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THE HYBRID APPROACH OF INFLATION TARGETING: WHAT OPPORTUNITIES FOR AN EMERGING ECONOMY LIKE TUNISIA?

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Abstract

After economic crises happening in many emerging countries, flexible exchange rates became a required theoretical condition helping to target inflation. Many countries stopped using exchange rate as an anchor for monetary policy and started using inflation targeting framework. In emerging countries, monetary authorities work to stabilize the exchange rate because of their "fear of floating". They are against high volatility of interest rate allowing speculative attacks and causing free fluctuations of their national currency. To avoid uncontrolled market movements, they have to choose between active and public exchange rate management and tight inflation targeting. In the same vein, Central bank of Tunisia follows financial measures linked closely to inflation without focusing especially on monetary aggregates in order to study a possible transition to targeting inflation strategy. It uses a simple Taylor rule where interest rates adjustment are guided by the anticipated inflation deviation from its original target and also by the gap between observed and potential GDP.As an emerging economy with a high degree of financial vulnerability, and facing different shocks, Tunisia should adopt a hybrid rule of inflation targeting in an open economy. This hybrid rule explicitly takes into account the evolution of the exchange rate in the reaction function of the central bank.

Keywords: Inflation Targeting, Hybrid Targeting Rule, Emerging Economy, Exchange Rate Regime

JEL classification: E, F

1. Introduction

The 1980s witnessed a hyperinflation in several countries, especially in Latin America, resulting in significant dysfunctions at the level of their economies. The debate was then focused on the opportunity presented by nominal anchoring policies of the exchange rate to stabilize prices as well as the economic activity.

This is no longer the case nowadays as inflation no longer represents the primary objective of most of these countries and other emerging ones. The primary concern has

therefore been to select the most adequate exchange system out of the development frameworks that highlight the promotion of exportations via a competitive price policy. This strategy was adopted by the early emerging countries of Asia.

Considering the collapse of several fixed rate regimes in the 1990s and following the exchange crises that occurred in many emerging countries, most of the latter are now abandoning fixed rate systems, also called anchor systems, in favor of a discretionary management in the form of managed or flexible floating. This transition took place either under market pressure, following a speculative attack, or after a massive influx of capitals (in the absence of these attacks). Consequently, there is an important debate[1] now on the choice of the most suitable exchange system in these countries: isn't flexibility eventually inevitable? Will these systems then be an intermediate step before the unavoidable transition to floating?

Taking into consideration developments in the theory and new empirical studies conducted on this issue, the debate touched more specifically on the re-examination of the advantages of a floating exchange system combined with the establishment of an inflation target, or levels of prices, compared to a more permanent system of fixed exchange, based *inter alia* on the use of a common currency. Flexibility of the exchange rates is presented as a universal remedy when it is accompanied with a new strategy of monetary policy, namely "Inflation Targeting" (IT).

The Canadian experience is a pioneer in the initial adoption of a floating exchange system. Canada actually started to float its currency since the end of the 1940s[2]. The success that this country has known in this respect, since WWII, and particularly its most recent experience in the adoption of a floating exchange rate combined with an inflation target, has served as an example for other industrialized countries and emerging economies as well. Thus, more and more countries are abandoning the nominal anchoring exchange rate as an intermediate objective of the monetary policy in favor of IT.

The flexibility of the exchange rate is considered as one of the theoretical conditions necessary to the adoption of IT. In addition, to simultaneously target inflation and the exchange rate using the same instrument (the interest rate), causes a conflict between the internal objective (stability of prices) and the external one (stability of the currency's external value) as per the Tinbergen rule (1952).

More precisely in IT, this conflict is even more problematic that managing inflation becomes the primary objective of the central bank (CB) that becomes obliged to publish achievements of the inflation's quantified target that it fixed. In fact, in case the inflation's internal objective is privileged while no justification on stability of prices can be presented, this could, in the future, jeopardize the credibility of the adopted monetary policy and can also hamper its anchoring and anticipatory capacity.

The review of economic and empirical literature sheds light on the way emerging countries can take into consideration the exchange rate variable in an IT regime in line with the particularities of these countries and it also shows that financially vulnerable emerging economies can benefit from a hybrid IT approach. This approach, as presented in the works of Garcia *et al.* (2011), for instance, offers substantial benefits, in the case of financially vulnerable emerging economies, in reducing the volatility of the exchange rate, the interest rate and the trade balance, particularly in terms of risk premium shock fluctuations**.**

Considered as a financially vulnerable emerging economy, Tunisia announced (in 2012) its adoption of a greater flexibility in its exchange policy although the Tunisian Central Bank (TCB), which took preliminary steps in IT[3], maintains *de facto* anchoring to a composite. Thus, conduct of the monetary policy does not consist in explicitly targeting the monetary mass but it

[1] El-Hodiri, M. and Mukhamediyev, B., 2014. Monetary policy rules in some transition economies. Eurasian Journal of Economics and Finance, 2(3), p 26-27.

[2] The early experience of Canada in respect to floating exchange rates from 1950 to 1962 has often been cited as an example, mainly by Milton Friedman (1953) to illustrate the virtues of such a system and it inspired several academic studies.

[3] IMF, (2014), Annual Report on Exchange Rate Arrangement and Exchange Restrictions.

follows the evolution of some indicators that are tightly linked to the inflation (importation prices, the output gap, core inflation etc.).

In the present work, we will try to answer the following question: What place should the exchange policy hold in emerging countries targeting inflation? Is active management of exchange really justified and necessary or does it leads the central bank to derail of its primary objective which is achieving stability of prices? Analyzing the stylized facts to see that if a hybrid approach simultaneously targeting inflation and exchange can be considered an opportunity for Tunisia.

2. The Central Bank's Reaction to Exchange Rate Variations

Monetary authorities of many emerging countries fear floating and hesitate to let the value of national currency fluctuate freely. According to Calvo and Reinhart (2002), the "fear from floating", translated in a high volatility of exchange rates, is potentially destabilizing for the banking and financial sector. In conformity with Mundell's incompatibility triangle, it is not theoretically possible for a country to reconcile the autonomy of the monetary policy, exchange rate anchoring and freedom of capital movement. Thus, and within the scope of an IT policy, the implicit objective of exchange can be in conflict with the inflation's official objective which would reduce the credibility and the efficiency of such a monetary policy strategy. The fear from floating noted in emerging countries today can be explained by the fear from speculative attacks. In this respect, Calvo and Reinhart (2002) highlighted a relatively large divide between the *de jure* exchange policy and the *de facto* one in the case of a high number of emerging countries declared to be officially purely floating regimes. In fact, monetary authorities in these countries, fearing to see the exchange objective become a target for speculators, intervene in a discretionary way in the exchange market.

The choice of the optimal exchange regime within the scope of IT is crucial to emerging countries. They have to resort to arbitration between active and announced management of their exchange rate and a rather disguised management as they can also apply strict inflation targeting with no objective of exchange rate.

A number of empirical studies tried to analyze the way central banks in these countries effectively integrate exchange in the conduct of their monetary policy.

By working on time series, Mohanty and Klau (2004) studied the monetary rule of the exchange rate in a sample of 13 emerging countries (11 of which target inflation).They retained two alternative measures of the exchange rate namely the relative variation of the real effective exchange rate (*REER*) and the variation REER's misalignment[4]The results are hard to exploit as adopting IT managed to affect the behavior of the central banks object of the study and, more particularly, highlighted the importance they could have given to the exchange rate.

As an extension of the mentioned study, other works tried to generalize these conclusions, such as the study conducted by Aizenman *et al.* (2011) who considered Taylor's rule[5]added to the first difference in the logarithm of the real effective exchange rate (LREER) using data for the period 1989-2006, on a sample of 16 emerging countries (11 of which target inflation by considering only the post-target adoption period for the latter). They found that the central banks of these two types of countries respond to the exchange variations even when they obtained results suggesting that monetary authorities in countries that do not target inflation highly react to the exchange rates in targeting countries. Thus, they show that monetary authorities in inflation targeting countries have high reactivity toinflation variations as it is a primary objective for them. However, and conforming to theoretical and practical recommendations, the exchange rate would therefore be only a secondary objective.

Furthermore, the study conducted by Ostry *et al.* (2012) only focused on emerging countries targeting inflation and studied a sample of 14 countries covering the period from the

[4] Gap between the observed *REER* and the long-term balance exchange rate calculated with the help of Hodrick and Prescott's filter (1997).

[5] By noting that the Taylor rule estimations on contemporary data are realized for each of the two sub-samples.

adoption date of IT in each of these countries until the end of 2010. They adopted a totally different monetary rule to keep what they call "the real target interest rate" measured by the difference between the short-term nominal interest rate observed over a period *t* and the target inflation rate over one year. In addition, they do not integrate the estimated rule of the REER but rather the latter's gap with respect to its tendency. Eventually, they selected a "forward looking" monetary rule in which the gap between the inflation and its target is no longer measured with the help of contemporary values but one that corresponds to the difference between the anticipated targeted inflation rates over a year. This choice is justified by the fact that the anticipated inflation rate can purge, to a certain extent, the estimations' results of exchange-related management motivations within central banks which are linked to the transmission of exchange variations to internal prices (pass-through).Methodological divergences in this approach do show that the estimations' results are in concordance with those obtained by Aizenman *et al.* (2011).

This literature review showed that the volatility of the exchange rate is a major concern for central banks in emerging countries targeting inflation in the conduct of their monetary policy which helped highlight the reaction of the short rate to currency movements even though this implicit objective does not seem to re-question the objective of inflation fixed by the central bank. However, these works do not help solve the problem related to the conflict of objectives and costs induced by simultaneous targeting of the inflation and of the exchange through one interest rate.

What is important at this level is to bring to light the theoretical conditions required for this exchange targeting to be efficient and to check whether this simultaneous inflation and exchange targeting is costly in terms of inflation and output volatility.

In general, two fields of theoretical and empirical literature tried to answer these queries based on a small macroeconometric model of the various types of monetary rules according to which they either integrate an exchange objective or not (Lucotte, 2015).

- The first field[6] tries to check the extent to which the degree of transmission of exchange to local prices, and more generally the degree of openness of an economy, can justify exchange targeting. In this respect, Pavasuthipaisit (2010) tried to determine the conditions that would justify the inclusion of the exchange rate in an interest rate rule. However, McCallum (2006) was able to show that the exchange rule, in comparison with the interest rate rule that does not integrate the exchange rate, allows for better performances in terms of product when the economy is more open.

These two studies suggest that in terms of inflation volatility, the two types of monetary rules are significantly equivalent whatever the rate of economic openness may be ; but they do not affirm that joint targeting and exchange is counterproductive in the way the monetary rule obtained by McCallum (2006) is not added to the exchange. The Pavasuthipaisit (2010) model shows that it is optimal for a monetary authority to attribute importance to the exchange objective when the pass-through is high. On the contrary, when the latter is weak, the importance given to the exchange objective has to point toward zero. He demonstrates, in addition, that the degree of integration to international capital markets equally shows the importance attributed to the objective of exchange stabilization in the monetary policy's conduct. He also suggests that this importance is even more significant that the degree of financial integration is high; while it should be low when mobility of capitals is low in line with Mundell's principle of Impossible Trinity according to which the three objective of stability of the exchange rate, integration to international capitals' markets and of monetary policy dependence cannot be attained simultaneously.

- The second field of analysis[7] aims at studying the extent to which the level of debt dollarization can justify an active management of the exchange rate on the part of the central bank. The studies have produced contradictory results: Moron and Winkelried (2005), for

[6] This issue was mainly treated by McCallum (2006) and Pavasuthipaisit (2010) although the retained approach and the targeted objective are significantly different.
[7] See the extension of Pavasuthipaisit's results (2010).

instance, show that taking exchange into consideration in the interest rate rule can be beneficial in terms of inflation volatility and output for economies displaying a high financial vulnerability. However, other studies such as those of Cespédes *et al.* (2004), Cavoliand Rajan (2006) or Batini *et al.* (2007) reach a contrary result and recommend a perfect flexibility of the exchange rates.

It is worth noting, in this respect, that the research conducted by Garcia *et al.*(2011) is considered as one of the most current and comprehensive studies of all studies focusing on the importance of exchange targeting in the inflation targeting framework in emerging countries. Based on a dynamic stochastic general equilibrium model, these authors tried to compare the impact of various monetary policy rules on economic performance in developed countries[8]with emerging ones. The obtained results show that emerging countries have better macroeconomic performance in terms of volatility of inflation and output, when the central bank follows a monetary rule characterized by an interest rate rule that takes into account exchange considerations (considering the gap between the real exchange rate and its stationary state level) than when following a traditional monetary rule, *i.e.* one that is characterized by a function of adjustment of the central bank's prime rate to address the inflation gap with its target in addition to the production gap. The obtained results confirm that beyond the pass-through argument, the management of exchange rate can be justified and beneficial when an economy is victim of "the original sin"[9] and is highly dollarized. It would seem that conflict of objectives is not really an issue for this type of economy.

In addition, by analyzing the conditions that would allow emerging countries targeting inflation to achieve better macroeconomic performances during the period of primary materials' price boom that started in 2007, Pourroy (2012) tries to empirically test whether the management of exchange rate improves IT. Does this management allow the central bank to avoid resorting to arbitration between inflation volatility and that of production in its reactive function without affecting its credibility? The methodology used is a comparison between a free floating and hybrid inflation targeting (HIT). The latter studied 16 inflation-targeting emerging economies (ITEEs) face to the inflation shock of 2007-2008. This shock is a typical example of an exogenous shock affecting prices at the international level. His results show two distinct behaviors among emerging economies that adopted an inflation-targeting framework, namely those with an independent floating exchange rate on the one hand, and those adopting managed floating on the other. It is the first study that shows that the strategy of the exchange rate played a fundamental role in ITEEs in the case of shocks on prices during the period2007-2008. HIT helps to reduce the impact of the inflation and creates a lower deviation from the target with less loss of credibility.

According to Pourroy (2012), there is a paradox in the credibility principle "the most credible CBs are not those that did what they said they would; the most credible CBs are those that enlarged their toolkit with other goals and tools, with no clear communication about these actions" (p.450).

This seems to confirm the idea that recommends the emerging countries' benefit and necessity of containing the exchange fluctuations, particularly in a large scale external shock context. Thus, countries with active exchange management resist the best to a high inflationary trend adopted by countries with a floating exchange regime.

3. Hybrid approach: simultaneous inflation and exchange targeting

As discussed above, Garcia *et al.* (2011) tried to look at the extent to which emerging countries can take the exchange rate into consideration in an IT regime according to the specificities of these countries. These authors use stylized models of financially-vulnerable "emerging" economy FVEE) and financially-robust "advanced" economy (FRAE) to compare the

[8] In the way they have some strength on the level of economic development and financial stability.

[9] The original sin is manifested as explained by Eichengreen and Hausmann (1999) by the difficulty of these countries to issue securities in their own currency in international markets which increases the proportion of external loans in foreign currency.

performances of monetary policy rules in the management of demands' shocks, costs' shocks and shocks affecting the risk premium.

Their results show that giving a small weight to the exchange rate in financially-robust advanced economies is beneficial in the management of shocks on risk premiums without unfavorably affecting inflation and the output gap; however, in FVEE, smoothing the exchange rate reveals to be more advantageous in reflecting the reverse effect of demand shocks on exchange rate fluctuations.

Approaches that integrate the exchange rate within the scope of inflation targeting are described as "hybrid approaches of inflation targeting".

3.1. Typology of hybrid targeting inflation approaches

At this level, three types of approaches can be distinguished:

3.1.1. The "Plain Vanilla" Approach

This approach applied in advanced economies describes the orthodox framework of IT. In this case, the variations of the exchange rate are indirectly taken into consideration and the monetary policy implies adjustments in the target interest rate guided by the anticipated deviation of inflation from its target and by the deviation of the Gross Domestic Product *(*GDP) from its potential level (output gap*)*. In this case, the central bank smoothes the interest rate trajectory. This strategy is formulated by the following reaction function:

$$\hat{\imath}_t = \rho_i \hat{\imath}_{t-1} + (1 - \rho_i)\,[\delta \hat{\pi}_t + \varphi \hat{y}_t] + \upsilon_t \qquad (1)$$

In which $\hat{\imath}_t \equiv i_t - (\bar{r} - \pi^T)$ is the gap between the interest rate target i_t *in the period t* through the long term permanent value defined as the long term equilibrium exchange rate $\bar{r}$ plus the inflation target π^T.

$\hat{\pi}_t \equiv (\pi^f_t - \pi^T)$ represents the gap in *t* between the anticipated inflation (π^f_t) and the target inflation (π^T).

$\hat{y}_t \equiv (y_t - \bar{y}_t)$ is the deviation of the real GDP y_t from its potential level estimated $\bar{y}_t$ in a period *t* (production gap).

v_t is a variable that represents the adjustment parameters, for example with the inaccuracy in the implementation of the monetary policy.

The main characteristics of the "plain vanilla" reaction functions are:

- Parameter ρ_i refers to the way the CB gradually intervenes in economic evolution.
- The value of δ has to be superior to *1* for the real interest rate variations to be at least equal to any variation in the anticipated inflation deviation from the target.[10]
- To ensure the coherence of the long term inflation objective, the central bank attributes some importance to the various components of the monetary policy's reaction function to mitigate GDP deviations from its potential level.
- The exchange rate does not appear explicitly in the monetary policy's reaction function. We implicitly take into consideration the fluctuations of the exchange rate since they affect inflation forecasts and the *GDP*.

3.1.2. Open Economy Inflation Targeting

In Open Economy Inflation Targeting, we explicitly take into account the evolutions of the exchange rate in the CB's reaction function rather than indirectly taking it into account through impacts on the output gap and anticipated inflation.

[10] The distinction between the strict or flexible *CI* discussed by Svensson (2000) partly depends on whether δ is superior or not to φ.

In practice, several (developed or emerging) IT countries seem to systematically adjust their exchange rate in response to the fluctuations of the exchange rates compatible with IT in an open economy. The way of integrating the exchange rate in the CB's reaction function is the same as that of output gap integration: there is no exchange rate target but some importance is given to reduce exchange rate volatility. Introducing the exchange rate in the CB's reaction function does not imply the fixation of an exchange rate target. In fact, reducing the exchange rate volatility has to be compatible with a non-inflationist long-term economy balance.

$$\hat{\imath}_t = \rho_i \hat{\imath}_{t-1} + (1-\rho_i)[\delta\hat{\pi}_t + \varphi\hat{y}_t + \chi(\hat{q}_t - \eta\hat{q}_{t-1})] + v_t \quad (2)$$

$\hat{q}_t$ is the deviation of the real exchange rate during period *t* compared to its long-term steady state level.

This specification considers the alleviation of the volatility of the level of the exchange rate compared to its long-term steady state value, variations in the exchange rate or both at the same time.

If $\eta = 0$, the CB systematically alleviates the deviations of the real exchange rate level compared to the steady state equilibrium rate.

If $\eta = 1$, the CB alleviates the variations of the real exchange rate consistent with the objective of limiting the volatility of the exchange rate.

More generally, if $0<\eta<1$, the CB attributes some weight to limit exchange rate volatility and to alleviate exchange rate misalignment.

3.1.3. Exchange Rate-Based Inflation Targeting

The exchange rate is used as an operational instrument or an approximate target for monetary policy.

In this case, the CB's reaction function can be described by:

$$\hat{q}_t = \rho_q \hat{q}_{t-1} - (1-\rho_q)[\delta\hat{\pi}_t + \varphi\hat{y}_t] + v_t \quad (3)$$

As is the case within the framework of the traditional approach and the open economy inflation targeting, the inflation objective coefficient δ has to be high enough to guarantee that inflation will be brought back to its mid-term target. In this approach, the CB should not act on the foreign exchange market by using sterilization operations. However, to reach a required level of exchange rate, the CB can intervene in the money market by changing the short-term interest rate. In this case, the exchange rate is considered as an operational objective for monetary policy.

3.2. Performance Evaluation of Hybrid Rules

The performance of monetary policy rules in hybrid alternatives of IT is evaluated from calibrated models of FRAEs and financially-vulnerable "emerging" ones. These models are used to treat the issue of domestic demands, the pressures on costs and the risk premium shocks.

The analysis focalizes on three questions:

- Are hybrid monetary policy rules more performing than "plain vanilla"?
- Which weight to give, if need be, to the exchange rate in the monetary policy rule?
- How does the hybrid monetary policy rule affect the variability of a large scale of economic variables?

3.2.1. Performance of the Hybrid Rule and Arbitration between Inflation Volatility and Output Gap Volatility

The volatility of the output gap and /or inflation is significantly higher in FVEEs than in FRAEs compared to the various types of shocks which reflect the differences of economic structures. In

both types of economy, arbitration between inflation volatility and that of the output gap depends on the nature of shocks:

In case of disruptions on the demand, the frontier formed by the letter v of the monetary rule shows that arbitration between the inflation and the output gap is very limited in scope in a "plain vanilla" rule.

However, in case of shocks on costs, there is a conflict of objectives between inflation and the output gap which gives legitimacy to a clear arbitration between the variability of inflation and that of the output gap.

Eventually, in case of risk premium shocks, there is no need for arbitrations when trying to reduce inflation volatility or that of the output gap in the "plain vanilla" rule.

Concerning demand shocks, it is useful to conduct a small arbitration between inflation volatility and that of the output gap. However, the various monetary policy rules have significant effects on the position of the monetary policy frontiers.

Contrary to advanced economies in which the "plain vanilla" rule and the open economy rule behave similarly, in emerging economies, hybrid rules and particularly ones based on the exchange rate, lead to a weaker volatility of the output gap without having a higher inflation volatility as in the "Plain vanilla" rule. This result translates the fact that, in FVEE, domestic demand shocks result in depreciation rather than in currency appreciation with counterproductive effects on the volatility of inflation and output gap. In this case, it is useful to resist depreciation as it reduces the exchange rate *pass-through* to inflation and leads to a higher response to the interest rate.

It is also worth noting that the source of a demand shock in an emerging economy greatly counts in this context due to the sensitivity of the exchange rate to the trade balance. With a domestic demand shock, the deterioration of this balance will entail depreciation of the currency. However, when the shock is originally external, an improvement in the trade balance results in a beneficial appreciation of the currency. In this case, in line with advanced economies, smoothing the exchange rate could be unhelpful.

In case of costs shocks, all monetary policy rules behave in the same way in both types of economies. In addition, smoothing the exchange rate does not significantly modify the basic conflict between the compensation of effects of such shocks on inflation and output gap because this type of shock tends to lead to a real appreciation of the currency. Therefore, to resist this appreciation by reducing the interest rate counters the decline of the output gap but with higher inflation costs. Hybrid rules thus tend to change the frontier of the monetary policy towards a lower output volatility and a higher inflation volatility.

In case of risk premium shocks, the hybrid rule tends to be more performing than the "Plain vanilla". The version ½ and ½ of open economy rule is particularly performing. Such a shock leads to a significant depreciation of the currency in emerging economies as well as in developed ones by boosting inflation and output (towards the improvement of the external competitivity). Thus, resisting depreciation tends to reduce inflation and output volatility.

It is important to note that even though a shock on risk premium can increase the output, it leads to a more accelerated decline of consumption which results in the appearance of arbitration between inflation and stabilization of domestic demand.

These results are generally in line with conventional visions on appropriate responses to various sorts of shocks. Ragan (2005) observes that in advanced economies, fluctuations of the exchange rate, associated with disruptions that are directly affecting the demand, have a tendency to compensate the effects of shock on the production and inflation. Consequently, rules that alleviate adjustments of the exchange rate after demand shocks, tend to be counter-productive. If exchange rate fluctuations are of little use in financially vulnerable economies,[11] rules that resist exchange rate fluctuations could be beneficial.

In case of risk premium shocks, exchange rate fluctuations are destabilizing in such a way that the hybrid rule reducing the exchange rate variation becomes better than the "Plain vanilla" approach. This is compatible with Ragan's argument, who explains that in the case of such shocks, an IT policy should aim at compensating the effects of the demand in order to

[11] As it is the case in demand shocks.

alleviate the consequences of inflation. This could be done by allowing the interest rate to sufficiently increase in order to counterbalance the demand stimulus and a weaker currency. The hybrid rule functions better in this sense and therefore outdoes the "plain vanilla" approach.

In advanced economies, scholars find that in an "open economy with hybrid policy rules," in which we attribute little weight to the exchange rate, we obtain the same results as in the "plain vanilla" approach if the intention is to manipulate demand and cost push shocks. However, this rule is significantly better in handling risk premium shocks. The exchange rate-based policy rule is not performing in this case. In emerging economies, hybrid policy rules are more performing than "plain vanilla" policy rule. The exchange rate-based policy rule is particularly performing in the advent of domestic demand shocks only. The open economy rule has the same results in demand and cost-push shocks. The ½ and ½ is better when there are risk premium shocks.

To choose a policy rule, monetary authorities should take into consideration the structure of the economy and major shocks to which it is exposed. In addition, uncertainty about the nature of shocks compels monetary policy makers to have a "default" rule which can be successful in reacting to all kinds of disturbances in the economy.

3.2.2. The Weight of the Exchange Rate in a Hybrid Policy Rule

We can say that it is beneficial to include the exchange rate in the policy reaction function; but we must know what weight to put on this variable in terms of inflation and production.

The authors consider two cases in point: in the first, the policy's reaction function puts a significant weight on inflation and output. In the second case, scholars use a weight that is similar to the Taylor rule.

As a result, it is beneficial to include the exchange rate in the reaction function, but the weight placed on it should be relatively small.

Plain vanilla policy rules are more performing in reacting to demand and cost-push shocks in advanced and financially robust economies.

In emerging ones, or else known as financially vulnerable economies, it is helpful to put some weight on the exchange rate. In case of domestic demand and risk premium shocks, and if we place a weight of 0.5 on the exchange rate in the "½ and ½" open economy rule, there is a decline in the volatility of production without significant effects on the volatility of inflation.

However, placing any weight on the exchange rate declines inflation performance in case of supply shocks. But it is profitable to put some weight on the exchange rate in a "½ and ½" open economy rule with Taylor responses to inflation and output in an emerging economy. This decision allows a reduction of the output volatility face to all types of shocks. It also reduces inflation volatility in the case of demand and risk premium shocks.

3.2.3. Hybrid Policy Rules and Macroeconomic Performance

IT central banks have two principal goals: stable inflation and growth. They want to mitigate large fluctuations in interest rates, exchange rates and trade balance. Through simulations of hybrid rules, authors analyze the volatility of a number of economic variables besides output and inflation. These variables are the real interest rate, the real exchange rate and the real trade balance. In response to cost-push shocks, the volatility of the five variables is higher. Volatility, in response to demand and risk premium shocks, is analogous in advanced economies. But in emerging ones, it is less responsive to risk premium shocks than to demand shocks.

In advanced economies, the Taylor rule is efficient in reducing inflation, output and interest rate volatility, but it is not very effective with exchange rate and current account volatility. In an emerging market, the alternative rule is better than the Taylor rule. The latter is not powerful in an emerging market economy. This result can be explained by the weakness of the monetary policy transmission mechanism.

Garcia *et al.*(2011), show that for both types of economies, the rule that is effective at reducing financial volatility is the open economy rule, using either the exchange rate, or a ½ and

½ average of the change and level of the exchange rate. We can evaluate the benefits from integrating the exchange rate in the policy rule by the weights placed on the change or by the level of the exchange rate.

Batini *et al.* (2007), Ravenna and Natalucci (2008) consider that responding to the level of the exchange rate reduces the inflation and output stabilization results. Moron and Winkelried (2005) explain that CBs should respond lightly to a combination of the level and change in the exchange rate to improve the performance in this case.

The speed of the exchange rate pass-through into prices may explain the importance of exchange rate weights. Scholars conclude that having a modest element of exchange rate smoothing in the reaction function can be useful in reducing volatility in the financial markets of FVEEs financially-vulnerable emerging economies. It is not very risky to primary policy objectives.

In conclusion, FVEEs should profit more from a HIT approach, which improves output and inflation performance, than from a plain vanilla one. The weight put on the exchange rate in a hybrid framework should be small relative to the weights put on inflation and output. This light smoothing does not have negative impacts on macroeconomic performance.

The analysis of financial vulnerability indicators shows the high degree of vulnerability of the Tunisian economy. We will focus our analysis on the structure and the characteristics of this economy to decide over which hybrid approach of inflation targeting should monetary authorities adopt.

4. The Hybrid Approach, an Opportunity for Tunisia?

In light of the brief theoretical and empirical literature review presented above, it is clear that such type of approach can be pertinent in the particular case of a FVEE in specific situations.

In the scope of the present study, we are interested in Tunisian economy which we consider as a FVEE and we will try to analyze the opportunity for monetary authorities to adopt a hybrid approach of inflation targeting.

The degree of financial vulnerability of the Tunisian economy has particularly aggravated since the 2011 revolution. This vulnerability will be analyzed by facts stylized on the evolution of principal indicators of vulnerability such as those defined by the IMF. Therefore, the opportunity to introduce the exchange rate in the reaction function of the TCB will be studied through various shocks that it went through.

The analysis of the pass-through, the debt structure, commercial openness, external shocks such as energy prices and raw materials prices, are elements that will allow us to determine the opportunity to adopt a hybrid approach of inflation targeting in Tunisia.

4.1. Indicators of Financial Vulnerability of the Tunisian Economy

As a response to financial crises that affected some emerging economies in the 1990s, the IMF deployed considerable efforts to improve its capacity to analyze degrees of vulnerability of these economies to such crises. Economic growth of these countries, extremely sensitive to investors' behavior, is highly dependent on external loans and other inflows of foreign capitals. The IMF has therefore created vulnerability indicators that take into account the economic structure of these emerging countries.

Specific and current information about international reserves, external debt and movement of capital help detect, timely and easily, the degree of vulnerability. These efforts go hand in hand with those that the fund deployed to improve its capacity to analyze fundamental data such as the identification of critical levels for some indicators, application of resistance tests or models of early warning systems.

These indicators cover several sectors and in particular the financial sector. When there are pressures on economies, the difficulties in a given sector usually spread to affect others. For instance, concerns engendered by a country's budget deficit can cause a sudden decline in the value of its currency, or weaken trust in banks that hold claims on the state, or trigger a banking crisis.

Indicators of external debt, indicators of adequacy of currency reserves as well as indicators of financial robustness are among the most important indicators closely followed by the IMF.

4.1.1. Indicators of External Debt

Indicators of external debt can be analyzed by the maturity profile, repayment schedule, sensitivity to the interest rate, or even by currency composition. As such, the respective ratios of external debt by exportations (EXTD/EXP) and by GDP (EXTD/GDP) are useful indicators because they reveal the borrowing and repayment capacity of the concerned countries.

Table 1. Structure of external debt by main currencies (%)

Year	USD	EUR	JPY	Other	Total
2000	37.8	29.1	21.7	11.4	100
2001	34.8	32.6	22.5	10.1	100
2002	32.9	38.1	20.3	8.7	100
2003	26.3	45.0	21.1	7.6	100
2004	21.6	53.6	17.7	7.1	100
2005	20.7	56.0	15.7	7.6	100
2006	17.7	61.6	12.9	7.8	100
2007	13.8	64.4	14.2	7.6	100
2008	11.7	62.8	17.5	8.0	100
2009	12.8	63.1	16.4	7.7	100
2010	14.3	61.3	16.1	8.3	100
2011	20.1	56.8	15.3	7.8	100
2012	19.0	60.0	14.0	7.0	100
2013	18.2	61.3	11.8	8.7	100
2014	21.5	53.2	12.2	13.1	100

Source: Annual reports of the TCB 2000-2014

The analysis of the Tunisian debt structure (Table 1), over the period 2000-2014, shows a strong dependence compared to two main international currencies namely the Dollar and the Euro (more than 3/4), over most of the studied period which shows a high vulnerability of the Tunisian economy to the appreciation of these two currencies. Table 2 shows, on the other hand, a continuous degradation of the EXTD/GDP ratio and EXTD/EXPORT ratio since the revolution (to respectively move from 43.3% and 116% in 2010 to 56.1% and 162.9% in 2014). Similarly, the MLTD/GDP ratio follows the same tendency (the gap, representing short-term debts, continues to grow to lose 6 more points in percentage in 2010 to 12.6% in 2014) which is another justification of our economy's financial vulnerability level.

4.1.2. Indicators of Currency Reserves' Adequacy

Indicators of currency reserves' adequacy are necessary to know how a country is capable of avoiding liquidity crises. The ratio of currency reserves by volume of short-term debt (RES/STD) attributes a high significance to the analysis of vulnerability of countries with high, yet uncertain, access to capital markets.

It is, therefore, worth noting that in the case of Tunisia, this ratio greatly declined after 2010 although it started to decline as of the end of the year 2006 (it was divided into four between 2006 and 2014 moving from almost 600% to less than 150%) which illustrated the fragility of the situation in which the Tunisian financial authorities found themselves when trying to respect their external debt repayment commitments and particularly their short maturity.

Table 2. Ratios of external debt (%)

Year	EXTD/GDP	EXTD/Export	MLTD/GDP	RES/STD
2000	51.4	188.9	46.5	183.7
2001	50.3	167.3	47.4	315.9
2002	49.4	166.8	45.9	272.0
2003	52.8	180.7	49.6	315.4
2004	52.7	169.9	50.0	447.7
2005	51.6	156.6	48.7	492.6
2006	46.2	136.0	43.0	597.7
2007	42.9	110.2	39.6	585.8
2008	43.2	101.0	38.5	454.4
2009	43.0	129.7	37.5	426.9
2010	43.3	116.0	37.4	376.4
2011	45.7	117.7	39.2	276.7
2012	49.6	131.8	40.7	218.0
2013	51.1	140.7	41.4	170.3
2014	56.1	162.9	44.5	149.8

Source: Annual reports of the TCB 2000-2014

4.1.3. Indicators of Financial Solidity

Indicators of financial solidity help to evaluate the strengths and weaknesses of financial sectors in countries. They revolve around the adequacy of equity capital in financial institutions, the quality of assets and banks' off-balance sheet positions, banks' profitability and liquidity as well as loan's expansion and quality. Financial health indicators help, for example, analyze the sensitivity of financial systems to market risks and mainly to exchange rate and interest rate fluctuations.

As such, the study (IMF, 2012) conducted by an IMF expert committee in July 2012 on the Tunisian financial system stability showed:

- First of all that Tunisian banks are exposed to interest rate risk due to the existence of a structural inadequacy of maturity in their portfolios considering that a major part of their assets are mid and long-term ones and are mainly funded by short-term liabilities (essentially made of customer deposits). Nevertheless, controls on capitals limit commitment to international interest rates which explains the weak level of real domestic interest rates. On the other hand, Tunisian banks do not seem to be exposed to significant risks of direct exchange which may explain their low foreign currency commitment (less than 5% of their loans) and the weakness of loans obtained from exporters and their total absence from foreign investment (which is strictly prohibited by exchange regulations). At the end of 2011, the official level of bad debts was 13%. The regulatory capital was 11.5% of risk-weighted assets and banks' profitability was always relatively high (the average return of equity was 7.9%).However, banking vulnerabilities are seemingly more critical than the official communicated statistics show. This can be explained, for example, by the fact that public corporate lending's are never closed due to a state guarantee, or also, to lack of auditing practices and weakness of controlling mechanisms which hampers the quality of these statistics that are not established in conformity with international best practices due to a lack of internal auditing performed by banks (IMF, 2012).
- Second that the Tunisian financial sector is of medium size and is dominated by banks with assets representing almost 115% of the GDP. More than half of total bank loans are oriented towards industry, commerce and tourism. A large part of the rest seems to be oriented to the public sector although this is impossible to confirm due to shortage of data.
- Third, that the non-banking financial sector is relatively modest representing about 20% of all assets of the financial system in 2011. Fixed/variable-income markets remain modest with a capitalization representing 24% of the GDP. The investment capital remains weak and the leasing sector was just over 15% of the gross fixed capital formation. Concerning the insurance

sector, the main vocation of which does not come from life insurance, it is in eternal difficulty and the amount of annual premium never exceeds 2% of the GDP.

Finally, that resistance tests on the banking system's solvency and liquidity (IMF, 2012) showed significant vulnerability factors. On the one hand, tests that stimulated the impact of unfavorable scenarios on the banking system's solvency during the period 2012–2014 revealed a concentration of considerable risks in which banks are very sensitive to payment failures from their major borrower. On the other hand, liquidity tests revealed a high dependence of the banking system on the TCB's refunding and on the risk of major withdrawals of customer deposits.

Table 3. Indicator of financial integration (in %)

Year	FDI (net flow)	PI (net flow)	(FDI+PI)/GDP
2000	1505.5	16.6	5.2
2001	1051	-653	1.3
2002	1577	-33	4.7
2003	1130	83	3.4
2004	1704	43	4.5
2005	3106	293	8.1
2006	961	116	2.4
2007	2071	87	4.3
2008	2247	287	4.6
2009	2357	78	4.0
2010	2165	253	3.8
2011	1616	102	2.7
2012	2504	83	3.7
2013	1815	180	2.6
2014	1805	160	2.4

Source: Annual reports of the TCB 2000-2014

However, the evolution of the financial integration indicator**,** measured by the sum of deposits and withdrawals of direct foreign investment (DFI) and portfolio investments (PI) as a percentage of GDP, shows that Tunisia is still poorly integrated in the global financial market (this ratio rarely exceeds 5% over all the studied period, see Table 3). These key facts constrains us to limit ourselves, in the following part, to the analysis of demand shocks and cost shocks without dwelling on risk premium shocks such as in the work elaborated by Garcia *et al.*(2011).

The indicators elaborated above show that Tunisian economy is financially vulnerable due to the structure of foreign currency denominated debt (original sin), its dependence on currency reserves for the repayment of its debt and the payments of its importations. Furthermore, financial solidity indicators show that Tunisian banks are at risk of rates, liquidity and solvency. The financial system and capital markets, in particular, are not well developed.

According to Aizenman *et al.* (2011), this type of economy risks to suffer losses associated with exchange rate volatility. Therefore, monetary authorities have to use Taylor rule which takes into consideration the inflation target, the output gap and the exchange rate fluctuation. Such an inflation targeting strategy would be beneficial in establishing a higher credibility in the monetary policy. The choice of a hybrid rule depends, therefore, on the nature of shocks these economies have gone through.

4.2. Degree of Sensitivity of Tunisian Economy to External Shocks

Tunisian economy is extraverted with a commercial openness rate[12] around 85% in annual average over the period 2000-2014 which shows a high level of integration in the international goods' market. We can thus deduce that it is highly sensitive to external shocks: demand shocks[13] and cost shocks.

Demand shocks will be treated through the analysis of tourism earnings' growth and the rate of main raw materials positively affecting Tunisian exportation earnings, in particular those from olive oil and mainly phosphate, the latter being the country's principal natural (mining and agricultural) sources of wealth. As to cost shocks, they will be analyzed through the growth of petrol and wheat prices considering that these two products, being part of the principal input of a major part of local industry, can raise the country's importations' bill.

4.2.1. Demand Shocks

Tunisia's tourism vocation was a strategic choice in the development model adopted since the 1960s. As such, it is worth noting that the evolution of tourism earnings shows the difficulty through which the sector has passed since the financial crisis of 2008, a situation that has escalated with the advent of the 2011 revolution due to social disturbances and terrorist threats which illustrates the fragility of such a sector.

Similarly, the analysis of phosphate prices shows an exponential rise between 2006 and 2008 to then witness an uneven evolution yet with a general upward tendency. But, Tunisia has not profited from this favorable situation with all the labor disruptions, sit-ins and social claims by mineral field population which affected phosphate extraction and transformation activities[14]. Concerning the olive oil sector, the price of which has approximately known the same pattern of evolution, its positive impact on the trade balance (TBL) has only been felt in a cyclical way because it is dependent on climatic conditions and the quality of the harvested crop.

In FVEEs, and in case of demand shocks, the hybrid rules and particularly the one based on the exchange rate, lead to a weaker volatility of the output gap without having higher inflation volatility.

The source of demand shock is important in such types of economy. Tunisia has not benefited from a positive external demand shock in terms of phosphate and olive oil. In addition, the external demand shock of tourism has largely declined which aggravated the trade balance deficit. Resisting the depreciation of national currency by smoothing the exchange rate is useful. The hybrid rule based on the exchange rate is exclusively efficient in the case of demand shocks.

In emerging economies, it is profitable to give a small weight to the exchange rate in a "½ and ½" open economy rule with Taylor responses to inflation and output. This rule reduces inflation and output volatility face to all types of shocks.

4.2.2. Cost Shocks

Tunisia is a net importer of energy products (petrol and gas) and wheat and the price of these two products since the price boom of 2005 (Table 4) has negatively impacted the trade balance, which has further deteriorated, (this deficit's ratio represents 15.5% of GDP in 2013) and the budget balance with a larger deficit of the "general compensation fund". To illustrate with an example, always related to the same year 2013, this fund's expenditure in terms of subsidizing basic products exceeded 5.5 billion TND representing a 1/5 of total state expenditure out of the

[12] The openness rate is equal to the sum of exportations and importations applied on the GDP.

[13] Although demand shocks could be of domestic and external origin, our study focuses on the latter as they constitute fundamental shocks undergone by Tunisian economy during the post-revolution period.

[14] This sector's shortfall in terms of exportation earnings is estimated at 5 billion TND over the period 2011-2015.

debt service. This has caused budgetary deficit to reach almost 7% of the GDP (the worst performance in the last twenty five years).

Table 4. Index of tourism earnings and prices of raw materials (Basis 100 in 2000)

Year	Tourism Earnings	Wheat	Olive Oil	Phosphate	Brent
2000	100.0	100.0	100.0	100.0	100.0
2001	96.7	111.4	83.9	95.5	85.7
2002	84.6	130.7	99.2	90.9	87.5
2003	87.9	128.1	129.2	93.2	101.3
2004	109.3	137.7	164.4	93.2	134.1
2005	119.6	133.3	172.9	95.5	190.8
2006	126.4	168.4	232.5	100.0	228.4
2007	143.0	223.7	193.3	161.4	254.0
2008	163.8	286.0	176.6	795.5	340.1
2009	153.0	195.6	148.7	204.5	215.6
2010	146.2	196.5	134.4	279.5	278.5
2011	102.7	277.2	130.1	420.5	390.0
2012	120.9	274.6	132.9	422.7	392.6
2013	117.8	273.7	161.9	336.4	381.7
2014	126.8	250.0	165.8	250.0	346.9

Source: Annual reports of the TCB 2000-2014, calculations of the authors.

In case of cost shocks, we consider that all monetary rules can operate in the same way as well in an emerging economy, such as Tunisia, as in advanced economies.

4.3. The Analysis of Exchange Rate Regime and Pass-Through

4.3.1. Exchange Rate Regime

Since the start of the millennium, the TCB has introduced some flexibility in its exchange policy all the while keeping a *de facto* anchoring to a currency basket consisting mainly of the American Dollar and the Euro.

Considering the strong depreciation that the dinar has known between the beginning of 2011 and the end of 2014 as opposed to these two currencies (it has depreciated of almost 19%, see Table 5) and considering the current balance (CBL) deterioration and the need to reconstitute its currency reserves, a more flexible management of the exchange policy has been introduced by the TCB since 2012. It consists of determining its reference exchange rate on the basis of the average exchange rate of the interbank market and not in terms of a fixed currency basket. It intervenes on the exchange market through bilateral transactions when the market quotations undergo substantial deviations as opposed to daily fixing.

The Tunisian exchange regime is part of intermediate regimes and is classified by the IMF as a Crawl like arrangement in which the exchange rate has to stay within a narrow margin of 2% compared to a tendency statistically identified for six months or more. It is necessary to highlight that Tunisian monetary authorities have stepped preliminary steps in IT (IMF, 2014). In this respect, the TCB's monetary policy's conduct no longer consists in explicitly targeting the monetary mass but in following the evolution of some indicators that are tightly linked to inflation (importation prices, the output gap, core inflation etc.).

Table 5. Index of the exchange rate of the TND (Basis 100 in 2010), Trade and current balance

Year	USD	JYEN	EUR	TBL/GDP	CBL/GDP
2000	95.74	78.14	66.59	12.7	4.2
2001	100.45	72.65	67.88	13.1	4.2
2002	99.20	69.58	70.73	11.4	3.5
2003	89.89	68.10	76.82	10.4	2.9
2004	86.95	70.69	81.63	9.7	2.0
2005	90.61	72.32	85.00	8.4	1.0
2006	92.80	70.06	88.08	9.7	2.0
2007	89.34	66.50	92.34	10.1	2.5
2008	85.92	73.40	95.15	12.0	3.8
2009	94.19	88.69	99.02	10.9	2.8
2010	100.00	100.00	100.00	13.2	4.8
2011	98.28	107.81	103.22	13.3	7.4
2012	109.02	120.03	105.85	16.5	8.2
2013	113.45	101.96	113.83	15.5	8.3
2014	118.67	98.52	118.76	16.5	8.8

Source: Annual reports of the TCB 2000-2014, calculations of the authors.

The TCB uses the interest rate as the monetary policy's primary instrument. The central bank's reaction function is a simple Taylor rule in which the target interest rate adjustments are guided by the deviation of anticipated inflation from its target and by the GDP's deviation from its potential.

4.3.2. Pass-Through Analysis

The exchange rate flexibility observed these last years and the high degree of commercial openness of Tunisian economy would legitimize the interrogations as to its cause-effect relation between depreciations and inflationary pressures. The analysis of the exchange rate pass-through to price helps answer this question.

In order to evaluate the pass-through and to analyze the Tunisian monetary authorities' behavior in the treatment of the inflation problem, we refer to the work of Charfi Marrakchi and Kadria (2014) conducted on Tunisian economy during the period 2000-2013. These authors resort to a model gathering external prices, the output gap, monetary market rates as an instrument of monetary policy, the nominal exchange rate, a chain of domestic prices composed of the import price index, the producer price index and the consumer price index. The econometric analysis they have prepared demonstrated that the pass-through is incomplete for the chain of prices, high on the import price index, relatively modest for the producer price index and low for the consumer price index.

The fact that the pass-through is slow for the consumer price index can be explained by a more important weight of administered prices in the composition of the basket that serves to determine this index. In fact, 30% of this basket's prices are administered by the government (Charfi Marrakchi and Kadria, 2014). In sum, nominal depreciation negatively and progressively impacts the chain of prices all the while respecting a downward tendency by highly affecting first the import price index, to then move, less strongly, to the producer price index and to finish, eventually and poorly with the consumer price index. The transmission of nominal depreciation is thus gradually realized through price chain and over time highlighting the dynamic process of the pass-through. The results of Charfi Marrakchi and Kadria (2014) show that long-term pass-through is higher than the short-term one considering the short-term price rigidity.

Eventually, the depreciation of the TND registered since the end of 2010, contributed to the increase of domestic prices. To control inflation, a restrictive monetary policy is adopted by the monetary authorities through the rise of the prime rate. For these authors, neither the nominal exchange rate variations nor those of the monetary market's rate have impacted the economic growth rate. In fact, nominal depreciation has no desired effect on the output gap and

was unable to boost economic growth through the rise in exportations. Besides, the restrictive monetary policy had no effects on the output gap, but it seems more efficient in reducing the consumer price index and containing inflation. Additionally, as the pass-through has a low impact on the consumer price index, the weight given to the exchange rate in the TCB's reaction function should relatively be lower than that given to the inflation and production gap.

5. Conclusion

Inflation targeting strategy in emerging economies cannot be the same as in advanced ones. The legal and institutional setting is different particularly with respect to autonomy and credibility of the central bank. Levels of development and financial integration as well as inflation are divergent. The macroeconomic performances can be disrupted by various exogenous shocks particularly those that are due to a high volatility of the exchange rate severely affecting economic growth and the price level.

It is therefore primordial for a more efficient monetary policy to take into account the specificities of these economies. These countries' CBs, particularly those in vulnerable economies such as Tunisia, should adopt a monetary policy (of the Taylor rule type) that integrates an inflation target, the output compared to its potential and the fluctuations of the exchange rate. The typology of inflation targeting hybrid approaches shows that the choice of a particular rule depends on the nature of shocks incurred by an economy.

The analysis of Tunisian economy's vulnerability indicators reveals a high degree of commercial integration. Besides, external shocks to which it is exposed, being essentially demand and cost shocks, plead in favor of the choice of a hybrid rule that improves the performances in terms of inflation and output.

The choice has to be on one of the two following hybrid rules of the monetary policy: the open inflation targeting economy and the exchange rate-based inflation targeting economy.

The review of empirical literature on the sensitivity of economy to shocks demonstrates that the weight put on the exchange rate in a hybrid framework should be small relative to weights on inflation and output. However, putting more weight on inhibiting exchange rate volatility probably harms macroeconomic performance. In an exchange rate-based approach to inflation targeting, we can conclude that the volatility of the exchange rate, interest rate, and trade balance may decrease but at a high cost according to inflation and output volatility, particularly when the economy is facing demand and cost-push shocks. For other hybrid rules, a high degree of exchange rate smoothing in the rule is detrimental to macroeconomic performance. Particularly, the framework might be inclined to speculative pressures ahead of periodic reclose of the exchange rate, resulting in higher interest rate volatility and pressure on foreign exchange reserves, or both.

It would be wiser for the TCB to opt for open economy inflation targeting which explicitly takes into account the evolutions of the exchange rate in the reaction function. The weight of the exchange rate in this rule should relatively be lower than that of inflation and production. In addition, the weakness of the exchange rate pass-through at the level of the consumer price index in Tunisia calls for such a choice.

References

Aizenman, J., Hutchinson, M., and Noy, I., 2011. Inflation targeting and real exchange rate in emerging markets. *World Development,* 39 (5), pp.712-724. http://dx.doi.org/10.1016/j.worlddev.2010.11.005

Batini, N., Levine, P., and Pearlman, J., 2007. Monetary rules in emerging economics with financial market imperfections. *School of Economics, University of Surrey School of Economics Discussion Papers Series*, No. 0807, pp.1-56.

Calvo, G. and Reinhart, C., 2002. Fear of floating. *Quarterly Journal of Economics,* 117(2), pp.379-408. http://dx.doi.org/10.1162/003355302753650274

Cavoli, T. and Rajan, R., 2006. Monetary policy rules for small and open developing economics: A counter factual policy analysis. *Journal of Economic Development,* 31(1), pp.89-111.

Cespédes L., Chang, R., and Velasco, A., 2004. Balance sheets and exchange rate policy.*American Economic Review,* 94(4), pp.1183-1193. http://dx.doi.org/10.1257/0002828042002589

Charfi Marrakchi, F. and Kadria, M., 2014. Measuring and explaining incomplete pass-through transmission to prices in Tunisia. S*econd Financial Management Conference (PFMC - 2014),* Paris 15-16 December 2014. Paris: France.

Eichengreen, B. and Hausmann, R., 1999. Exchange rate and financial fragility. *National Bureau of Economic ResearchNBER Working Papers, No. 7418*, pp.1-54.

El-Hodiri, M. and Mukhamediyev, B., 2014. Monetary policy rules in some transition economies. *Eurasian Journal of Economics and Finance*, 2(3), pp 26-44. http://dx.doi.org/10.15604/ejef.2014.02.03.002

Friedman, M., 1953. *The case for flexible exchange rates*. In: Essays in Positive Economics, Chicago, Chicago University Press, pp.157-203.

Garcia, C.J., Restrepo, J.E., and Roger, S., 2011. How much should inflation targeters care about the exchange rate. *Journal of International Money and Finance*, 30(7), pp.1590-1617. http://dx.doi.org/10.1016/j.jimonfin.2011.06.017

Hodrick, R. and Prescott, E., 1981. *Post-war U.S. business cycles: An empirical investigation*. *Journal of Money, Credit and Banking*, 29(1), pp.1-16. http://dx.doi.org/10.2307/2953682

International Monetary Fund (IMF), 2012. *Tunisie: Évaluation de la stabilité du système financier [Tunisia: Financial System Stability Assessment], No.12/241*. Washington, D.C.: International Monetary Fund.

International Monetary Fund (IMF), 2014. *Annual report on exchange arrangements and exchange restrictions.* Washington D.C.: International Monetary Fund.

Lucotte Y., 2015. Le ciblage d'inflation dans les économies émergentes [Inflation targeting in emerging economies]. *Revue Française d'Economie [French Economics Review],* 30(2), pp.93-128. http://dx.doi.org/10.3917/rfe.152.0093

McCallum, B.T., 2006. Singapore's exchange rate-centered monetary policy regime and its relevance for China. *Monetary Authority of Singapore MAS Staff Paper,* No. 43, pp.1-13.

Mohanty, M.S. and Klau, M., 2004. Monetary policy rules in emerging market economics issues and evidence. *Bank of International Settlement BIS Working Papers*, No. 149, pp.1-33.

Moron, E. and Winkelried, D., 2005. Monetary policy rules for financially vulnerable economies. *Journal of Development Economics,* 76(1), pp.23-51. http://dx.doi.org/10.1016/j.jdeveco.2004.08.001

Ostry, J.D., Ghosh, A., and Chamon, M., 2012. Two targets, two instruments: monetary and exchange rate policies in emerging market economies? *IMF Staff Discussion Note,*12/01, pp.3-24. http://dx.doi.org/10.5089/9781475503623.006

Pavasuthipaisit, R., 2010. Should inflation-targeting central bank respond to exchange rate movements? *Journal of International Money and Finance,* 29(3), pp.460-485. http://dx.doi.org/10.1016/j.jimonfin.2009.06.005

Pourroy, M., 2012. Does exchange rate control improve inflation targeting in emerging economies?*Economics Letters*, 116(3), pp.448-450. http://dx.doi.org/10.1016/j.econlet.2012.04.036

Ragan, C., 2005. The exchange rate and Canadian inflation targeting.*Bank of Canada Working Paper,*No. 2005–34, pp.1-30.

Ravenna, F. and Natalucci, F., 2008. Monetary policy choices in emerging market economies: The case of high productivity growth. *Journal of Money, Credit and Banking,* 40(2-3), pp.244–271. http://dx.doi.org/10.1111/j.1538-4616.2008.00112.x

Svensson, L., 2000. Open-economy Inflation Targeting. *Journal of International Economy*, 50, pp.155-183. http://dx.doi.org/10.1016/S0022-1996(98)00078-6

Tunisian Central Bank (TCB), 2000-2014. Annual Reports, 2000-2014. Tunis: Tunisia Central Bank.