Capital Account Liberalization and Exchange Regime Choice - What is the Scope of Flexibility for Tunisia?

Ben Ali Mohamed Sami

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Abstract

The structural reforms that has been adopted by Tunisia for its economy since 1986, have allowed the establishment of the convertibility of its current account in January 1993. The capital account liberalization remains a top priority in the immediate future. In this respect, the exchange regime that will be Tunisia's choice is vital. This study evaluates the exchange rate regime from a welfare perspective within a game-theoretic framework. In a tradable/non-tradable goods model framework, Tunisia's exchange rate regime choice is cast in terms of external competitiveness and domestic inflation. Based on the Tunisian economic parameters, the simulation outcomes reveal that capital account liberalization is compatible with a flexible exchange regime. Simulation exercises also show that such a regime leaves the authorities a margin of manœuvre to correct the balance of payment disequilibrium and to promote a policy of economic growth by exportations.

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تحرير حساب رأس المال وخيار سياسة سعر الصرف: ما مدى المرونة لتونس؟

بن علي محمد سامي

الملخص

لقد مكنت الاصلاحات الهيكلية التي تبنتها تونس لاقتصادها منذ عام 1986، من السماح بعملية التحول في حساب رأس مالها في يناير من عام 1993. حيث تبقى عملية التحرير في قمة أولوياتها في المستقبل المنظور. وفي هذا الصدد فإن سياسة سعر الصرف سوف تحظى باهتمام أكبر. تقيم هذه الدراسة سياسة سعر الصرف من وجهة نظر الرفاه وفي إطار نظرية الالعاب. ففي إطار نموذج للسلع القابلة للاتجار/وغير القابلة للاتجار، فإن خيار سياسة سعر الصرف التونسي تعتبر منغلقة من حيث التنافسية الخارجية والتضخم المحلي. واستناداً إلى الشركاء الاقتصاديين لتونس، فإن نتائج المحاكاة تشير إلى أن تحرير الحساب الجاري يتوافق مع النظام المرن لسعر الصرف. كما تبين تمارين المحاكاة أيضاً إن مثل هكذا النظام يترك للسلطات هامشاً من الحركة لتصحيح ميزان المدفوعات غير المتوازن، ومن أجل ترويج سياسة النمو الاقتصادي عن طريق التصدير.

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Introduction

The choice of an optimal exchange rate regime has been the subject of an old debate in international economics since the precursory and seminal papers of Mundell (1961), McKinnon (1963) and Kenen (1969), and the contributions of Crockett and Nsouli (1977), Dreyer (1978), Heller (1977, 1978), Holden et al. (1979), Melvin (1985) and Wickham (1985), among others.

As Schor (1997) shows, this debate has never been closed.[1] In the last few years, the question has received renewed interest for the emerging market economies, particularly with Bailliu and Murray (2003), Chang and Velasco (2000), Edwards (1993, 1996, 2001), Edwards and Savastano (1999) and Williamson (2000), to name a few.

Although this question arises for all economies, it is of particular relevance for emerging economies. These economies face a very unstable monetary and financial international environment. This environment is characterized by a strong integration of the financial markets and high volatility of capital flows. In search of a certain economic stability, what choice of exchange rate regime will these economies make?

This question is of particular importance as it conditions the whole economic policy of these countries; safeguard their competitiveness, their stability and consequently, their economic growth. Reflecting the differences in the levels of economic and financial development, no exchange rate regime may be prescribed in a uniform way for all these countries (Frankel, 1999). Needless to say, choosing the optimal degree of flexibility compatible with the economic conditions of the country is not an easy task.

The objective of this paper is to study the choice of an optimal exchange regime for Tunisia. Its purpose is to evaluate the impact of this choice on the welfare of the monetary authorities, in particular, the external competitiveness and inflation.

Exchange Regime Choice: A Brief Survey of the Literature

Traditionally, two types of exchange rate regimes may be distinguished: (a) the fixed exchange; and (b) the floating exchange regimes. The fixed or pegged exchange rate system is a regime in which the Central Bank intervenes without limit to buy and sell its currency against other currencies to a predefined rate.[2]

Drawing a clear demarcation line between fixed and flexible exchange regimes is not an easy task. In fact, as the official rates of intervention of the Central Bank on the exchange rate market, as the purchase and sale of the national currency against other currencies widen, the regime approaches a free float. In a floating regime, the nominal exchange rate is an endogenous variable determined by market forces according to the demand and supply. In the framework of this regime, the monetary authorities have no commitment to a desired trajectory of the exchange rate. Consequently, they do not practice any intervention to guide this trajectory, hence the autonomy of the monetary policy.

Beyond the traditional fixed-flexible dichotomy, recent literature treats a variety of exchange regimes falling between these two polar cases of pure float and absolute fixity. These regimes are classified by a decreasing flexibility order: the independent float, the lightly managed float[3], the managed float, the crawling broad band regimes, the crawling narrow band regimes, the crawling pegs, the pegged within bands regimes, the conventional systems of fixed parities[4], currency boards and currency union/dollarization, and the regimes of countries that have no distinct official legal tender[5].

The choice set of criteria of an exchange rate regime traditionally suggested in the literature, which are usually related to the economic characteristics of a given country, originate in most of the theory of the optimum currency area. Other factors, rarely tested in literature, can also interfere in the decision process. Thus, the choice of an optimal exchange rate regime will depend on: the size of the country, its level of economic and financial development, its degree of openness to trade and to financial flows, the structure of its production and exportations, its inflation history, the inflationary temptations of the government, the nature and the source of the shocks, the position of its terms of trade and current account balance, the level of its exchange reserves and the mobility of the capital account, the flexibility of its fiscal policy, as well as the preferences of the political decision-makers in the arbitrage between different economic policy objectives.

As Frankel (1999) asserts: No single currency regime is right for all countries and at all times. The choice will depend on the relative weight assigned to each of these factors. In this respect, the exchange regime choice in theoretical literature is abundant. This literature, globally distinguishes between three principal approaches to explain the why and the how of the choice between fixed and flexible exchange regimes.

A first approach, which is based on the theory of optimum currency areas, developed during the 1960's following the original works of Mundell (1961), McKinnon (1963) and Kenen (1969) emphasizes the superiority of fixed exchange rate regimes within the framework of a monetary integration. The principal choice criteria of this regime are: the production factors mobility, the economic openness and the production diversification. Other choice criteria have emerged ever since, in particular: the degree of financial integration, the similarity of the rate of inflation and the homogeneity of the preferences. An extension of the original approach suggests the superiority of fixed exchange rate regimes but adopts a different logic. It privileges an arbitrage between the benefits and the costs of the integration of a currency area.

A second approach in line with the works of Fisher (1977), Turnovsky (1976), Flood (1979), Aizenman and Frenkel (1982, 1985), considers the optimality of the choice between fixity and flexibility with reference to the stabilization capacities of different regimes in an environment exposed to different types of shocks. The highlight of the conclusions of this literature is - if the economy is affected by monetary shocks, the fixed exchange regimes would be preferable. However, if these shocks are of real nature, flexibility would be more attractive.

A third approach considers the role of credibility in the choice process. The credibility of the monetary policy and the rationality of the economic agents are explicitly advanced after the seminal works of Kydland and Prescott (1977), Calvo (1978) and those of Barro and Gordon (1983). This approach was revived towards the end of the 1980s and adopted by Horn and Persson (1988) in the exchange regime choice decisions. It has been also enriched through the contributions of Aghevli, Mohsin and Montiel (1991), Collins (1996), Edwards (1996), and Persson and Tabellini (2000). According to this approach, adopting pegged exchange rate regime to a stable currency can generate gains in terms of a less inflation and therefore of a higher credibility of the monetary authorities. This credibility gain is generally arbitrated against the flexibility loss that causes the renunciation to the shocks adjustment mechanism.

If these different approaches can provide important knowledge to determine the choice of a particular exchange regime, the characteristics of an economy are also crucial for this choice. It is interesting at this stage to consider the choice of the exchange regime within the framework of the Tunisian economy.

Which Exchange Regime for Tunisia?

Since its independence, Tunisia has embarked on several economic development plans in a strategy for the establishment of a production structure and of a sector of public enterprises. Following the demise of the Bretton Woods system of fixed exchange system in 1973, major industrial countries moved to a system of floating exchange rates. Until the end of the Bretton Woods system, Tunisia had pegged its currency to the French Franc, given the importance of France as its principal trading partner. The managed floating that Tunisia officially adopted until the early 1980s actually maintained its nominal exchange rate within a stable band relative to the French Franc.

In 1986, Tunisia embarked on Structural Adjustment Policies aimed to establish a market-based and private-sector driven economy. As a result, Tunisia initially let its currency depreciate by about 40% over the next few years, before adopting a policy of a stable real effective exchange rate (REER). This exchange rate policy, aimed at maintaining the real exchange rate at a constant level to a composite basket of currencies of its main trading partners. The composition as well as the weights of the currencies of the basket underwent some modifications by widening them to introduce the commercial partner countries and the weak European currencies, since the objective of the Tunisian authorities was to enhance the external competitiveness.[6] Within the framework of this exchange rate policy, the objective was to guarantee, through regular adjustments in the value of the nominal exchange rate, the consistency of the effective real exchange rate.

Unlike other emerging economies, Tunisia was more prudent in its capital account liberalization policy in the 1990s. Its real effective exchange rate targeting policy, combined with sound monetary and fiscal policies, helped Tunisia to preserve external competitiveness and bring some discipline in macroeconomic policies. Nevertheless, the limitations specific to this exchange rate regime are beginning to emerge as the process of economic and financial liberalization, since the establishment of the convertibility of its current account in January 1993[7], is pursued.[8] In fact, the Tunisian authorities have decided to gradually liberalize the

capital account of the balance of payments to accompany the country's increased integration into the world economy.

To minimize the risks of increased international financial integration and to maintain monetary policy independence in an open capital account environment, the Central Bank of Tunisia is gradually moving from real effective exchange rate targeting framework to a floating exchange regime. A more flexible exchange regime could provide a solution to this dilemma (Fanizza et al., 2002; Fanizza et al., 2004). This study examines this hypothesis empirically. In particular, it aims to provide an answer to the following question: Would the choice of the flexibility option be an optimal choice in the case of the Tunisian economy?

The Model

This study follows the recent literature relating to the evaluation of the different exchange regimes with reference to the welfare criteria. The welfare approach defined in terms of costs/profits in the the exchange rate regime choice, has been notably adopted by Aizenman (1994), Chin and Miller (1998), Devereux and Engel (1999), Eaton (1985), Helpman and Razin (1982), Lapan and Enders (1980) and Neumeyer (1988). These authors consider the maximization of an objective function defined with respect to real and nominal variables. Such maximization determines the different costs and advantages of the adoption of a particular exchange rate system. The current accounts, the production, the growth rate, are usually the most important real variables considered. The nominal variables are primarily the general price level or the rate of inflation. These models are usually defined, as a Nash non-cooperative game between the government and the private sector agents.

Based on Agénor (1994), Asikoglu and Uctum (1990), Devarajan and Rodrik (1992), and Zhang (2001), a model is proposed that adopts this approach to the case of the Tunisian economy. The choice of an exchange rate system within the framework of this model is defined in terms of strategic interaction between the domestic firms and the monetary authorities. In a tradable/non-tradable goods model, the authorities are supposed to choose an optimal exchange regime that maximizes their welfare. The latter is obtained by the minimization of a loss function defined in terms of external competitiveness and domestic inflation.[9]

The approach of the choice of an exchange regime with respect to the welfare criteria considers the model of a small open economy producing tradable and non-tradable goods. The economic agents are, on the one hand, represented

by the monetary authorities, and by the agents of the private sector on the other. These agents interact in an optimization game where each tries to maximize his welfare. To attain this objective, the monetary authorities have access to the exchange rate as instrument of the economic policy, while the enterprises act on the non-tradable goods prices. This optimization game allows each of the agents to determine his objective function while minimizing a loss function.

The monetary authorities loss-function, such as defined in the literature, is determined by the deviation of the real exchange rate and the inflation rates from their respective targets. Analytically, this function is defined by the following equation:

$$Z^g = -\alpha \left[(1n\ E + 1n\ P_E - 1n\ P_N) - 1n\ \right] + \tfrac{1}{2}\lambda\ (1n\ P - 1n\ \Theta)^2\ ;\ \alpha,\lambda > 0 \quad (1)$$

Z^g: the monetary authorities loss-function expressed in logarithm level.
E: the nominal exchange rate.
α,λ : coefficients that represent the weights assigned by the monetary authorities to the external competitiveness and the domestic inflation respectively.
P, P_E and P_N : the general price level, the tradable goods' prices and the non-tradable goods' prices respectively.
 , Θ: the targeted levels of the real exchange rate (equilibrium exchange rate) and the general price level, respectively.

The authorities' loss-function as defined in Equation 1, is captured through the sum of two factors:

- The deviation of the real exchange rate from its equilibrium level, or its misalignment (first term). The negative sign of this term indicates that the appreciation of the real effective exchange rate affects negatively the authorities' welfare. In fact, the deviation of the real exchange rate from its equilibrium trajectory (appreciation) causes the monetary authorities a loss in terms of external competitiveness.
- The deviation of the general price level from its targeted level (second term of the equation) causes a loss to the monetary authorities in terms of a higher inflation.

Following the literature, the general price level may be expressed by the following equation:

$$1n\ P = \delta\ 1n\ P_N + (1-\delta)\ (1n\ E + 1n\ P_E]; \qquad 0<\delta<1 \qquad (2)$$
$(1-\delta)$: measures the degree of economic openness.

A small economy is usually a "price taker". The tradable goods' prices are consequently determined on world markets. According to Adams and Gros (1986), the prices of the non-tradable goods are determined by:

$$1n\ P_N = \varepsilon[(1n\ E + 1n\ P_E - 1n\ P_N) - 1n\ ] + \phi 1n\ \psi; \quad \varepsilon, \phi > 0 \qquad (3)$$

ε: elasticity of non-tradable goods' prices with respect to real exchange rate disequilibrium (overvaluation or undervaluation).

ϕ : elasticity of non-tradable goods' prices with respect to the domestic money growth.[10]

ψ : measures the domestic money growth.

The non-tradable goods' prices as defined in this equation, are determined by two terms: (a) the domestic money growth, and (b) the deviation of the real exchange rate from its equilibrium level (misalignment).

The first term indicates that an undervaluation of the real exchange rate implies an increase (proportionally to the elasticity ε) in the non-tradable goods' prices. In fact, an undervaluation induces an increase in exportation and a consequent transfer of the resources from the non-tradable goods sector to the tradable goods one. The consequent decrease of the production and supply of the non-tradable goods induces an increase in their prices. Conversely, an overvaluation of the real exchange rate has downwards effects on the non-tradable goods' prices.

The second term represents the effect of an increase or a decrease in the domestic money growth on the non-tradable goods' prices (proportionally to elasticity ϕ).

Within the framework of this model, the choice of the exchange rate system is determined by a game between the monetary authorities and the private sector economic agents represented by the enterprises. While setting up their prices, these enterprises minimize their losses to protect their positions. Following Agénor (1994), their behavior is given by a loss-function of the following form:

$$Z^e = \tfrac{1}{2}\{\ln P_N - \varepsilon[(\ln E + \ln P_E - \ln P_N) - \ln\ ] - \phi \ln \psi\}^2 \tag{4}$$

The enterprises loss-function as defined in Equation 4, is determined by the difference of two terms. The first term (P_N), is the price of non tradable goods. The second represents the sum of two components. The first component focuses on the deviation of the actual real exchange rate from its long-run equilibrium while the second focuses on the forces of money supply.

Equations 1 and 4 define the behavior of the monetary authorities and the enterprises, respectively.

In order to derive the appropriate exchange regime, the model defined in the previous section is considered:

$$Z^g = \alpha[(\ln E + \ln P_E - \ln P_N) - \ln\ ] + \tfrac{1}{2}\lambda\,(\ln P - \ln \Theta)^2$$

The next step is changing the variables and expressing them in proportional rates of change, rather than in level form:

$$e = \ln E,\ \varphi = \ln \psi,\ \omega = \ln\ ,\ P_N = \ln P_N,\ P_E = \ln P_E,\ \theta = \ln \Theta$$

Hence, the general price level will be determined by:

$$\ln P = \delta P_N + (1 - \delta)\,e \tag{5}$$

To simplify, it is supposed that the international prices remain unchanged $(P_E = 0)$ and the monetary authorities' loss function is derived within the framework of a flexible exchange regime:

$$Z_f^{\,g} = -\alpha\,(e - P_N - \omega) + \tfrac{1}{2}\,\lambda[\delta P_N + (1 - \delta)\,e - \theta]^2 \tag{6}$$

The enterprises loss-function in the framework of a flexible exchange rate system becomes:

$$Z_f^{\,g} = \tfrac{1}{2}[P_N - \varepsilon\,(e - P_N - \omega) - \phi\varphi]^2 \tag{7}$$

The roots of this second order equation yield the monetary authorities' reaction function (Equation 8) and the domestic enterprises one (Equation 9), respectively:

$$R_g : \bar{e} = \frac{(\alpha - \lambda\delta p_N + \lambda\delta^2 p_N + \lambda\theta - \lambda\theta\delta)}{(\lambda - 2\lambda\delta + \lambda\delta^2)} \tag{8}$$

$$R_e : \bar{P}_N = \frac{(\varepsilon e - \varepsilon\omega + \phi\varphi)}{(1 + \varepsilon)} \tag{9}$$

Solving Equations 8 and 9 simultaneously yields the Nash equilibrium values of the devaluation rate and of the inflation rate:

$$\tilde{e} = \frac{\alpha + \alpha\varepsilon + \lambda\varepsilon - \lambda\omega\delta^2 - \lambda\varphi + \lambda\delta^2 + \lambda\theta + \lambda\theta\varepsilon - \lambda\delta - \lambda\delta\varepsilon}{\lambda(\delta\varepsilon + 1 + \varepsilon - 2\delta + \delta^2)} \tag{10}$$

$$\tilde{P}_N = \frac{\alpha\varepsilon + \lambda\theta\varepsilon - \lambda\theta\delta\varepsilon - \lambda\varepsilon\omega + 2\lambda\delta\varepsilon\omega - \lambda\delta^2\varepsilon\omega + \lambda\phi\varphi - 2\lambda\delta\phi\varphi + \lambda\delta^2\phi\varphi}{\lambda(1 - 2\delta + \delta^2 - \delta\varepsilon + \varepsilon)} \tag{11}$$

By substituting these values in Equation 6, the authorities' loss-function under a flexible exchange rate system is determined:

$$\tilde{z}_f^g = -\alpha \left[\frac{\alpha + \lambda\delta\phi\varphi + \lambda\theta - \lambda\theta\delta - \omega\lambda + 2\omega\lambda\delta - \omega\lambda\delta^2}{\lambda(1 - 2\delta + \delta^2 - \delta\varepsilon + \varepsilon)} \right] + \tfrac{1}{2}\lambda \left[\frac{\alpha}{\lambda(1 - \delta)} \right] \tag{12}$$

To determine the monetary authorities' welfare function in the framework of a fixed exchange rate system, a comparative methodology is proposed. Under a fixed exchange regime, the authorities announce and maintain a fixed exchange rate (therefore e=0, no adjustment in the exchange rate). In this case, and according to Equation 9, the behavior of the enterprises within the framework of a fixed exchange rate system will be defined as:

$$P_N^{\hat{}} = \frac{(-\varepsilon\omega + \phi\varphi)}{(1 + \varepsilon)} \tag{13}$$

Accordingly, the monetary authorities' loss function under a fixed exchange rate system will be defined as:

$$z_x^{\tilde{}\,g} = -\alpha \left[\frac{(\varepsilon\omega - \phi\varphi)}{(1 + \varepsilon)} - \omega \right] + \tfrac{1}{2}\lambda \left[\delta \frac{(-\varepsilon\omega + \phi\varphi)}{(1 + \varepsilon)} - \theta \right] \tag{14}$$

Simulation Outcomes [11]

To simulate the model, it is necessary to determine the relative weight assigned by the Tunisian monetary authorities to the competitiveness objective and to the inflation one.

The export promotion policy in Tunisia sustained by a real exchange rate targeting strategy permits the supposition that the authorities assign a rather important weight to the competitiveness objective. The weak rates of inflation recorded during the last three decades clearly show that the authorities are highly concerned with the inflation objective too. Hence, it may be presumed that the authorities assign equal importance to the competitiveness and to the inflation objectives (α=0.5).

It must be admitted that the simulation parameters are difficult to estimate with precision. Approximations will be set primarily on the basis of the available statistics as well as on the basis of assessment of the reform of the Tunisian economy. These estimates do not impair the conclusions of this study but rather, give satisfactory results.

Also considered in this simulation basis is an economic openness rate of the Tunisian economy (1-δ) of 30%. Consequently, the coefficient (δ) is estimated at 70%. [12]

Since about ten years ago, the inflation annual rate - measured by the consumer price index - has fluctuated around 3% in Tunisia due to a broad money

growth rate targeting between 8 and 10%. The Tunisian Central Bank's domestic broad money growth rate projection for the year 2006 is estimated to be about 8%.[13] Therefore, a growth rate (φ) of 9.5% for the domestic money growth rate and an inflation target (θ) of 3% may be considered. [14]

Non-tradable goods' prices reveal a certain rigidity. In fact, they are in most of the cases, state-managed. It is supposed that the non-tradable goods' inflation elasticity with respect to the money growth (ϕ) is of 0.7. In this case, an increase of 10% in the money supply will induce an increase of 7% in the prices of the non-tradable goods. The elasticity of the prices of non-tradable goods with respect to the real exchange rate disequilibrium (ε) is estimated at 0.2.

Another required variable for the simulation is the equilibrium real exchange rate growth rate. According to Fanizza et al. (2002), between 1990 and 2001, the real effective exchange rate based on GDP deflator in Tunisia has appreciated by about 7%. In average, the exchange rate has appreciated therefore by about 0.7% per year during this period. Furthermore, according to the estimations of equilibrium real exchange rate on the basis of the Tunisian economic fundamentals, these authors indicate that Tunisia's effective real exchange rate has been near its equilibrium trajectory.

In this simulation, a similar trend of the equilibrium exchange rate may therefore be considered. The annual equilibrium real exchange growth rate is then set to 1%. To resolve the indeterminacy problem related to the estimation of the value of λ, it is assumed that monetary authorities' preferences follow a Cobb-Douglas function. This allows to write $\lambda = 2(1 - \alpha)$.

On the basis of the above specified parameters, the simulation outcomes reported in Table 1, it may be deduced that a flexible exchange regime causes lower loss to the monetary authorities compared to the fixed exchange rate regime. Consequently, it would be more favorable.

Table 1.

Simulation parameters : $\alpha= 0.5$, $\phi= 0.7$, $\varepsilon= 0.2$, $\omega= 0.01$, $\lambda= 2(1 - \alpha)$, $\varphi= 0.1$, $\delta= 0.7$, $\theta= 0.03$	
Z^G_X	Z^G_F
0.0334	-0.2348

According to the evolution of economic conditions, the authorities may change their preferences of competitiveness by increasing the weight assigned to this variable. Which exchange regime would be optimum in this case from the authorities' standpoint? To investigate this issue, the value of (α) in the loss function on the basis of the same simulation parameter values may vary. The results are reported in Table 2.

Table 2.

Simulation Parameters: $\alpha=0.5$, $\phi=0.7$, $\varepsilon=0.2$, $\omega=0.01$, $\lambda=2(1-\alpha)$, $\varphi=0.1$, $\delta=0.7$, $\theta=0.03$		
	Z^g_x	Z^g_f
$\alpha = 0.02$	0.0014	0.0015
$\alpha = 0.03$	0.0021	0.0021
$\alpha = 0.04$	0.0028	0.0025
$\alpha = 0.05$	0.0034	0.0028
$\alpha = 0.1$	0.0068	0.0024
$\alpha = 0.15$	0.0101	-0.0018
$\alpha = 0.50$	0.0334	-0.2348
$\alpha = 0.80$	0.0534	-1.7090
$\alpha = 0.90$	0.0600	-4.4226
$\alpha = 0.99$	0.0660	-54.3649

From Table 2, it may be noted that when the value of α is changed, a flexible exchange system causes, from a certain threshold, a less heavy loss than a fixed exchange rate regime. Consequently, this regime would be more optimal. Indeed, if authorities assign a weight superior to 3 % to the competitiveness objective, a flexible system would be more favorable for the authorities since it causes a lower loss than a fixed exchange regime (0.0025 < 0.0028). For a preference weight inferior to this threshold, a fixed exchange rate would be more optimal.

As far as Tunisia is concerned, the sustained effort of the Tunisian authorities to promote the exportations and the competitiveness of the domestic products on the foreign markets, it may be presumed that the preferences of Tunisian monetary authorities are superior to this threshold. They can even surpass the chosen coefficient in this simulation basis (the value of $\alpha=0.5$). From this perspective, it may be asserted that a flexible exchange regime would be

more optimal in the Tunisian context.

The exchange rate flexibility in the perspective of the economic openness and the capital account liberalization would allow the Tunisian monetary authorities to draw benefits from this choice. The principal conclusion that emerges from these results is that an eventual change in the preferences of the monetary authorities regarding the arbitrages between competitiveness and inflation to promote growth by exportations or for balance of payments, adjustments purposes will be compatible with a flexible exchange regime. Based on Table 3, an increase in the value of α, results in a lower loss to the authorities in the presence of a flexible exchange regime.

Table 3.

Simulation Parameters: $\alpha= 0.5$, $\phi= 0.7$, $\varepsilon= 0.2$, $\omega= 0.01$, $\lambda= 2(1-\alpha)$, $\varphi= 0.1$, $\delta= 0.7$, $\theta= 0.03$		
	Z^g_x	Z^g_f
$\omega = -2.6$	-1.0048	-1.0178
$\omega = 0$	0.0292	-0.2378
$\omega = 0.01$	0.0334	-0.2348
$\omega = 0.04$	0.0459	-0.2258
$\omega = 1.5$	0.6676	0.2122
$\omega = 5$	2.2764	1.2622
$\omega = 10$	4.8638	2.7622
$\omega = 50$	37.8133	14.7622

From Tables 3 and 4, it may be deduced that the equilibrium real exchange rate growth (ω) and the inflation target (θ) affect the magnitude, but not the direction of the choice of a particular exchange regime. In fact, whatever the value taken by these parameters, the flexible exchange system will always be chosen by the monetary authorities because it consistently attains a lower loss than the fixed regime.

Table 4.

Simulation Base : $\alpha = 0.5$, $\phi = 0.7$, $\varepsilon = 0.2$, $\omega = 0.01$, $\lambda = 2(1-\alpha)$, $\varphi = 0.1$, $\delta = 0.7$, $\theta = 0.03$		
	Z^g_x	Z^g_f
$\theta = 0$	0.0341	-0.2048
$\theta = 0.01$	0.0338	-0.2148
$\theta = 0.02$	0.0335	-0.2248
$\theta = 0.03$	0.0334	-0.2348
$\theta = 0.1$	0.0352	-0.3048
$\theta = 0.3$	0.0672	-0.5048

| $\theta = 0.4$ | 0.0983 | -0.6048 |
| $\theta = 0.5$ | 0.1393 | -0.7048 |

In contrast to these two variables, the effect of the economic openness rate on the choice of the exchange regime is more pronounced. The simulation outcomes for different openness parameter values (1-δ), show that from an openness threshold of 25% (δ=0.75), a flexible exchange system gives the authorities a more important welfare than a fixed system. Consequently, this is more optimal. For a degree of economic openness inferior to this threshold (75%), a flexible system causes an important loss in terms of welfare to the authorities. Consequently, a fixed regime will be preferred (0.0525 > 0.0335). In the polar case of an autarky economy (δ≥98), a fixed exchange system represents the only practical choice.

These results are in line with the conventional theory of the optimal exchange regime choice according to which the openness increases the need for flexibility. The principal knowledge that emerges for the Tunisian case is that the openness of the Tunisian economy and the capital account liberalization would be more compatible with a flexible exchange regime.

Table 5.

Simulation Parameters: $\alpha=0.5$, $\phi=0.7$, $\varepsilon=0.2$, $\omega=0.01$, $\lambda=2(1-\alpha)$, $\varphi=0.1$, $\delta=0.7$, $\theta=0.03$		
	Z^g_x	Z^g_f
$\delta = 0.5$	0.0333	-0.1821
$\delta = 0.55$	0.0333	-0.2032
$\delta = 0.6$	0.0333	-0.2237
$\delta = 0.7$	0.0334	-0.2348
$\delta = 0.75$	0.0334	-0.1750
$\delta = 0.8$	0.0335	0.0525
$\delta = 0.9$	0.0336	4.2350
$\delta = 0.98$	0.0337	255.7732

With regards to the domestic money growth variable, the simulation results (Table 6) show that a flexible exchange system, even with a negative money supply (cases of disinflation), will be optimal for the case of the Tunisian economy. This result holds up to money growth level of about 80%. Beyond this threshold, the trend reverses and a fixed exchange system will be more optimal for the authorities (0.3232 < 0.3252).

These results can be explained by reference to the credibility theory. The discretionary economic policies that generally accompany a flexible exchange rate system, and the lack of discipline that they generate by the excessive money supply, can induce an important inflationary bias. This one can be corrected by resorting to the exchange rate fixity. The adoption of an exchange rate system as a rule of anchorage of the exchange rate to a stable currency, allows a higher credibility of the monetary authorities and gains in terms of a less inflation. The adoption of the rigid fixed exchange regimes, within the framework of a Currency Board or Dollarization regimes, represent an extreme case of exchange rate fixity the finality of which is the quest for higher credibility.

When the domestic money supply becomes excessively high (superior to 350%), the tendency in favor of a flexible exchange system reverses again. In this case, and beyond a certain threshold of the money supply, even the adoption of a fixed exchange system cannot be a remedy to the credibility problems if it is not accompanied by anti-inflationary measures.

Table 6.

Simulation Parameters : α=0.5, ϕ=0.7, ε=0.2, ω=0.01, λ=2(1 − α), φ=0.1, δ=0.7, θ= 0.03		
	Z^g_x	Z^g_f
φ = -0.5	-0.1140	-0.6548
φ = -0.1	-0.0224	-0.3748
φ = 0	0.0047	-0.3048
φ = 0.2	0.0638	-0.1648
φ = 0.4	0.1296	-0.0248
φ = 0.8	0.2812	0.2552
φ = 0.9	0.3232	0.3252
φ = 3.5	2.0022	2.1452
φ = 6.5	5.3401	4.2452
φ = 9.5	10.1786	6.3452

According to the results recorded in Table 7, the effect of the non-tradable goods inflation elasticity with respect to the domestic money supply (ϕ) on the authorities welfare, is very weak. It has effects on the magnitude rather than on the direction for the choice of the exchange regime. On the contrary, the effect of the domestic inflation elasticity with respect to the equilibrium real exchange rate (ε) on exchange rate systems' performance is pronounced.

As it may be easily seen from the results reported in Table 8, from a 0.25 value threshold of this parameter, a fixed exchange rate system gives the

authorities a higher welfare than a flexible system (0.0308 < 0.0358). Choosing the appropriate exchange regime depends therefore, and to a certain extent, on the sensitivity of the domestic inflation to the equilibrium exchange rate misalignment.

Table 7.

Simulation Parameters : α=0.5, ϕ=0.7, ε= 0.2, ω=0.01, λ=2(1 − α), φ=0.1, δ=0.7, θ= 0.03		
	Z^g_x	Z^g_f
$\phi = 0$	0.0047	-0.3048
$\phi = 0.1$	0.0087	-0.2948
$\phi = 0.2$	0.0127	-0.2848
$\phi = 0.5$	0.0250	-0.2548
$\phi = 1.5$	0.0683	-0.1548
$\phi = 2.5$	0.1149	-0.0548
$\phi = 3.5$	0.1650	0.0452
$\phi = 4.5$	0.2184	0.1452
$\phi = 5.5$	0.2753	0.2452

In Tunisia, the price structure is relatively rigid and it is unlikely that this elasticity surpasses this threshold. The growing Tunisian economic openness and capital account liberalization could bring an additional flexibility to the domestic price structure but it remains unlikely that such a threshold can be surpassed. Thus, it may be concluded, from an openness perspective, a flexible exchange regime will be an optimal choice for the Tunisian economy.

Table 8.

Simulation Parameters: α=0.5, ϕ=0.7, ε=0.2, ω=0.01, λ=2(1 − α), φ=0.1, δ= 0.7, θ=0.03		
	Z^g_x	Z^g_f
$\varepsilon = 0$	0.0402	-1.3172
$\varepsilon = 0.1$	0.0365	-0.6407
$\varepsilon = 0.2$	0.0334	-0.2348
$\varepsilon = 0.25$	0.0320	-0.0872
$\varepsilon = 0.3$	0.0308	0.0358
$\varepsilon = 0.35$	0.0296	0.1399
$\varepsilon = 0.45$	0.0276	0.3064
$\varepsilon = 0.65$	0.0242	0.5343
$\varepsilon = 0.85$	0.0216	0.6829

To derive the optimal exchange rate system choice in the context of

the Tunisian economic openness, proceeding from the exchange liberalization measures and suppression of the tariffs and non-tariffs barriers, all the parameters values in this simulation basis are further varied simultaneously to see their effects on the monetary authorities' welfare performance. A weight of 50 % for the competitiveness is considered, a 25% domestic money growth, an economic openness rate of 65%, an 8% inflation target, a 5% annual equilibrium real exchange growth rate, a unitary domestic inflation elasticity with respect to the money supply and of 0.5 with respect to real exchange rate misalignment. The simulation results are reported in Table 9. They indicate a lower loss under a flexible exchange regime.

Table 9.

Simulation Parameters: $\alpha= 0.5$, $\phi=1$, $\epsilon=0.5$, $\omega= 0.05$, $\lambda=2(1-\alpha)$, $\varphi=0.25$, $\delta= 0.35$, $\theta= 0.08$	
Z^g_x	Z^g_f
0.1004	0.0495

Now to be considered are the monetary authorities' preferences changes effect on welfare performance. These new parameters give positive results for a flexible system (Table 10).

Table 10.

| Simulation Parameters: $\alpha=0.5$, $\phi=1$, $\epsilon=0.5$, $\omega=0.07$, $\lambda=2(1-\alpha)$, $\varphi=0.25$, $\delta= 0.35$, $\theta=0.08$ |||
	Z^g_x	Z^g_f
$\alpha = 0.5$	0.1004	0.0495
$\alpha = 0.6$	0.1203	0.0362
$\alpha = 0.7$	0.1402	-0.0028
$\alpha = 0.8$	0.1602	-0.1061
$\alpha = 0.9$	0.1801	-0.4667
$\alpha = 0.95$	0.1900	-1.2258

Conclusion

In this paper, a model is considered that puts in interaction the monetary authorities on one hand, and the private sector agents represented by the domestic enterprises on the other. The choice of an exchange regime by the monetary authorities, results from the minimization of a loss-function defined in a Nash non-cooperative game with these enterprises. Based on certain parameters of the Tunisian economy, the simulation exercises reveal that the opening of the

Tunisian economy and the liberalization of its capital account is compatible with a flexible exchange regime since it causes a less heavy loss than a fixed system does. Such a system can assure the competitiveness objective and mitigate the inflationary bias, generally associated with the capital account openness. It can therefore bring the required credibility for such a transition period. This is particularly important as long as this transition phase is accompanied by new risk elements that necessitate a high credibility of the policies and the institutions.

In a capital account liberalization perspective, the simulation outcomes show that a change in the preferences of the monetary authorities in the framework of the arbitrage between competitiveness and inflation, is compatible with a flexible exchange regime. Such a regime allows the authorities to have a margin of manœuvre to eventually correct the balance of payment disequilibrium and to promote a policy of economic growth by exportations.

Footnotes

[1] Schor (1997): Changes fixes ou changes flexibles : Un débat jamais clos.

[2] In the Bretton Woods system, the exchange rate of the Dollar has a margin of fluctuation of +/- 1% around a central parity. Before August 1993, the European Monetary System has a fixed bilateral exchange rates with a margin of fluctuation of + /- 2.25% around a central parity.

[3] Contrary to an independent float regime, within the framework of a managed float, the authorities can intervene on the exchange market with the objective to lessen the excessive fluctuations of the exchange rate and not to defend a zone or a given level of the exchange rate.

[4] The country pegs (officially or de facto) its exchange rate, at a fixed rate, to a stable currency or to a basket of currencies.

[5] In this case, another monetary unit is the legal tender in the country, or the country is a member of a monetary union or of a cooperative monetary mechanism having adopted a common currency that has legal course in each of the member nations.

[6] It is safe to assume that the French Franc (and now the Euro) and the US Dollar still carry an important weight in this basket, given their continued importance for Tunisia.

[7] The current account convertibility of the Tunisian Dinar was announced by the President of the Republic in December 27, 1992. It entered into effect with Law No. 93-48 on May 3, 1993. From 1993, exchange control has been lifted on the current operations, the resident's current accounts, Tunisians' investments abroad as well as some external loans. Also, the establishment of interbank foreign exchange market in Tunisia in 1994 marked an important step toward decentralizing the management of foreign exchange and allowing market forces to play a greater role in exchange rate determination. Moreover, the Central Bank of Tunisia gradually reduced its market presence giving financial institutions bigger role in managing foreign exchange flows. Forward and swap markets have also been created.

[8] As Calvo et al. (1995) show, monetary authorities can follow a constant real exchange rate targeting policy only for a limited period.

[9] Within the framework of the Tunisian growing economic openness, the authorities have privileged an export promotion strategy attended by a real constant exchange rate strategy. Consequently, they are very concerned with the preservation of the external competitiveness and the price stability as well. Their policies are consequently defined in terms of competitiveness and inflation. The choice of this modelling in the Tunisian case is therefore particularly suitable. Within the framework of this model, the authorities' welfare is measured by the external competitiveness. This does not exclude the economic growth objective that is captured by the competitiveness effect.

[10] Non-tradable goods are goods that are not traded because of material impossibility (infrastructures, transportations.) or because of the domestic (protection measures) or world-

wide regulations (embargo), or for reasons of transportation costs. Non-tradable goods can become tradable when the regulations impeding their free circulation are eliminated or when the transportation costs lower or disappear. Tradable goods are often assimilated to the manufactured products while non-tradable goods are assimilated to the services (electricity, water, transportation, constructions, telecommunications, etc).

[11] The simulation is carried out using the Matlab computer program (version 7.0.1).

[12] According to preliminary simulations, this economic openness rate is satisfactory. The openness rate generally used in the literature (X+M/GDP) accounts only for the degree of the current account openness and cannot, consequently, be a reliable measure of the degree of effective economic openness of a country. An openness rate is approximated that accounts for the current account liberalization degree as well as the capital account. It will be noted that Tunisia's trade openness rate remains rather low. Indeed, with the different tariffs and non-tariffs barriers, Tunisia holds the index of 8 out of 10 of the Trade Restrictiveness Index of the International Monetary Fund (IMF, 2005). At the capital account level, the degree of openness is much weaker.

[13] Central Bank of Tunisia (2005).

[14] Despite the liberalization process of the Tunisian economy, many prices remain regulated. Indeed, oil, water, basic products, electricity, telephone and public transportations' prices still remain state regulated. At the same time, salaries remain comparatively rigid since wage negotiations in Tunisia generally intervene every three years.

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