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Pension Plan And Accumulation Of Savings: Case Of Ivory Coast

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Summary :
In this article, we propose an analysis compared of the two modes in Ivory Coast on the basis of simulation of the dynamics of the economy of the Ivory Coast. As one can see it, to discuss the comparative advantages of the various pension plans, the model with generation overlapping makes it possible to give a coherent framework. That enabled us to show, that contrary to a largely spread idea, capitalization has, a positive impact on the accumulation of the capital, contrary to the distribution which has negative impact in the specific case of the Ivory Coast.
Key words: *pay as you go system, funded pension, save, overlapping generations.*

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The Ivory Coast, influenced by the colonial powers, subscribed to a pay-as-you-go[1] system. Apart from this system, there is also another system where an individual in Côte d'Ivoire can obtain additional coverage, through private pension plans. These plans are based on a capitalization[2] scheme and managed by insurance companies through commercial banks.

Indeed, these two different pension systems are often judged by their supposed effects on savings. Some households in Ivory Coast have significant assets when they retire. Others, on the contrary, and especially the majority, then see their standard of living drop due to a low accumulation[3] during the period of activity.

The economic literature has focused on the analysis of the impact of pension systems on the behavior of savings. Two founding articles are at the origin of the controversy; Feldstein (1974) and Barro (1974). This controversy can be summed up in a debate over which model is supposed to best represent savings decisions. The behavior of the economic agent is linked to his decision horizon. From this point of view, it is possible to identify three models of behavior.

First, the myopic agent has a decision horizon that is limited to the short term. This agent can be identified with a Keynesian agent. In this model, at the individual level, the pay-as-you-go pension system has a negative effect on savings, especially for low-income agents, and at the intergenerational level, its effect can be positive following the redistributive effect. Then, the ultra-rational agent at the Barro (1974) ~~agent à la Barro (1974)~~ has rather an infinite decision horizon, because he is altruistic. His well-being is not only a function of his consumption but also of the well-being of his offspring. In this model, the PAYG system has a neutral effect on

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[1] A system in which mandatory deductions are made from the assets redistributed to retirees in the form of pensions, in other words, the contributions paid by the assets and based on their professional income are immediately used to pay the retirees' pensions. The working people do not contribute for themselves later, but for the retirees of today, and their retirement will be ensured by the working people of tomorrow.

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[2] In this retirement system, the assets constitute savings, placed on the financial markets in the meantime and from which they will draw when the time comes to finance their retirement. Pensions are fed by previous savings, and not by a redistribution between working and retired people. In other words, each individual saves for retirement.

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[3] According to (Brun-Schammé and Duée, 2008), accumulation for retirement is strongly linked to age and socio-professional category.

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savings. And finally, the rational agent is the one who reasons over the period of his life cycle[4]. This is precisely the reference framework of the work of Feldstein (1974) which, moreover, has been enriched by the endogenization of the labor supply in order to better understand the effect of income on savings. In this model, the pay-as-you-go system has a negative effect on savings, with an "induced retirement effect": theoretically indeterminate, empirically negative (Feldstein) or neutral (Leimer and Lesnoy, 1982).

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Defenders of capitalization believe that this mode of financing allows members to benefit from a better return on their retirement investment and at the macro-economic level, to stimulate growth through increased savings.

For them, at the macroeconomic level, a shortfall in national savings causes part of the financing of national investment to be based on foreign capital. If this foreign capital ceases to invest in the economy, a shortfall in national savings can lead to a reduction in productive investment and, hence, in long-term growth.

Legros (2002) refutes this thesis and advances three arguments. The promise of a funded pension does not necessarily lead to savings flows because the lowest savings rates are not where the distribution is highest. Then, in countries where the PAYG system is developed and where there are few funded pension products, the impact of the life cycle is strong. Households anticipate a deterioration in the replacement rate and increase their savings. Finally, according to Legros (2002), if capitalization systems promise high returns, savings will decrease. Thus, a reform should not be undertaken with the aim of increasing savings.

Specifically, these effects are analyzed by making an implicit comparison between a pension system whose financing is based on a transfer between generations (pay-as-you-go system) and another whose financing is based on compulsory savings (system by capitalization).

The overlapping generations model introduced by Allais [1947] and Samuelson [1958], in its version with production and capital accumulation (Diamond [1965]) constitutes the usual theoretical framework for studying this problem.

For this, we will use a simple version of the nested generation model introduced by Diamond (1965) and improved by Stéphane. G (2012) to make the comparative analysis of the two pension schemes in Ivory Coast on the basis of simulation.

The purpose of this article is precisely to assess the impact of different pension schemes on the accumulation of savings in Ivory Coast based on a simulation of the dynamics of the Ivorian economy.

After presenting the model, we will apply the model to the question of retirement in Ivory Coast and our approach will therefore make it possible to compare from the point of view of the accumulation of savings.

I. Basic economic model

The overlapping generations model à la Samuelson-Diamond considers two periods of life of identical duration during which young workers and retirees coexist. In this model, individuals are born in each period of t. At time t, there are individuals who live their first period, they offer their work in an inelastic way during their first period (youth) and distributes the income that they draw from their work between consumption and savings. And individuals who live their second period that of retirement, it consumes the savings of the first period as well as the interest produced.

The population believes at the rate such that : $N_t = (1+n_t)\, N_{t-1}$

We assume that there are a large number of firms, having the same production function and producing $Y = F(K, L)$ a single homogeneous good whose price is equal to unity. Markets are competitive, labor and capital receive their marginal product.

1.1- consumers

Young people sell their work and receive a salary W_t that allows them to consume C_t^j and save S_t. Old people consume all of their savings income before they die.

Its intertemporal usefulness is noted:

Max $U_t(C_t^j ; C_{t+1}^v)$

The budgetary constraints of an agent born in t are therefore:

[4] According to the life cycle theory, saving is a means of smoothing consumption over the life cycle, by transferring earned income to the retirement period.

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When young: $C_t^j + S_t = W_t$ (1)

When he is old: $C_{t+1}^v = (1 + r_{t+1}).S_t$ (2)

Where r_{t+1} is the real interest rate at t + 1 (it is anticipated at t).
By aggregating (1) and (2) we obtain its intertemporal budget constraint:

$$C_t^j + \frac{C_{t+1}^v}{1 + r_{t+1}} = W_t \qquad (3)$$

The consumer seeks an intertemporal allocation that maximizes his utility under the budget constraint :

$$\begin{cases} C_t^j, C_{t+1}^v Max U_t(C_t^j, C_{t+1}^v) \\ C_t^j + \dfrac{1}{1 + r_{t+1}} C_{t+1}^v = W_t \end{cases}$$

The Lagrangian is written **:**

$$L = U_t(C_t^j, C_{t+1}^v) - \lambda(C_t^j + \frac{1}{1 + r_{t+1}} C_{t+1}^v - W_t) \qquad (4)$$

λ is the Lagrangian multiplier. From the first order conditions (see appendix) we obtain the following relations:

$$\begin{cases} \dfrac{C_{t+1}^v}{C_t^j} = \dfrac{1 + r_{t+1}}{1 + \rho} \\ C_t^j + \dfrac{1}{1 + r_{t+1}} C_{t+1}^v = W_t \end{cases} \qquad (5)$$

Equilibrium consumption and savings are then:

$$\begin{cases} C_t^j = \dfrac{1 + \rho}{2 + \rho} W_t \\ C_{t+1}^v = \dfrac{1 + r_{t+1}}{2 + \rho} W_t \\ S_t = \dfrac{1}{2 + \rho} W_t \end{cases} \qquad (6)$$

1.2- the firms
~~**les firmes**~~

It is assumed that the economy is composed of a large number of enterprises assimilated to a representative firm which operate in a competitive environment, since the enterprises are identical. The company produces goods and services (y_t) from:

K_t = capital ;

L_t = ~~travail.~~work

The production function is a classic production function of the Cobb-Douglas type with constant returns to scale, as it is most often used in this type of work. Production per head is then written $y_t = f(k_t)$. The stock of productive capital also depreciates at (rate δ = 1).

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Under these competitive conditions, the producer maximizes his profit:

$$\pi_t = F(K_t, L_t) + (1-\delta)K_t - W_t L_t - R_t K_t \qquad (7)$$

With $(1-\delta)$ = capital depreciation rate.

This implies the following first-order conditions:

$$\begin{cases} W_t = f(k) - kf'(k) \\ r_t = f'(k) \end{cases} \qquad (8)$$

Factors of production are remunerated at their marginal productivities. Considering a Cobb-Douglas production function, $y = k^{\alpha}$ the system becomes:

$$\begin{cases} W_t = (1-\alpha)k^{\alpha} \\ r_t = \alpha k^{\alpha-1} \end{cases} \qquad (9)$$

1.3- Intertemporal Balance [5]

On date t, three markets are open: the labor market, the capital market and a market for goods.
The aggregate supply of labor is equal to N_t (each young individual offers one unit of labor inelastically). The equality of supply and demand on the labor market is therefore written:

$$L_t = N_t \qquad (10)$$

At the beginning of the first period t, there is a K_{t-1} unit of capital. They are owned by the old people in t (who acquired them in $t-1$). Once production has taken place, and the factors of production have been remunerated, the young from t for the labor they provided, the old from t for the capital they lent, the old from t now have no no more reason to keep capital; they consume it entirely.

At the end of the period t, therefore, all that remains in the form of capital is the savings of young people (made from their earned income), $N_t s_t$. It is this stock that will constitute the supply of capital in $t+1$; companies asking then . The interest rate of K_t, , will therefore be such that:

$$K_{t-1} + N_t s_t - K_{t-1} = K_t \qquad (11)$$

$$N_t s_t = K_t$$

$$s_t = \frac{K_t}{N_t} \qquad (12)$$

If the equilibrium on the capital market is not written in the form of an equality between savings and investment (the equality between two flows) but between savings and the stock of capital itself, it is that everything happens as if the depreciation of capital was complete, the old people who hold the stock of capital from the beginning of the period consuming it (by converting it into consumer goods).

By Walras' law, the two budgetary constraints (1) and (2) saturated, the condition of zero company profile, and of two job-resource equalities (10) and (11) on the labor market and on the the capital market must imply equality between jobs and resources in the goods market. To verify this, let's sum member to member.

$$N_t C_t^j + N_t s_t = w_t N_t,$$

$$N_{t-1} C_{t-1}^v = (1+r_t) N_{t-1} s_{t-1},$$

$$rK_{t-1} + w_t N_t = F(K_{t-1}, N_t),$$

[5] Stéphane Gauthier (2012)

~~et utilisons~~and use $N_{t-1}s_{t-1} = K_{t-1}$. ~~On obtient~~We get :

$$N_t(C_t^j + s_t) + N_{t-1}C_{t-1}^v = K_{t-1} + F(K_{t-1}, N_t) \qquad (13)$$

The sum of the demand for goods by young individuals in t, $N_t(C_t^j + s_t)$, and the demand for goods and by old individuals in t, $N_{t-1}C_t^v$ is equal to the total quantity of goods available in the absence of capital depreciation, $K_{t-1} + F(K_{t-1}, N_t)$. Or even, taking into account (11),

$$F(K_{t-1}, N_t) = N_tC_t^j + N_{t-1}C_{t-1}^v + K_t - K_{t-1} \qquad (14)$$

That is, value added (GDP) is household consumption plus business investment.

Assuming that the population grows at a constant rate (equal to $(N_t - N_{t-1}) / N_{t-1}$), it is possible to define an equilibrium as follows:

Definition

An intertemporal equilibrium with perfect forecasts is a sequence ($k_t, t \geq 0$) such that:

$$s(w(k_t), r(k_{t+1})) = (1+n)k_{t+1} \qquad (15)$$

is satisfied for all $t \geq 0$, given k_0.

This equilibrium is defined by an evolution of the stock of capital over time: it is in this sense that it is intertemporal (or dynamic). On the other hand, household (and business) expectations were assumed to be correct.

II. Application to the issue of retirement in Ivory Coast

Retirement is summarized here as a contribution made in the first period of life, when the individual is young and working, and a pension received in the second period of life. Suppose that the State deducts on the date t an amount τ_t from each individual born in t (i.e. old-age contribution) and transfers the pension p_t to each individual born in $t-1$.

2.1- Pay-as-you-go pension

In a pay-as-you-go pension system, the amounts withdrawn $N_t\tau_t$ are immediately and fully redistributed in the form of a pension to retirees. Assuming that everyone receives the same transfer, we have $p_t = N_t\tau_t / N_{t-1} = (1+n)\tau_t$.

In a pay-as-you-go system, (1) and (2) become:

When he is young $C_t^j + S_t = W_t(1-\tau)$

When he is old $C_{t+1}^v = (1+r_{t+1}).S_t + (1+n)\tau$

With τ is the contribution rate and $(1+n)\tau$ represents the pension.

When the economy is at the golden rule, the system is equivalent to the funded system in a capitalization. Otherwise, the two investments have different returns.

In total savings $s_t + \tau$, only s_t a supply of capital constitutes; the contribution τ is paid directly to the old man. Consequently, the equilibrium dynamics (15) is written:

$$s_t = (1+n)k_{t+1} \qquad (16)$$

Savings s_t are expected to be lower than those that would prevail in the absence of a pension system.

2.2- Funded retirement

In a funded pension system, τ_t is placed on the capital market and earns $(1+r_{t+1})\tau$ in $t+1$. Suppose that the deduction (the old-age contribution) remains constant over time: $\tau_t = \tau$ for all $t \geq 0$.

In a funded pension system in a capitalization, the budget constraints (1) and (2) become:

When he is young $C_t^j + S_t = W_t(1-\tau)$

When he is old $C_{t+1}^v = (1+r_{t+1}).\ (S_t + \tau)$

Net savings being equal to $N_t(s_t + \tau)$, the equilibrium dynamic (15) is:

$$s_t + \tau = (1+n)k_{t+1} \qquad (17)$$

III. Calibration and simulation of parameters: case of Ivory Coast

The year 2010 is assumed as the reference year for our simulation. The simulation is done over 31 years from 20

3.1- Statistical data and analysis methods

3.1.1- Data sources

The database that we refer to here is observed over the period from 1960 to 2011. These data come mainly from the databases of the World Bank and the Penn World Table, version 8.1.

3.1.2- Method of analysis

In our case, we use the technique of ordinary least squares. This allows us to interpret the coefficients of the estimated parameters as elasticities. And this will be done using the Microfit software, EasyReg for the forecasts.

3.2- Results

3.2.1- Determination of the parameter α

To determine α, we first linearized the Cobb-Douglas function to obtain the initial parameters which we then introduced into the compact form of the Cobb-Douglas production function to obtain α using Microfit software.

As mentioned above, the production function is of the Cobb-Douglas form with constant returns to scale:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} \qquad (18)$$

With $\beta = 1-\alpha$

Where Y_t: Real Gross Domestic Product (income), A_t : efficiency parameter, $K_t$capital, : L_t labor (employees), α and β : elasticities.

The expression per head (per employee) of equation (13) becomes:

$$\frac{Y_t}{L_t} = \frac{A_t K_t^{\alpha} L_t^{\beta}}{L_t} \qquad (19)$$

$$\frac{Y_t}{L_t} = \frac{A_t K_t^{\alpha} L_t^{\beta}}{L_t^1} \qquad (20)$$

or $1 = \alpha + \beta$

~~Donc (20) devient~~So (20) becomes:

$$\frac{Y_t}{L_t} = \frac{A_t K_t^{\alpha} L_t^{\beta}}{L_t^{\alpha+\beta}}$$

$$\frac{Y_t}{L_t} = \frac{A_t K_t^{\alpha} L_t^{\beta}}{L_t^{\alpha} L_t^{\beta}}$$

$$\frac{Y_t}{L_t} = A_t \left(\frac{K_t}{L_t}\right)^{\alpha} \left(\frac{L_t}{L_t}\right)^{\beta}$$

$$y_t = A_t k_t^{\alpha} \qquad (21)$$

It is therefore equation (21) that we have estimated and the results are without Table 1

3.2.2- Result of the regression of the equation (y_t)

The table below contains the results of the regression of equation 21

Table 1: Result of the regression of the equation (y_t)

Année (1960-2011)		
Parameter	Coefficients	T-Ratio[Prob]
Constant	34,15	1.1242[0,266]
α	0,55	5.6673[0,000]

Source: the author from the results obtained on MICROFIT

3.2.3- Forecasting the evolution of savings in a pay-as-you-go scheme

The unit root test shows that the series studied is integrated of order 1. The observation of the AIC, Hannan-Quinn and Schwarz criteria made it possible to retain the ARIMA model (2,1,1). It is on the basis of this equation that we made the forecast.

$$dstrep_t = c + \alpha_1 strep_{t-1} + \alpha_2 strep_{t-2} + \beta_1 u_{t-1} + u_t \qquad (22)$$

The value of $R^2 = 0.14$, this value is low. This model could have good predictive power.

Table 2: regression result $dstrep$

Dependent variable : $dstrep$					
Méthode : MCO					
Observation :45					
Variable	Coefficient	t-value	[p-value]	HC t-value(*)	[HC p-value]
C	-3,426	-0.309	0,757	-0,325	0,744
$strep_{t-1}$	-0,556**	-2,935	0,003	-2,853	0,004
$strep_{t-2}$	0,190	1,100	0,271	0,973	0,330
u_{t-1}	-0,950***	-9,252	0,000	-12,881	0,000
R-square	0,145			Akaike info criteria	8,013
Residual Sum of Squares	11,387102334E+04			Hannan-Quinn	8,073
S.E. of regression	52,700			Schwarz criteria	8,174

Source: the author from the results obtained on EasyReg

3.2.4- Forecasting the evolution of savings in a capitalization scheme

The same previous approach was used to choose the ARIMA model (3,1,4) below. It is on the basis of this equation that we made the forecast.

$$dstcap_t = c + \alpha_1 stcap_{t-1} + \alpha_2 stcap_{t-2} + \alpha_3 stcap_{t-3} + \beta_1 u_{t-1} + \beta_2 u_{t-2} + \beta_3 u_{t-3} + \beta_4 u_{t-4} + u_t \qquad (23)$$

The value of $R^2 = 0.87$, this value is high. It seems obvious that this model has a good predictive power.

Table 3: regression result $dstcap$

Dependent variable : $dstcap$					
Méthode : MCO					
Observation :45					
Variable	Coefficient	t-value	[p-value]	HC t-value(*)	[HC p-value]
C	-69,172	-0,569	[0,569]	-0,349	0,727
$stcap_{t-1}$	0,889***	4,274	[0,000]	4,083	[0,000]
$stcap_{t-2}$	-0,948***	-3,962	[0,000]	-5,633	[0,000]
$stcap_{t-3}$	0,719***	4,239	[0,000]	5,793	[0,000]
u_{t-1}	-0,393	-1,631	[0,102]	-1,585	[0,113]
u_{t-2}	-1,181***	-4,529	[0,000]	-5,602	[0.000]
u_{t-3}	-0,323*	-1,439	[0,150]	-1,870	[0,061]
u_{t-4}	-0,406*	-2,061	[0,039]	-2,220	[0,026]
R-square	0,879			Akaike info criteria	1,024
Residual Sum of Squares	88,662746359E+04			Hannan-Quinn	1,036
S.E. of regression	15,479			Schwarz criteria	1,056

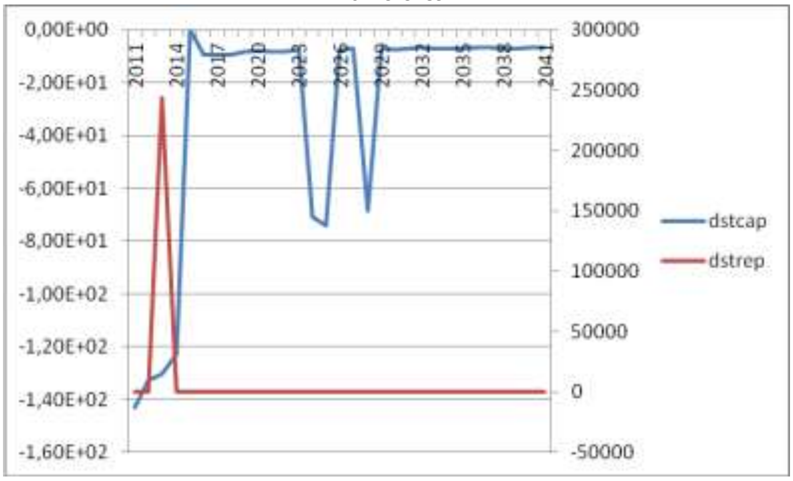
Source: the author from the results obtained on EasyReg

Following the results of the two forecasts, we will proceed to its graphical representation.

3.2.5- Comparative evolution of savings in a pay-as-you-go scheme and in a capitalization scheme.

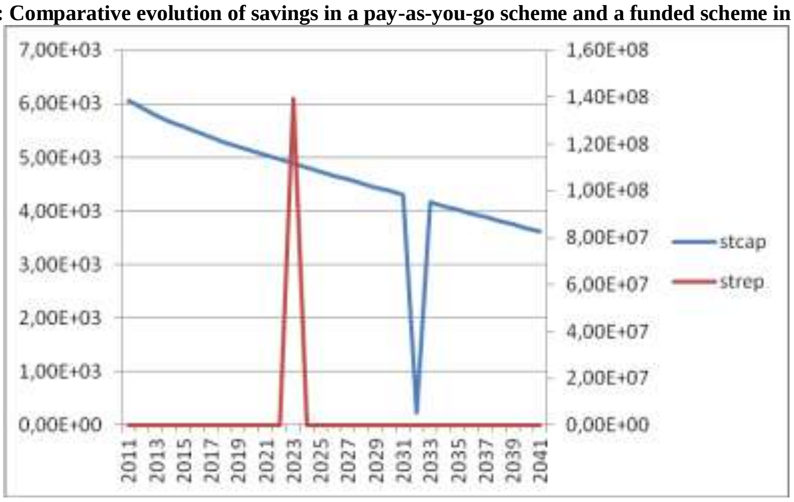
From the parameters specific to Ivory Coast, we realize that savings are better when there is no pension system. On the other hand, savings are stable in the presence of a pay-as-you-go pension system. Thus, the savings situation is better in the absence of a pension system than in the presence of a pay-as-you-go pension system in Ivory Coast. We can thus conclude that the capitalization system is preferable to the pay-as-you-go system in terms of return on savings and accumulation of savings.

Graph 1: Comparative evolution of savings in a pay-as-you-go scheme and in a capitalization scheme as a difference



Source: the author based on study data

Graph 2: Comparative evolution of savings in a pay-as-you-go scheme and a funded scheme in terms of



Source: the author based on study data

As can be seen, to discuss the comparative advantages of different pension schemes, the overlapping generation model provides a coherent framework. This allowed us to show that, contrary to a widely held idea, capitalization has a positive impact on the accumulation of savings, unlike the distribution which has a negative impact in the specific case of Ivory Coast.

Through our results that seem important to us. We believe that it is likely to significantly change the terms of the debate on pension reform in Ivory Coast. To this end, we have presented them in a framework that we wanted to be as simple and explicit as possible.

Bibliography

[1]. Aubert. J-M (1999) « Comparaison du rendement des régimes de retraite : une approche par cas-types » In: Economie et statistique, n°328, pp. 61-79.

[2]. Abel, A.B. [1985], Precautionary saving and accidental bequests, American Economic Review, 5(4), pp. 777-791.

[3]. Artus P. et Legros F (1999), « Le Choix du Système de Retraite: taille du système de retraite par répartition et âge optimal de départ à la retraite », Economica, p. 102-116.

[4]. Artus., P., Legros. F (1999), « Le choix du système de retraite », Economica, Paris.

[5]. Artus. P (2003), « Macroéconomie Problèmes contemporains, Approches théoriques », Economica, Ch 2 Problèmes intergénérationnels »

[6]. Augier. L., Chauveau. T., Loupias. C (1995), « Epargne privée et retraite par répartition dans un modèle de croissance optimale, en avenir incertain et avec générations d'agents ». In: Revue économique, Volume 46, n°2, pp. 195-215.

[7]. Blanchet. D (1998), « Le débat répartition-capitalisation : un état des lieux », complément du rapport du Conseil d'Analyse Economique « Epargne et retraite ».

[8]. Blanchet. D, Villeneuve. B (1997) « Que reste-t-il du débat répartition-capitalisation ? » In: Revue d'économie financière, n°40. Les systèmes de retraite, structure(s), défis et perspectives. pp. 157-174.

[9]. Caussat (1992), « Retraite et épargne: Histoire d'un débat dans la littérature économique américaine ». In: Revue d'économie financière. n°23. Le financement des retraites : La gestion du partage et des risques. pp. 159-172.

[10]. Charpentier. F (1996), « Retraites et fonds de pension : l'état de la question en France et à l'étranger » , Edition Economica. 369 p.

[11]. Conseil d'Analyse Economiques (1998), « Retraites et Épargne », Davanne O., Lorenzi J. H., Morin F., Charpin J. M., Majnoni I., Blanchet D. et Diamond P..

[12]. Diamond, P.A. [1965], National debt in a neo-classical growth model, American Economie Review, 55(5), pp. 1126-1150.

[13]. Drouhin. N (1997), « Systèmes de retraite et accumulation du capital: un modèle à générations imbriquées avec durée de vie incertaine », Recherches Économiques de Louvain / Louvain Economic Review, Vol. 63, No. 2, pp. 133-151

[14]. Koné Daba (2016), « Analyse du choix de régime de retraite en Côte d'Ivoire », 19 Septembre 2016, Université de Bouaké (Côte d'Ivoire).

[15]. Samuelson, P.A. [1975], Optimum social security in a life cycle growth model, International Economic Review, 16(3), pp. 539-544.

[16]. Stéphane. G (2012) « Macroéconomie : modèles dynamiques ». Economica, pp.315, Corpus Economie, 978-2-7178-5928-7. <hal-00858281>

[17]. Yvon Fauvel (1986), « L'incidence des régimes publics de pensions sur la consommation : une extension du modèle de Feldstein et une évaluation empirique pour le Canada » L'Actualité économique, vol. 62, n° 2, p. 210-235.