interactions entre les communautés épistémiques et les communautés de pratique..*
Frédéric CRÉPLET, Olivier DUPOUËT, Francis KERN, Francis MUNIER, février 2004.

2004–**07** *Les Portails d'entreprise : une réponse aux dimensions de l'entreprise « processeur de connaissances ».*
Frédéric CRÉPLET, février 2004.

2004–**08** *Cumulative Causation and Evolutionary Micro–Founded Technical Change : A Growth Model with Integrated Economies.*
Patrick LLERENA, André LORENTZ, février 2004.

2004–**09** *Les CIFRE : un outil de médiation entre les laboratoires de recherche universitaire et les entreprises.*
Rachel LÉVY, avril 2004.

2004–**10** *On Taxation Pass–Through for a Monopoly Firm.*
Rabah AMIR, Isabelle MARET, Michael TROGE, mai 2004.

2004–**11** *Wealth distribution, endogenous fiscal policy and growth : status–seeking implications.*
Thi Kim Cuong PHAM, juin 2004.

2004–**12** *Semiparametric Analysis of the Regional Convergence Process.*
Théophile AZOMAHOU, Jalal EL OUARDIGHI, Phu NGUYEN VAN, Thi Kim Cuong PHAM, Juillet 2004.

2004–**13** *Les hypothèses de rationalité de l'économie évolutionniste.*
Morad DIANI, septembre 2004.

2004–**14** *Insurance and Financial Hedging of Oil Pollution Risks.*
André SCHMITT, Sandrine SPAETER, septembre 2004.

2004–**15** *Altruisme intergénérationnel, développement durable et équité intergénérationnelle en présence d'agents hétérogènes.*
Alban VERCHÈRE, octobre 2004.

2004–**16** *Du paradoxe libéral–parétien à un concept de métaclassement des préférences.*
Herrade IGERSHEIM, novembre 2004.

2004–**17** *Why do Academic Scientists Engage in Interdisciplinary Research ?*
Nicolas CARAYOL, Thuc Uyen NGUYEN THI, décembre 2004.

2005–**01** *Les collaborations Université Entreprises dans une perspective organisationnelle et cognitive.*
Frédéric CRÉPLET, Francis KERN, Véronique SCHAEFFER, janvier 2005.

2005–**02** *The Exact Insensitivity of Market Budget Shares and the 'Balancing Effect'.*
Gaël GIRAUD, Isabelle MARET, janvier 2005.

2005–**03** *Les modèles de type Mundell–Fleming revisités.*
Gilbert KOENIG, janvier 2005.

2005–**04** *L'État et la cellule familiale sont–ils substituables dans la prise en charge du chômage en Europe ? Une comparaison basée sur le panel européen.*
Olivia ECKERT–JAFFE, Isabelle TERRAZ, mars 2005.

2005–**05** *Environment in an Overlapping Generations Economy with Endogenous Labor Supply : a Dynamic Analysis.*
Thomas SEEGMULLER, Alban VERCHÈRE, mars 2005.

2005–**06** *Is Monetary Union Necessarily Counterproductive ?*
Giuseppe DIANA, Blandine ZIMMER, mars 2005.

2005–**07** *Factors Affecting University–Industry R&D Collaboration : The importance of screening and signalling.*
Roberto FONTANA, Aldo GEUNA, Mireille MATT, avril 2005.

2005–**08** *Madison–Strasbourg, une analyse comparative de l'enseignement supérieur et de la recherche en France et aux États–Unis à travers l'exemple de deux campus.*
Laurent BUISSON, mai 2005.

2005–**09** *Coordination des négociations salariales en UEM : un rôle majeur pour la BCE.*
Blandine ZIMMER, mai 2005.

2005–**10** *Open knowledge disclosure, incomplete information and collective innovations.*
Julien PÉNIN, mai 2005.

2005–**11** *Science–Technology–Industry Links and the 'European Paradox' : Some Notes on the Dynamics of Scientific and Technological Research in Europe.*
Giovanni DOSI, Patrick LLERENA, Mauro SYLOS LABINI, juillet 2005.

2005–**12** *Hedging Strategies and the Financing of the 1992 International Oil Pollution Compensation Fund.*
André SCHMITT, Sandrine SPAETER, novembre 2005.

2005–**13** *Faire émerger la coopération internationale : une approche expérimentale comparée du bilatéralisme et du multilatéralisme*.
Stéphane BERTRAND, Kene BOUN MY, Alban VERCHÈRE, novembre 2005.

2005–**14** *Segregation in Networks.*
Giorgio FAGIOLO, Marco VALENTE, Nicolaas J. VRIEND, décembre 2005.

2006–**01** *Demand and Technology Determinants of Structural Change and Tertiarisation : An Input–Output Structural Decomposition Analysis for four OECD Countries.*
Maria SAVONA, André LORENTZ, janvier 2006.

2006–**02** *A strategic model of complex networks formation.*
Nicolas CARAYOL, Pascale ROUX, janvier 2006.

2006–**03** *Coordination failures in network formation.*
Nicolas CARAYOL, Pascale ROUX, Murat YILDIZOGLU, janvier 2006.

2006–**04** *Real Options Theory for Lawmaking.*
Marie OBIDZINSKI, Bruno DEFFAINS, août 2006.

2006–**05** *Ressources, compétences et stratégie de la firme : Une discussion de l'opposition entre la vision Porterienne et la vision fondée sur les compétences.*
Fernand AMESSE, Arman AVADIKYAN, Patrick COHENDET, janvier 2006.

2006–**06** *Knowledge Integration and Network Formation.*
Müge OZMAN, janvier 2006.

2006–**07** *Networks and Innovation : A Survey of Empirical Literature.*
Müge OZMAN, février 2006.

2006–**08** *A.K. Sen et J.E. Roemer : une même approche de la responsabilité ?*
Herrade IGERSHEIM, mars 2006.

2006–**09** *Efficiency and coordination of fiscal policy in open economies.*
Gilbert KOENIG, Irem ZEYNELOGLU, avril 2006.

2006–**10** *Partial Likelihood Estimation of a Cox Model With Random Effects : an EM Algorithm Based on Penalized Likelihood.*
Guillaume HORNY, avril 2006.

2006–**11** *Uncertainty of Law and the Legal Process.*
Giuseppe DARI–MATTIACCI, Bruno DEFFAINS, avril 2006.

2006–**12** *Customary versus Technological Advancement Tests.*
Bruno DEFFAINS, Dominique DEMOUGIN, avril 2006.

2006–**13** *Institutional Competition, Political Process and Holdup.*
Bruno DEFFAINS, Dominique DEMOUGIN, avril 2006.

2006–**14** *How does leadership support the activity of communities of practice ?*
Paul MULLER, avril 2006.

2006–**15** *Do academic laboratories correspond to scientific communities ? Evidence from a large European university.*
Rachel LÉVY, Paul MULLER, mai 2006.

2006–**16** *Knowledge flows and the geography of networks. A strategic model of small worlds formation.*
Nicolas CARAYOL, Pascale ROUX, mai 2006.

2006–**17** *A Further Look into the Demography–based GDP Forecasting Method.*
Tapas K. MISHRA, juin 2006.

2006–**18** *A regional typology of innovation capacities in new member states and candidate countries.*
Emmanuel MULLER, Arlette JAPPE, Jean–Alain HÉRAUD, Andrea ZENKER, juillet 2006.

2006–**19** *Convergence des contributions aux inégalités de richesse dans le développement des pays européens.*
Jalal EL OUARDIGHI, Rabiji SOMUN–KAPETANOVIC, septembre 2006.

2006–**20** *Channel Performance and Incentives for Retail Cost Misrepresentation.*
Rabah AMIR, Thierry LEIBER, Isabelle MARET, septembre 2006.

2006–**21** *Entrepreneurship in biotechnology : The case of four start–ups in the Upper–Rhine Biovalley.*
Antoine BURETH, Julien PÉNIN, Sandrine WOLFF, septembre 2006.

2006–**22** *Does Model Uncertainty Lead to Less Central Bank Transparency ?*
Li QIN, Elefterios SPYROMITROS, Moïse SIDIROPOULOS, octobre 2006.

2006–**23** Enveloppe *Soleau et droit de possession antérieure : Définition et analyse économique.*
Julien PÉNIN, octobre 2006.

2006–**24** *Le territoire français en tant que Système Régional d'Innovation.*
Rachel LEVY, Raymond WOESSNER, octobre 2006.

2006–**25** *Fiscal Policy in a Monetary Union Under Alternative Labour–Market Structures.*
Moïse SIDIROPOULOS, Eleftherios SPYROMITROS, octobre 2006.

2006–**26** *Robust Control and Monetary Policy Delegation.*
Giuseppe DIANA, Moïse SIDIROPOULOS, octobre 2006.

2006–**27** *A study of science–industry collaborative patterns in a large european university.*
Rachel LEVY, Pascale ROUX, Sandrine WOLFF, octobre 2006.

2006–**28** *Option chain and change management : a structural equation application.*
Thierry BURGER–HELMCHEN, octobre 2006.

2006–**29** *Prevention and Compensation of Muddy Flows : Some Economic Insights.*
Sandrine SPAETER, François COCHARD, Anne ROZAN, octobre 2006.

2006–**30** *Misreporting, Retroactive Audit and Redistribution.*
Sandrine SPAETER, Marc WILLINGER, octobre 2006.

2006–**31** *Justifying the Origin of Real Options and their Difficult Evaluation in Strategic Management.*
Thierry BURGER–HELMCHEN, octobre 2006.

2006–**32** *Job mobility in Portugal : a Bayesian study with matched worker–firm data.*
Guillaume HORNY, Rute MENDES, Gerard J. VAN DEN BERG, novembre 2006.

2006–**33** *Knowledge sourcing and firm performance in an industrializing economy : the case of Taiwan in the 1990s.*
Chia–Lin CHANG, Stéphane ROBIN, novembre 2006.

2006–**34** *Using the Asymptotically Ideal Model to estimate the impact of knowledge on labour productivity : An application to Taiwan in the 1990s.*
Chia–Lin CHANG, Stéphane ROBIN, novembre 2006.

2006–**35** *La politique budgétaire dans la nouvelle macroéconomie internationale.*
Gilbert KOENIG, Irem ZEYNELOGLU, décembre 2006.

2006–**36** *Age Dynamics and Economic Growth : Revisiting the Nexus in a Nonparametric Setting.*
Théophile AZOMAHOU, Tapas MISHRA, décembre 2006.

2007–**01** *Transparence et efficacité de la politique monétaire.*
Romain BAERISWYL, Camille CORNAND, janvier 2007.

2007–**02** *Crowding–out in Productive and Redistributive Rent–Seeking.*
Giuseppe DARI–MATTIACCI, Éric LANGLAIS, Bruno LOVAT, Francesco PARISI, janvier 2007.

2007–**03** *Co–résidence chez les parents et indemnisation des jeunes chômeurs en Europe.*
Olivia ÉKERT–JAFFÉ, Isabelle TERRAZ, janvier 2007.

2007–**04** *Labor Conflicts and Inefficiency of Relationship–Specific Investments : What is the Judge's Role ?*
Bruno DEFFAINS, Yannick GABUTHY, Eve–Angéline LAMBERT, janvier 2007.

2007–**05** *Monetary hyperinflations, speculative hyperinflations and modelling the use of money.*
Alexandre SOKIC, février 2007.

2007–**06** *Detection avoidance and deterrence : some paradoxical arithmetics.*
Éric LANGLAIS, février 2007.

2007–**07** *Network Formation and Strategic Firm Behaviour to Explore and Exploit.*
Muge OZMAN, février 2007.

2007–**08** *Effects on competitiveness and innovation activity from the integration of strategic aspects with social and environmental management.*
Marcus WAGNER, février 2007.

2007–**09** *The monetary model of hyperinflation and the adaptive expectations : limits of the association and model validity.*
Alexandre SOKIC, février 2007.

2007–**10** *Best–reply matching in Akerlof's market for lemons.*
Gisèle UMBHAUER, février 2007.

2007–**11** *Instruction publique et progrès économique chez Condorcet.*
Charlotte LE CHAPELAIN, février 2007.

2007–**12** *The perception of obstacles to innovation. Multinational and domestic firms in Italy.*
Simona IAMMARINO, Francesca SANNA–RANDACCIO, Maria SAVONA, mars 2007.

2007–**13** *Financial Integration and Fiscal Policy Efficiency in a Monetary Union.*
Gilbert KOENIG, Irem ZEYNELOGLU, mars 2007.

2007–**14** *Mise en œuvre du droit du travail : licenciement individuel et incitations.*
Yannick GABUTHY, Eve–Angéline LAMBERT, avril 2007.

2007–**15** *De l'amiante au chrysotile, un glissement stratégique dans la désinformation.*
Gisèle UMBHAUER, avril 2007.

2007–**16** Le *don tel qu'il est, et non tel qu'on voudrait qu'il fût.*
Frédéric LORDON, mai 2007.

2007–**17** *R&D cooperation versus R&D subcontracting : empirical evidence from French survey data.*
Estelle DHONT–PELTRAULT, Étienne PFISTER, mai 2007.

2007–**18** *The Impact of Training Programmes on Wages in France : An Evaluation of the « Qualifying Contract » Using Propensity Scores.*
Sofia PESSOA E COSTA, Stéphane ROBIN, mai 2007.

2007–**19** *La transparence de la politique monétaire et la dynamique des marchés financiers.*
Meixing DAI, Moïse SIDIROPOULOS, Eleftherios SPYROMITROS, mai 2007.

2007–**20** A *two–pillar strategy to keep inflation expectations at bay : A basic theoretical framework.*
Meixing DAI, juin 2007.

2007–**21** *Monetary hyperinflations and money essentiality.*
Alexandre SOKIC, juin 2007.

La présente liste ne comprend que les Documents de Travail publiés à partir du 1er janvier 2000. La liste complète peut être donnée sur demande.
This list contains the Working Paper writen after January 2000, 1rst. The complet list is available upon request.