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Measurement of the pressure on the Moroccan foreign exchange market

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Abstract- This paper aims to measure the pressure on the Moroccan foreign exchange market through the EMPI index. It was found that no crisis was signaled by this index during the years 2018 and 2019, which means that the policy of gradual flexibility of the exchange rate regime, which entered into force in January 2018, played a key role in this sense. Consequently, this reform would undoubtedly have reduced the pressure on the exchange rate by making the Moroccan economy more resilient and less vulnerable to exogenous shocks. Thus, 8 periods of crisis were identified with significantly high probabilities. Among these 8 periods we can distinguish 3 periods which have been planned with more intensity in particular in the second half of the year 2008, in the first half of the year 2012 and 2017.

Keywords: exchange rate, foreign exchange market, EMPI, pressure, Morocco.

I. INTRODUCTION

No one can deny that any sector of activity operating in an economy open to international relations is exposed to exchange rate risks. The exchange rate is considered as an exogenous variable and a source of imbalance or factor of balance, including the need to manage its consequences.

Since the Bretton Woods collapse, several systemic financial crises have affected the world, notably the Mexican peso crisis (1994-1995), the Asian crisis (1997), the mortgage crisis in the United States (2007-2008) and currently the global health crisis from Covid-19. This is how global financial markets have become more unstable and volatile, leading to more recurrent and deeper crisis scenarios. Currency crises seem to be becoming a key theme in financial systems today, both nationally and internationally.

In addition, many studies have been conducted to measure the pressure on the foreign exchange market and to identify speculative attacks on local currencies. In this framework, the International Monetary Fund (IMF), as a supervisor and regulator of the world economy, defines speculative attacks as a kind of exchange rate crisis that occurs when the national currency devalues (system with a fixed exchange rate), depreciates (system with a flexible exchange rate) or is at a level far from its equilibrium value. In this case, the monetary authorities are forced to significantly increase interest rates or inject large volumes of foreign currency into the foreign exchange market to protect the national currency. For this reason, the IMF has developed an early warning system for foreign exchange crises which includes formal and quantitative tools, including in particular the pressure index on the foreign

exchange market. This index allows the authorities to provide an appropriate response to correct the pressures on the foreign exchange market.

If currency crises are a phenomenon to be reckoned with, it is necessary to know the mechanisms by which shocks are transmitted from the real economy to the currency, hence the notion of pressure on the exchange rate. Indeed, currency crises appear following pressure on the exchange rate. **How then to measure the degree of pressure?**

It is in this wake that the problem of this article falls, which seeks to estimate the pressure on the foreign exchange market in Morocco, over a period ranging from January 2002 to December 2019, via the use of the EMPI index, developed by Girton and Roper.

II. LITERATURE REVIEW

Currency crisis is a case in which the exchange rate has depreciated significantly over a short period of time. Eichengreen et al. (1994) [1] define speculative attacks or crises as large movements in exchange rates, interest rates and international reserves. Frankel and Rose (1996) [2] explain that a devaluation of at least 25% in nominal value and a decrease of 10% compared to the previous year leads to a crushing of the currency.

The models in the literature on the monetary crisis are named: first, second or third generation. The Krugman Models (1979) [3] and Flood and Garber (1984) [4] are the main studies of the first generation models. The main components of a first generation model are purchasing power parity (PPP), budget constraints, timing of deficits, money demand function, government decision on exchange rate and post-crisis monetary policy. Second-generation models often include more factors of speculative attacks arising due to self-fulfilling expectations ((Obstfeld, (1994), Obstfeld (1997), Velasco, (1996)) [5.6.7]. The actors believe in the ultimate failure of policy makers and therefore defending the exchange rate can be costly due to high interest rates.Therefore, the speculative attack on the currency can develop either as a result of a fundamentally anticipated future deterioration, ie with a realization of the prophecy.As for the third generation models, they emphasize the balance sheet decompositions associated with devaluations.

Banks and businesses face credit risk in developing countries due to borrowing in dollars or euros and lending in local currency. Moreover, they are exposed to liquidity shocks since they finance long-term projects with short-term borrowings (Burnside, 2008) [8]. Mishkin (1996) [9] argues that the position of banks whose liabilities are mainly in foreign currency may further weaken in the event of devaluation. The 1990s brought a new experience to the monetary crisis. At the end of 1994, a serious monetary crisis struck Mexico and other Latin American countries. Two years later, an unexpected and surprising series of financial crises hit Southeast Asia. The Asian crisis started in Thailand in July 1997 and affected Malaysia, Indonesia and the Philippines. The next wave caused serious unrest in Hong Kong in the fall of 1997 and again in Indonesia. Singapore and Taiwan were less affected. The cases in Asia have undermined investor confidence in emerging markets, especially Russia and Turkey, which are characterized by chronic fiscal imbalances. The unrest in Russia triggered the outbreak of a currency crisis in Brazil in early 1999 and some adverse spillover effects, especially for other Latin American economies such as Argentina.

Due to the global crisis of 2008, the markets are slack with the abundance of global liquidity. However, Turkey suffered a speculative attack in August 2018.

Indeed, the causes of currency crises are financial imbalances, current account deficit, overvaluation of the exchange rate, the country-specific exchange rate system, structural problems in the banking and financial sectors and political instabilities. . If money is put into circulation by the central bank at a rate greater than the increase in demand for money, a financial deficit will result, leading to the depletion of national reserves and the collapse of the currency. The current account deficit includes the cycle of overspending and overvaluation of the currency, which deteriorates a current account balance, reduces national reserves, and ultimately leads to devaluation. Exchange rates may be overvalued due to changes in the external environment, local supply shocks, political reasons (e.g. limited credibility of the currency-based inflation-fighting program), pressure on the rise on the exchange rate (Sasin , 2001) [10]. The currency crises between 1995 and 1999 are examples of exchange rate regimes that create currency crises. The Asian crises have shown the importance of proper corporate governance, especially when large financial corporations dominate the economy. Structural weaknesses and instability in the banking and financial sectors also cause crises. Market intermediaries believe that policymakers will protect the financial system from collapse and that they can solve the problem of monetary expansion. This means that higher inflation is better than giving up exchange rate stability. Thus, domestic investors are rushing to banks to withdraw their balances and turn into hard currency. This creates turbulence on interest and exchange rates and often leads to currency crashes and banking crisis. To avoid possible turbulence, governments choose to recover economically as soon as possible by carrying out a strong devaluation. The concept of political instability/vulnerability encompasses a wide variety of situations such as external or internal military coup and conflicts between governments and executive institutions in some countries (Dabrowski, 2002) [11].

Many studies highlight the role of deteriorating economic indicators in monetary crises. Kamin and Rogers (1996) [12] argue that stabilization policies based on the exchange rate are helpful in accelerating the process of disinflation, but this situation leads to overvalued exchange rates and large current account deficits. These factors make it difficult to stabilize exchange rates. As the anti-inflation program is prolonged, its cost will increase and it will increase the reliance on restrictive monetary policy. Under these conditions, a restrictive monetary policy requires a change in the monetary response function to protect the exchange rate and this condition makes the economy more vulnerable to negative shocks. Frenkel (1997) [13] also points out that in the world with huge capital markets, there are not enough official reserves to stabilize at the wrong rates and there is no exchange rate policy that can protect the economy from errors on a macroeconomic basis. However, monetary crises can generally be predicted. Using historical data from econometric model panels or country sections, one can predict the crisis with any degree of accuracy. However, the possible problem of endogeneity of the monetary policy at risk can also limit the predictability of crises.

Speculative Pressure Index (Eichengreen , Rose and Wyplosz , 1996), Currency Market Turbulence Index (Kaminsky & Reinhart , 1999) [14], Banking Sector Fragility Index (Kibritçioğlu , 2003) [15] and the extreme risk index (Ural and Balaylar , 2007) [16] were formed according to the signal approach to measure the degree of pressure on the financial markets and predict crises. Eichengreen et al. (1994) suggest the foreign exchange market confidence index (EMPI) formulated by the weighted average of changes in exchange rates, official reserves and interest rates. Crisis is defined as the multiple of the standard

deviation above the sample mean, i.e. the EMPI reaches an extreme value. The sample mean and baseline standard deviation can also be differentiated across countries. According to the signal approach, a variable is believed to give a warning signal that a crisis may occur if the variable exceeds a certain threshold in the period preceding a crisis. Kaminsky et al. (1998) [17] pioneered this approach. Leading indicators are divided into variables. The next step in finding early warning indicators is to study the behavior of the variables. Exports overvalued real effective exchange rates (REER), slowing GDP growth, high ratio of money (M2) to foreign exchange reserves and equity prices give reliable signals that a crisis of change may occur in the next twenty-four months when these variables exceed limit values.

The global financial crisis of 2008–2009 revived the interest of economists in the design and performance evaluation of early warning systems, which is the model used to measure the probability of observing periods of financial crisis in the short term.

Researchers are always interested in predicting the timing and form of monetary crises, in this regard there are many studies in the literature. The balance of payments model (Mundell, 1960) [18] to test the interdependence between the ability to fix a currency and the level of international reserves of the central bank is the first attempt to understand the causes of the monetary crisis.

Literature studies are divided into two groups. The first group includes studies that propose both parametric (regression-based) and non-parametric (early signal) models and evaluate the performance of the different signal approach. Signal approach studies are frequently applied in the literature. Girton and Roper (1977) create the foreign exchange market pressure index using monetary policy and balance of payments. Weymark (1995) provides a theoretical background for the Girton and Roper model. Eichengreen et al. (1994) form the Exchange Market Preassure Index using the signal approach. This study was the pioneer of other research. Using the logitprobit model, Frankel and Rose (1996) examine 70 crises with 17 leading indicators over 105 developing countries over the period (1971-1992). Kaminsky, Lizondo and Reinhart (1998) [19] observe indicators displaying unusual behavior before the financial crisis. Bussiere and Fratzscher (2006) [20] have developed an early warning system based on multinomial logit regression which makes it possible to differentiate between calm periods, crisis periods and post-crisis periods. The multinational logit model tends to predict the financial crisis in emerging markets better than the binomial logit model. Beckman et al. (2006) [21] apply parametric and non-parametric early warning systems on a sample of 20 countries between January 1970 and April 1995. Comelli (2014) [22] also compares the performance of parametric and non-parametric early warning systems for currency crises in 28 emerging countries and observes that parametric systems perform better.

The second group of studies on early warning systems consists of a discussion of the importance of leading indicators or macroeconomic indicators in explaining the crisis. Corsetti and. al (1998) [23] note that the Asian crisis is the result of weak macroeconomic fundamentals and a weak institutional environment. Yorgancılar and Soydal (2016) [24], Uğurlu and Aksoy (2017) [25] and Kaya and Köksal (2018) [26], study the relationship between FX market pressure index and macroeconomic indicators in Turkey. Uğurlu and Aksoy (2017) observe a relationship between current account deficit, interest rate, total liabilities and volatility index (VIX). Similarly, Yorgancılar and Soydal (2016) conclude that the Lending/National Income Rate and the VIX index

are significant on the FX market pressure index. Also, Kaya and Köksal (2018) show unidirectional Granger causality from the stock market to the foreign exchange market pressure index using the vector auto regression analysis model.

III. METHODOLOGICAL FRAMEWORK: OVERVIEW OF THE FOREIGN EXCHANGE PRESSURE INDEX (EMPI)

Given the diversity of exchange rate regimes, and the different reactions to the shock, the EMPI, developed by Girton and Roper, is used to quantify the pressures on a currency. This indicator is relevant whether the plan is fixed, intermediate or flexible. The EMPI is calculated monthly, it can be positive or negative. A higher EMPI, reflecting the depreciation and/or depletion of reserves, thus indicates heightened tensions in the foreign exchange market.

The objective is to identify episodes of currency crises in the Moroccan economy. To do this, we construct an EMPI, using monthly data relating to the nominal exchange rate against the dollar and foreign exchange reserves. This index will be used in the section devoted to measuring the responses of business sectors to exchange rate risks. Indeed, we can calculate the EMPI as follows:

$$\mathbf{EMPI}_t = \left(\frac{e_t - e_{t-1}}{e_{t-1}}\right) * 100 - \left(\frac{\sigma_e}{\sigma_{fxr}}\right)\left(\frac{fxr_t - fxr_{t-1}}{fxr_{t-1}}\right) * 100 \quad \textbf{(1)}$$

Either ;

$$\mathbf{EMPI}_t = \Delta e_t - \left(\frac{\sigma_e}{\sigma_{fxr}}\right)\Delta fxr_t$$

Or :

$\Delta \mathbf{e_t}$ is the change in the nominal exchange rate against the dollar at time t,

$\Delta \mathbf{fxr}$ is the change in the stock of foreign exchange reserves at time t,

$\frac{\sigma_e}{\sigma_{fxr}}$ represents the ratio between the standard deviations of variations in the nominal exchange rate against the dollar and the stock of foreign exchange reserves.

Remember that the EMPI is a weighted average of variations in the nominal exchange rate and foreign exchange reserves. The higher the EMPI, the greater the pressures on currency demand. In addition, a country is exposed to a speculative attack when the EMPI exceeds a certain threshold that we will define later.

Once the EMPI is calculated, it is needed its mean (μ_{EMP}) and its standard deviation (σ_{EMP}). Admittedly, a given economy is exposed to a speculative attack when the EMPI reaches twice the deviation from its average (which can be called a critical threshold).

Technically speaking, there is a crisis if: • If $EMPI_t > \mu_{EMPI} + \varphi * \sigma_{EMPI}$ with φ is a parameter fixed at 2 (for our case), in accordance with what is done in the literature and it generally assumes values between 1.5 and 3.

Taking into consideration the conceptual underpinnings relating to the EMPI and in order to estimate it for the case of our country, we will use monthly data, ranging from January 2002 to February 2020, relating to the nominal exchange rate and to the reserves of exchange. Subsequently, a second crisis index is calculated as a binary variable taking the following values:

- 1 when the first index reaches the critical threshold ($EMPt > \mu_{EMP} + \varphi * \sigma_{EMP}$)
- & 0 elsewhere.

IV. SEARCH RESULTS

1. Analysis of the evolution of the EMPI in Morocco

The analysis of the evolution of the EMPI through a graphic representation makes it possible to identify the different phases of crises over the above-mentioned period. Particular attention will be given to the last two years which have seen Morocco adopt a more flexible exchange rate regime.

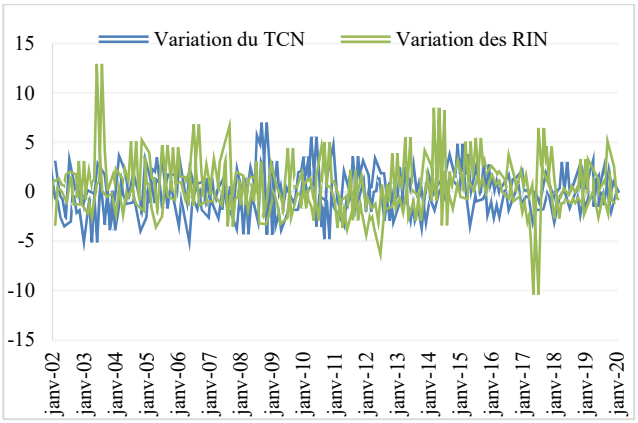

Figure 1: Evolution of variations in the nominal exchange rate and foreign exchange reserves in Morocco between 2002 and 2020

It is clear that foreign exchange reserves have been considerably reconstituted in the Moroccan economy since the entry into force of the reform of the exchange rate regime towards a more flexible regime. Indeed, they were of the order of 241 MM.DH at the end of December 2017 to rise thereafter on April 17, 2020 to 286.3 MM.DH. This notable improvement is naturally the result of Morocco's successful exit from the international financial market, which was concluded with the signing of a bond loan in the amount of 1 billion euros in November 2019, and the drawing on the Precautionary and Liquidity Line (PLL) of 3 MM dollars with the IMF in April 2020.

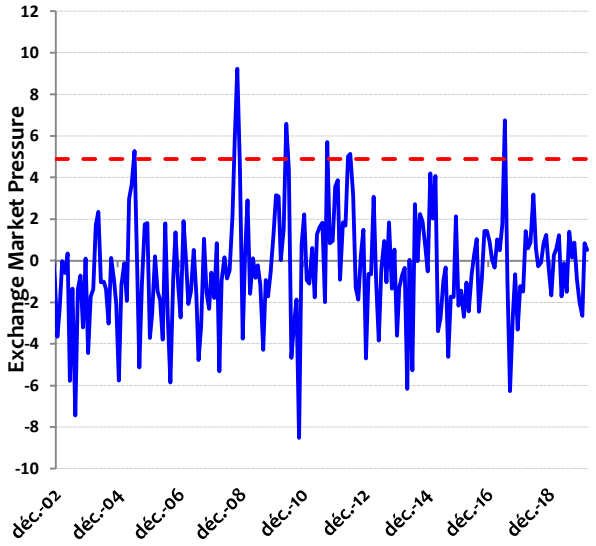

Figure 2: Evolution of the EMPI crisis index in Morocco between 2002 and 2020

The analysis of the monthly evolution of the EMPI, during the period January 2002-April 2020, made it possible to identify 6 periods marked by pressure on the Moroccan foreign exchange market:

Table 1

Periods marked by pressure on the foreign exchange market in Morocco between 2002 &2020

Periods	Interpretations
1st - period (June 2005)	This period was characterized by a 3.5% depreciation of the dirham against the dollar and a 2.4% drop in foreign exchange reserves in the month of April 2005 alone.
2 nd period (September-October 2008)	This period coincided with the advent of the international financial crisis; the value of the dirham recorded an average depreciation of

	more than 4% and foreign exchange reserves contracted by 6%, from 200 MM.DH in August 2008 to 189 MM.DH in October 2008.
3 rd period (May 2010)	This period saw a 4.8% depreciation of the NEER and a 5% drop in foreign exchange reserves.
4th - period (September 2011) :	The pressure is induced in particular by the effect of the 3% drop in foreign exchange reserves and a 4% depreciation of the dirham against the dollar.
5th - period (May- June 2012) :	During this period, the value of the dirham depreciated by more than 2% and foreign exchange reserves recorded a cumulative drop of nearly 8%.
6th - period (May- June 2017) :	This period is characterized by the effects of the announcement by the Moroccan authorities of their intention to switch to a more flexible exchange rate regime. Consequently, the dirham was put under pressure under the effect of fears expressed by banks and importers who sought to protect themselves against a possible depreciation of the exchange rate.

Source: compiled by the author

Considering the results of the previous analysis, it can be concluded that the EMPI recorded particularly significant increases during the years 2002, 2006, 2008, 2011 and 2017. These years correspond to periods when Morocco experienced crises of which coincided with significant fluctuations in both Net International Reserves (significant drop in NIR) and the Nominal Exchange Rate (strong appreciation of the TCN).

In the same vein, the main crisis experienced by Morocco according to the EMPI is that of October 2008, when the dirham was devalued by 7%. Similarly, foreign currency reserves decreased by 6% from 200 MM.DH in August 2008 to 189 MM.DH in October 2008.

Obviously, it seems that the combined effect of an appreciation of the TCN and a significant drop in the RIN makes the Moroccan economy particularly vulnerable to a currency crisis. The figure below groups together a few scenarios to avoid preventing the appearance of a possible crisis or pressuring on the foreign exchange market.

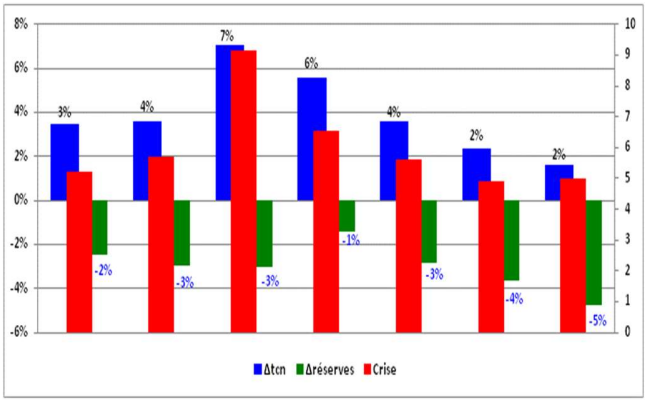

Figure 3: Scenarios that are likely to cause pressure on the foreign exchange market in Morocco

Starting from the fact that no crisis has been signaled by the EMPI index during the last two years, it can be concluded that the policy of gradual flexibility of the exchange rate regime, which came into force in January 2018, played a crucial role in that Sens. Consequently, this reform would undoubtedly have reduced the pressure on the exchange rate by making the Moroccan economy more resilient and less vulnerable to external shocks.

2. Estimation of the probability of triggering a currency crisis

In order to assess the probability of occurrence of a currency crisis on the foreign exchange market in Morocco, we based ourselves on the Logit model (of which "CRISIS" is the binary variable explained)[1], which takes into account the explanatory variables of Morocco's external sector.

The objective is to empirically identify warning indicators that can signal as faithfully as possible the probable occurrence of a currency crisis. It is a question of defining the factors of vulnerabilities to exchange rate crises, beyond the determinants of the exchange market, by integrating other explanatory variables linked to the external sector. The model Logit defines the probability associated with the event y= 1 (crisis) as the value of the distribution function of the logistic law at the point $x_i\beta$:

$$\boldsymbol{P_i = P(y_i = 1/x) = F(x_i\beta)} \qquad \textbf{(2)}$$

It admits as distribution and density functions respectively:

$$\boldsymbol{F(x_i\beta) = \frac{e^{x_i\beta}}{1+e^{x_i\beta}} = \frac{1}{1+e^{-x_i\beta}}} \qquad \textbf{(3)}$$

$$\boldsymbol{\& \; f(x_i\beta) = \frac{e^{x_i\beta}}{(1+e^{x_i\beta})^2}} \qquad \textbf{(4)}$$

Where $x_i = (xi1, xi2, \dots, xik)$, for all $i = 1,2, \dots, n$, is l e vecteur des variables explicatives and $\beta' = (\beta_1, \beta_2, \beta_3, \dots, \beta_k)'$ corresponds to the vector of parameters.

In order to model the "CRISIS" variable for the case of Morocco, we will use quarterly data covering the period starting from (Q1-2001 to Q4-2019)[2]. We have retained, in accordance with the various studies cited in the empirical literature, certain key variables of the external sector, in this case:

- The change in foreign exchange reserves (VAR_RIN);
- The current account deficit as a percentage of GDP (CC_BOP);
- The misalignment of the TCER (MES_TCER);
- The variation in exports (VAR_EXP).

Table II
The outputs of the Logit model

Variable	*Coefficient*	*Std. error*	*z-Statistic*	*prob.*
VAR_EXP (-1)	-0.15	0.06	-2.31	0.0209 *
VAR_RIN(-1)	-0.34	0.11	-3.27	0.0011 *
MES_TCER(-1)	-0.09	0.11	-0.86	0.3890 *
CC_BOP(-1)	0.33	0.09	3.58	0.0003

Source: BAM, calculated by the author; *Significant at the 5% threshold

The results of the Logit model shown in the table above show the expected impact of the warning variables used on the crisis index. So :

- While putting pressure on the foreign exchange market, REER distortions increase the likelihood of a foreign exchange crisis. Consequently, the Moroccan economy is all the

[1] The Logit model was introduced by Joseph Berkson in 1944. It is a probabilistic econometric model which is used to model the probability of observing an event conditional on the exogenous variables "y= 1; crisis" as the value of the distribution function of the logistic law at the point $x_i\beta$: $P_i = P(y_i = 1/x) = F(x_i\beta)$.

[2] Data relating to the exchange rate and international reserves are taken from the Bank Al Maghrib financial statistics database. For variables relating to the external sector such as exports and the current account balance of the balance of payments, we use data provided by the Office des Changes.

more vulnerable to a currency crisis if the value of the dirham is under/or overvalued.

- Regarding the current account deficit of the balance of payments, a widening of the latter can be seen as a sign of vulnerability and can also contribute to an increase in the EMPI. According to the estimates obtained, the Logit model reveals that a significant worsening of the current account deficit during period t-1 tends to increase the probability of a currency crisis appearing during period t.
- With regard to exports, any improvement in these could reduce a country's vulnerability to a currency crisis. In our case, it seems that the increase in Moroccan exports seems to have a weak or even zero impact (0.2%) on the EMPI. In this respect, one could conclude that the variation of exports cannot be considered as an early warning indicator to predict the pressures on the foreign exchange market in Morocco.
- As for the impact of the latest warning indicator, the change in foreign exchange reserves, it seems that a delayed improvement in the latter, by just one quarter, would be enough to have a positive impact on the EMPI. This variable thus plays a decisive role in the stability of the foreign exchange market by reducing Morocco's vulnerability to a crisis on this market.

3. Periods of future pressure on the Moroccan foreign exchange market

On the basis of the previous results, we see that the increase in the frequency of occurrence of a currency crisis is attributable to the deterioration of the main indicators of the external sector, apart from the variation in exports.

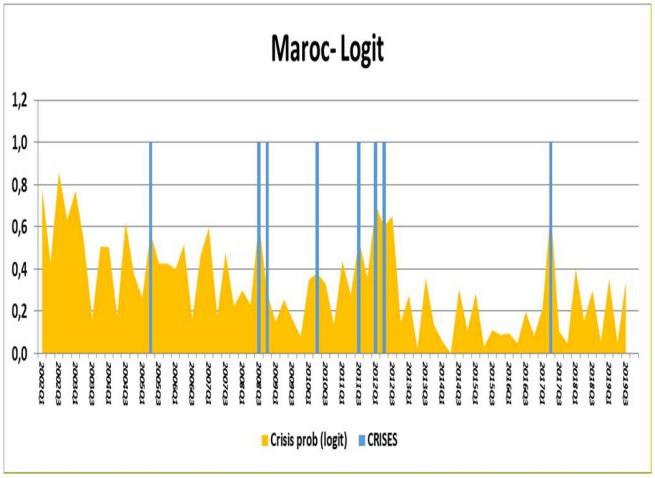

Figure 4: probability of crisis according to logistic regression with lagged exogenous variables

The Logit model predicted 8 crisis periods with significantly high probabilities. Among these 8 periods, we can distinguish 3 periods which were planned with more intensity, in particular in the second half of 2008, in the first half of 2012 and in the second quarter of 2017.

The analysis of the graph above shows us that after the first exchange rate crisis recorded on the foreign exchange market in the first quarter of 2002, the rate of appearance of crises accelerated between 2008 and 2012 following in particular to the effects of the 2008 financial crisis. the external sector during this period.

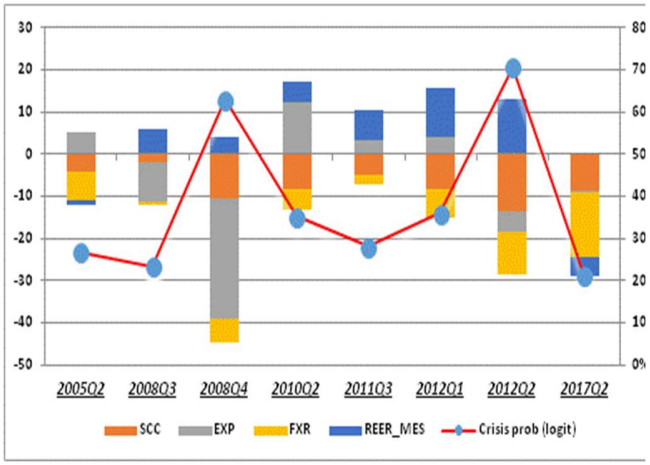

Figure 5: Contributions of external fundamentals in triggering crises

In other words, the Moroccan foreign exchange market was under pressure in the fourth quarter of 2008, with a probability of crisis approaching 63%. This unfavorable situation is mainly due to the worsening of the current account deficit by 10.7%, the drop in exports by 28% and the drop in foreign exchange reserves by 6%.

As for the crises of the first and second quarters of 2012, they are explained by the record levels of the current account deficit of -8.3% and -13.5% respectively, the sharp drop in reserves of -7% and -10 % respectively and the overvaluation of the REER by 12% and 13%.

As for the crisis reported in the second quarter of 2017, it stems from a deterioration in the current account balance deficit (-9%), the drastic drop in reserves (-16%) and the depreciation of the dirham by more than 4%.

The main conclusion of this analysis is that the EMPI index did not signal any currency crises during the years 2018 and 2019. It is therefore clear that the reform of the exchange rate regime towards a more flexible exchange rate, entered into in force at the beginning of 2018, contributed significantly to moderating the extent of the pressures on the foreign exchange market and to making the Moroccan economy relatively more resilient to external shocks.

The national project relating to the design of a new development model, showing some delay due to the national and international situation surrounded by uncertainties, constitutes an important opportunity for decision-makers to address issues relating to the external sector, and more particularly the foreign exchange market, and their repercussions on the macroeconomic framework.

History shows us that experiences differ and that what worked for one country in one context and time may not work in another country. We can always learn from the experiences of others, but to succeed an effort of adaptation is strongly required. This effort must imperatively take into account the various constraints of the current situation imposed in particular by the globalization of trade and international competition which, day by day, is becoming more and more severe by relying on our competitive advantages in economic, institutional, political and cultural.

V. CONCLUSION

By way of conclusion, the measurement of the pressure on the Moroccan foreign exchange market through the EMPI index has allowed us to observe that this index recorded particularly significant increases during the years 2002, 2006, 2008, 2011 and 2017. These years correspond to periods when Morocco experienced currency crises that coincided with significant fluctuations in both Net International Reserves (significant decline in NIR) and the Nominal Exchange Rate (strong appreciation of the NCR). In the same vein, the main crisis experienced by Morocco according to the EMPI is that of October 2008, when the dirham was devalued by 7%. Obviously, it seems that the combined effect of an

appreciation of the TCN and a significant drop in the RIN makes the Moroccan economy particularly vulnerable to a currency crisis. Starting from the fact that no crisis was signaled by the EMPI index during the years 2018 and 2019, we can conclude that the policy of gradual flexibility of the exchange rate regime, which came into force in January 2018, played a crucial role. in this direction. Consequently, this reform would undoubtedly have reduced the pressure on the exchange rate by making the Moroccan economy more resilient and less vulnerable to external shocks. Thus, 8 periods of crisis were identified with significantly high probabilities. Among these 8 periods, we can distinguish 3 periods which were planned with more intensity, in particular in the second half of 2008, in the first half of 2012 and in the second quarter of 2017.

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