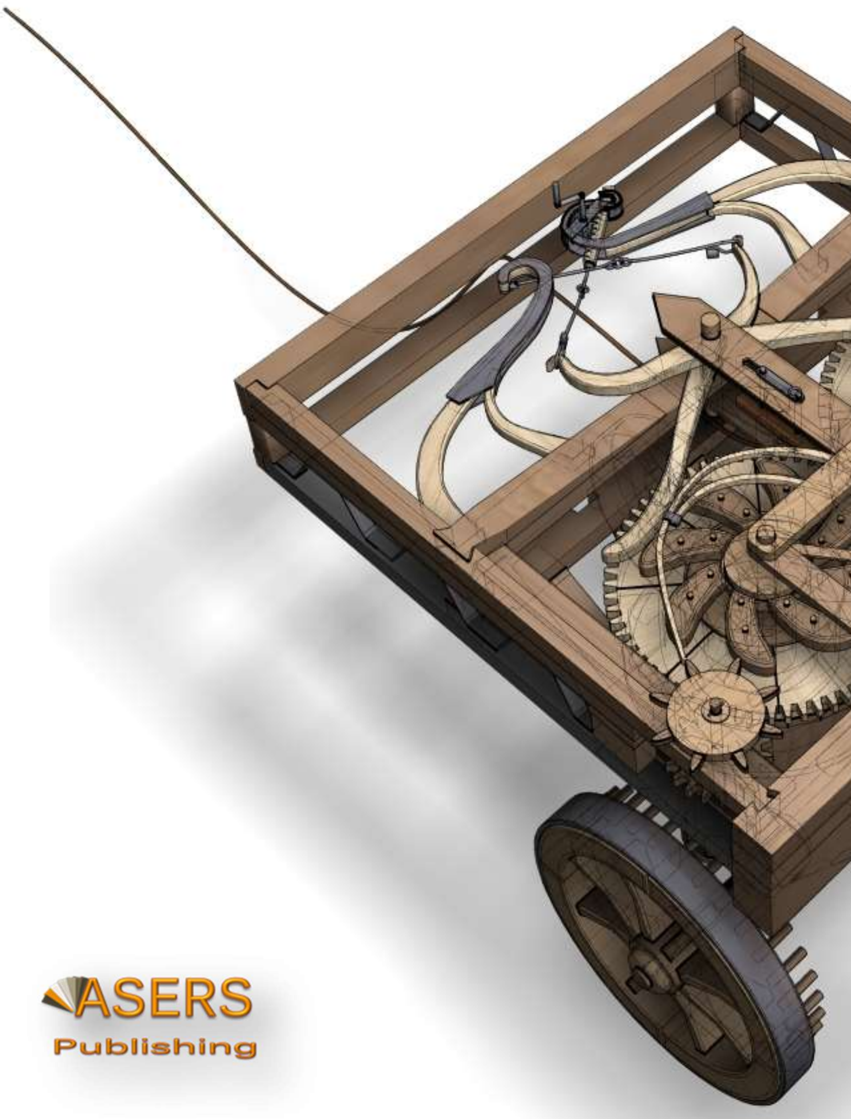
Theoretical and Practical Research in Economic Fields



Biannually
Volume XII
Issue 2(24)
Winter 2021

ISSN 2068 – 7710
Journal **DOI**
https://doi.org/10.14505/tpref

ASERS Publishing

ASERS Publishing is an advanced e-publisher struggling to bring further worldwide learning, knowledge and research. This transformative mission is realized through our commitment to innovation and enterprise, placing us at the cutting-edge of electronic delivery in a world that increasingly considers the dominance of digital content and networked access not only to books and journals but to a whole range of other pedagogic services.

In both books and journals, ASERS Publishing is a hallmark of the finest scholarly publishing and cutting-edge research, maintained by our commitment to rigorous peer-review process.

Using pioneer developing technologies, ASERS Publishing keeps pace with the rapid changes in the e-publishing market.

ASERS Publishing is committed to providing customers with the information they want, when they want and how they want it. To serve this purpose, ASERS publishing offers digital Higher Education materials from its journals, courses and scientific books, in a proven way in order to engage the academic society from the entire world.

Volume XII
Issue 2(24)
Winter 2021

ASERS Publishing
http://www.asers.eu/asers-publishing
ISSN 2068 – 7710
Journal's Issue **DOI**:
https://doi.org/10.14505/tpref.v12.2(24).00

Table of Contents:

Call for Papers
Summer Issue 2022
Theoretical and Practical Research in Economic Fields

Many economists today are concerned by the proliferation of journals and the concomitant labyrinth of research to be conquered in order to reach the specific information they require. To combat this tendency, **Theoretical and Practical Research in Economic Fields** has been conceived and designed outside the realm of the traditional economics journal. It consists of concise communications that provide a means of rapid and efficient dissemination of new results, models and methods in all fields of economic research.

Theoretical and Practical Research in Economic Fields publishes original articles in all branches of economics – theoretical and empirical, abstract and applied, providing wide-ranging coverage across the subject area.

Journal promotes research that aim at the unification of the theoretical-quantitative and the empirical-quantitative approach to economic problems and that are penetrated by constructive and rigorous thinking. It explores a unique range of topics from the frontier of theoretical developments in many new and important areas, to research on current and applied economic problems, to methodologically innovative, theoretical and applied studies in economics. The interaction between empirical work and economic policy is an important feature of the journal.

Theoretical and Practical Research in Economic Fields, starting with its first issue, it is indexed in EconLit, RePEC, ProQuest, Cabell Directories and CEEOL databases.

The primary aim of the Journal has been and remains the provision of a forum for the dissemination of a variety of international issues, empirical research and other matters of interest to researchers and practitioners in a diversity of subject areas linked to the broad theme of economic sciences.

All the papers will be first considered by the Editors for general relevance, originality and significance. If accepted for review, papers will then be subject to double blind peer review.

Invited manuscripts will be due till November 10th, 2020, and shall go through the usual, albeit somewhat expedited, refereeing process.

Deadline for submission of proposals:	10th May 2022
Expected publication date:	June 2022
Website:	http://journals.aserspublishing.eu/tpref
E-mail:	tpref@aserspublishing.eu

To prepare your paper for submission, please see full author guidelines in the following file: TPREF_Full_Paper_Template.docx, on our site.

ASERS Publishing

DOI: https://.doi.org/10.14505/tpref.v12.2(24).05

ASSESSING THE EFFECTS OF REAL EXCHANGE RATE DEPRECIATION ON THE MOROCCAN ECONOMY: EVIDENCE BASED ON SVAR APPROACH WITH SIGN RESTRICTIONS

Asmae AZZOUZI
Abdelmalek Essaâdi University, Morocco
azzouzi.asmae44@gmail.com

Ahmed BOUSSELHAMI
Abdelmalek Essaâdi University, Morocco
bousselhamia@yahoo.fr

Suggested Citation:
Azzouzi, A., Bousselhami, A. (2021). Assessing the Effects of Real Exchange Rate Depreciation on the Moroccan Economy: Evidence Based on SVAR Approach with Sign Restrictions. *Theoretical and Practical Research in Economic Field,* (Volume XII, Winter 2021), 2(24): 116 - 130. DOI:10.14505/tpref.v12.2(24).05
Article's History:
Received 12th of November 2021; *Revised* 22nd of December 2021; *Accepted* 27th of December 2021; *Published* of 31st of December 2021.

Abstract

The purpose of this paper is to analyze the dynamic response of a small subset of variables to exchange rate shocks by using a new method based on a set of theory-consistent sign restrictions for the purpose of identifying shocks over time (1995Q1–2019Q1) in the Moroccan economy. It is important to note that the current account presents the so-called "J-curve" phenomenon. Additionally, Morocco entered into a period of deeper and longer recession and higher inflation following the dirham's depreciation. Following a real depreciation, the output has little effect on improving the current account balance. Our results suggest that the monetary authorities reacted immediately to exchange rate shocks by raising their interest rates to prevent the economy from falling into deflation.

Keywords: contractionary; exchange rate shocks; vector autoregression; sign restrictions.

JEL Classification : C51; E30; F41.

Introduction

For transition economies, the reaction of real output to depreciation or devaluation[50] becomes a major challenge, not only for researchers but also for econometricians. The contribution of this study to the literature lies primarily in elucidating the conditions under which depreciations are more likely to be contractual/ expansionary in the economy. The importance of understanding the effect of depreciation on output cannot be ignored, as it provides important insights for policy-making.

The purpose of this paper is to study the empirical relationship between production and the depreciation of the Moroccan dirham. We use a fairly comprehensive vector autoregressive (VAR) model, as it allows the endogeneity of the exchange rate to be taken into account. Many previous studies that have adopted VAR models (*e.g.* Kamin and Rogers 2000; Ahmed *et al.* 2002; Shi 2006; Kim and Ying 2007 and Özcan 2020) have used the Choleski decomposition to identify shocks. It is only relatively recently that, in the devaluation literature, the VAR model based on the sign restriction method has been used.

[50]The terms "depreciation" and "devaluation" are used interchangeably in this paper, as the focus is on estimating the effects of real exchange rate changes on output.

This remainder of this article is organized as follows. Section 2 calculates the new effective exchange rate index (EERI), while Section 3 presents bivariate data analysis between the real exchange rate and output. Section 4 presents a complete VAR model, including analysis of the sign restriction methodology. Estimation results and robustness checks are presented in Sections 5 and 6, respectively. Finally, conclusions are presented in Section 7.

1. The New Effective Exchange Rate Index for The Dirham

In this section, we aim to estimate the exchange rate index of the Moroccan dirham, or the EERI, weighted according to trade (includes the US dollar, euro, yen, Chinese renminbi, and pound sterling). The importance of currencies depends on the percentage of trade with Morocco. In order to be able to calculate this index, the most important exchange rate would be that of the euro, which represents the importance of Europe in Moroccan trade. This effective exchange rate better reflects the impact of the exchange rate on macroeconomic conditions than a bilateral rate. The nominal EERI is an index of a weighted average of bilateral exchange rates. We have estimated the real EERI, which is considered as the nominal EERI adjusted by a measure of relative prices or costs, as its changes take into account both the evolution of the nominal exchange rate and the inflation differential vis-à-vis trading partners. The EERI has a variety of applications for both policy and market analysis: as a measure of international competitiveness; as a component of representative indices of monetary and financial conditions; as a criterion for assessing the transmission of external shocks; and as an intermediate monetary policy objective or operational objective.[51] It is therefore essential for authorities and stakeholders to have accurate EERI measures. In our study, we consider an exchange rate that is constructed so that a decrease reflects a real appreciation of the dirham.

The methodology proposed for constructing the trade-weighted index of the dirham is as follows. The current calculation method is based on the weighted geometric average of a basket of currencies chosen to represent the major share of Morocco's bilateral trade in goods and services. For a base period rated 0, the real effective exchange rate (EERI) index of the dirham (i) against a foreign currency of the partner countries (j), where $\omega_{j/i}$ is the weight of currency i.

1.1 Weight for the Effective Exchange Rate Index (EERI)

For the j currencies included in the index, the weight of an individual country's currency is based on the country's share of Morocco's trade in goods and services:

$$S_i = \frac{X_i^T + M_i^T}{\sum_{i=1}^{n}(X_i^T + M_i^T)}, \qquad \sum_{i=1}^{j} S_i < 1$$

where X represents total exports (goods and services) from country (i) to country (j), M represents total imports from j to i, and "n" is the number of Morocco's main trading partners.

The weights of the currencies included in the EERI are then calculated by resizing the trading shares (per ST) so that they total 100:

$$\omega_i = \frac{X_i^T + M_i^T}{\sum_{i=1}^{n}(X_i^T + M_i^T)} . S^T = S_i . S^T \quad \text{Où} \quad S^T = \frac{1}{\sum_{i=1}^{j} S_i}$$

Where S^T is the inverse of the share of trade represented by the currencies used in the EERI basket.

Therefore, the actual EERI is calculated according to the following formula:

$$EERI_{t/0}^{i} = \left[\frac{€M_t}{€M_0} \times \frac{CPI_t^{euro}}{CPI_t^2} \times \frac{E_t^2}{E_0^2}\right]^{\omega_{2,i}} \times \left[\frac{€M_t}{€M_0} \times \frac{CPI_t^{euro}}{CPI_t^3} \times \frac{E_t^3}{E_0^3}\right]^{\omega_{3,i}} \times \ldots$$

$$\times \left[\frac{€M_t}{€M_0} \times \frac{CPI_t^{euro}}{CPI_t^j} \times \frac{E_t^j}{E_0^j}\right]^{\omega_{j,i}} \times \left[\frac{€M_t}{€M_0}\right]^{\omega_{1,i}} \times EERI_0 EERI_{t/0}^{i}$$

$$= \prod_{j=1}^{n} \left[\frac{CPI_t^{euro}}{CPI_t^j} \times \frac{E_t^j}{E_0^j}\right]^{\omega_{j,i}} \times \frac{€M_t}{€M_0} \times EERI_0$$

where:

[51]For example, Singapore uses this type of exchange rate as an operational objective, with foreign exchange intervention to control the currency rate; for more details, see Monetary Authority of Singapore (2001).

$€M_t$ is the bilateral real exchange rate; units of dirhams per euro (euro/MAD);
E_t^i is the unit of euros per each unit of foreign currency ($i = 2, \ldots, j$);
ω_i is the weight of foreign currency ($i = 2, \ldots, j$);
ω_1 is the weight of the euro;
CPI_t^j is the price level in the foreign country j;
CPI_t^{euro} is the price level in the euro zone;
"t" is the current period;
"j" is the number of currencies included in the EERI;
EERI0 is equal to 100; and
0 is the base period.

This weighting system is based on the work of Turner and Van'tdack (1993). The weights, derived from trade flows in goods, reflect both direct bilateral trade and competition in third countries through double weighting. This method of weighting based on trade has its theoretical basis in Armington (1969) and implicitly assumes the existence of a single type of product, differentiated according to its country of origin, with a constant elasticity of substitution.

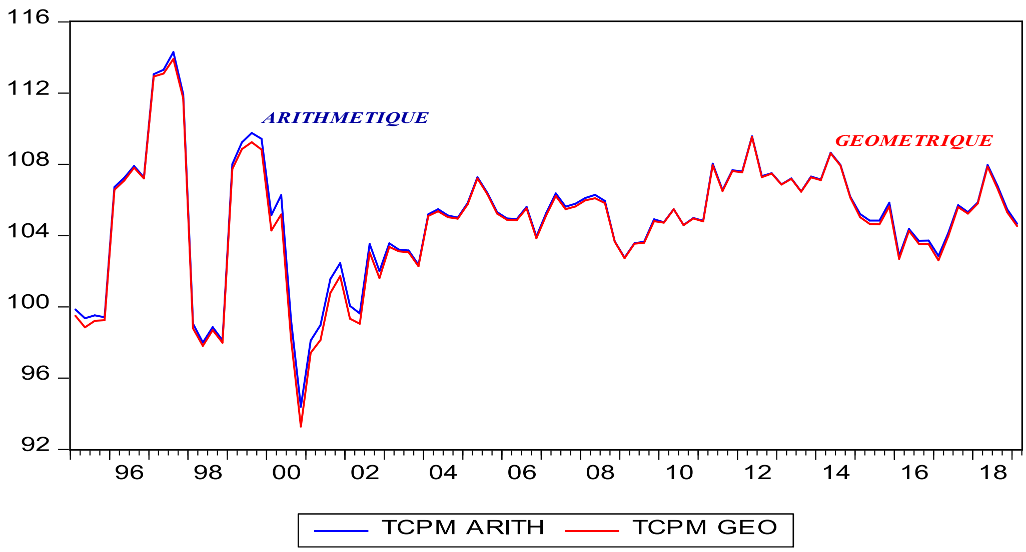
An older method for the often-used EERI calculation, based on the arithmetically weighted average of a basket of currencies, is also chosen to present Morocco's trade structure as illustrated in the figure below with a view to comparing this with the previous method. Specifically, at each moment t, the EERI is calculated using the following formula:

$$EERI_{t/0}^{i} = \left[\omega_{1,i} \left[\frac{€M_t}{€M_0} \right] + \omega_{2,i} \left[\frac{€M_t}{€M_0} \times \frac{CPI_t^{euro}}{CPI_t^2} \times \frac{E_t^2}{E_0^2} \right] + \omega_{3,i} \left[\frac{€M_t}{€M_0} \times \frac{CPI_t^{euro}}{CPI_t^3} \times \frac{E_t^3}{E_0^3} \right] + \ldots + \omega_{j,i} \left[\frac{€M_t}{€M_0} \times \frac{CPI_t^{euro}}{CPI_t^j} \times \frac{E_t^j}{E_0^j} \right] \right] \times EERI_0$$

$$EERI_{t/0}^{i} = \left[\omega_{1,i} + \omega_{2,i} \left[\frac{CPI_t^{euro}}{CPI_t^2} \times \frac{E_t^2}{E_0^2} \right] + \omega_{3,i} \left[\frac{CPI_t^{euro}}{CPI_t^3} \times \frac{E_t^3}{E_0^3} \right] + \ldots + \omega_{j,i} \left[\frac{CPI_t^{euro}}{CPI_t^j} \times \frac{E_t^j}{E_0^j} \right] \right] \times \left[\frac{€M_t}{€M_0} \right] \times EERI_0$$

Figure 1 shows the evolution of the EERI according to the two calculated methods.

Figure 1. The evolution of the EERI according to the two calculated methods



Note: TCPM represents EERI.

2. Bivariate Data Analysis

The feedback loop between output and the real exchange rate describes, first, how a depreciation of the real exchange rate could have both an expansionary and a restrictive effect on output. Second, it shows how real output growth could lead to an appreciation or depreciation of the real exchange rate.

According to the Balassa–Samuelson effect, in fast-growing economies, the relative price of non-tradable goods would rise more rapidly and thus lead to an appreciation of the real exchange rate over time. However, existing empirical studies suggest that the effects of growth on real exchange rates are non-existent or weak (for a comprehensive review of the empirical evidence, see Tica and effet 2006; Choudhri and Khan

2005; Chinn and Johnston 1996). At the same time, and paradoxically, advanced countries are following the conventional wisdom that growth is accompanied by real long-term appreciations, widely known as the Balassa–Samuelson hypothesis (BSH), while developing countries are moving in the opposite direction.

We first assess the bivariate relationship between the real exchange rate and seasonally adjusted GDP using cross-correlations with future values and lagged values up to four quarters (in our study). To make the results robust we use simple detrending methods such as linear filters, three filters are used: linear detrending; first difference; and the Hodrick–Prescott (HP) filter.

The bivariate correlations procedure calculates Pearson's correlation coefficient, Spearman's rho, and Kendall's tau-b, along with their levels of significance. In the present study, we use the Pearson's correlation coefficient. In case of data not being normally distributed or if they have ordered categories, we use Kendall'stau-b or the Spearman correlation, which measures the association between rank orders. Correlation coefficients range from –1 (perfect negative relationship) to +1 (perfect positive relationship). A value of zero indicates the absence of a linear relationship. When interpreting the results, we cannot conclude from the existence of a significant correlation that a causal relationship exists; it is the causality test in the Granger sense that will bring out their causality in pairs.

We use the real exchange rate of the dirham, which is constructed so that a decrease reflects a real appreciation of the national currency. Table 1 presents the representative short-term cross-correlations between the real exchange rate and output with lags of –4, –2, –1, 0, 1, 2, and 4. A positive (negative) lag indicates the number of quarters in which real GDP (industrial production index) causes (lags) effects on the real exchange rate. In other words, output growth in the open economy is exogenous to changes in the real exchange rate. While the consequences of a persistent decline in the real exchange rate on economic growth can be inferred from the correlation with negative lags, the correlation with positive lags suggests the possible inverse causal effect of output growth on the real exchange rate.

Table 1. Cross-correlations between exchange rate and output.

Lags / Filters	-4	-3	-2	-1	0	1	2	3	4
HP	0.018	0.071	0.043	0.053	0.002	0.021	0.027	0.048	0.038
DM	0.32	0.33	0.34	0.36	0.377	0.37	0.36	0.35	0.33
DIFF	-0.022	0.005	-0.048	-0.029	-0.067	0.01	-0.01	-0.0006	-0.057

Source: Authors' calculations.

Notes: DM=linear detrending; DIFF=first difference; HP=Hodrick–Prescott filter. A positive (negative) detrend indicates the number of quarters whose real output typically has a significant impact (lag) on the real exchange rate.

Table 2. Granger causality tests between the real exchange rate and output.

	Lag	HP	DM	DIFF
RER causes real Y in the Granger sense	-1	0.05(0.81)	0.04(0.83)	0.12(0.72)
	-2	0.07(0.92)	0.20(0.81)	0.04(0.95)
	-3	0.21(0.88)	0.38(0.76)	0.80(0.49)
	-4	0.19(0.93)	0.74(0.56)	0.52(0.71)
Y causes RER in the Granger sense	-1	0.90(0.34)	0.73(0.39)	0.26(0.61)
	-2	0.46(0.62)	0.40(0.66)	0.18(0.83)
	-3	0.50(0.68)	0.49(0.68)	0.27(0.84)
	-4	0.42(0.79)	0.47(0.75)	0.19(0.94)

Source: Authors' calculations.
Notes: The statistics shown are F-statistics with probability values in parentheses. DM=linear detrending; DIFF=first difference; HP=Hodrick–Prescott filter; RER=real exchange rate; Y=real output; RER ... Y tests the hypothesis that the real exchange rate causes real GDP in the Granger sense; Y ... RER tests the hypothesis that real economic growth seems to cause, in the Granger sense, the real exchange rate.

The correlations with negative shifts are clearly positive in our case. That is, real exchange rate depreciation is followed by output growth. For example, devaluations or depreciations are uniformly associated with the expansion of the Moroccan economy. This result is extremely sensitive to the mechanisms of the HP filter and the linear detrending method.

In order to further explore the bivariate relationship, we utilize Granger causality tests (see Table 2). Foreign GDP, foreign interest rate, current account, and real money supply are included to control for external influences that simultaneously affect the real exchange rate and output. From Table 2, it is clear that there is an absence of causality in both directions.

3. VAR Model with Sign Restrictions

This section is divided into two subsections: the first establishes the basic model; and the second illustrates the implementation of the sign restriction approach, following Mountford and Uhlig (2005).

3.1 Model

The relationships documented (positive or negative) between real output and the real exchange rate in the previous section may result from a spurious correlation, where both variables are affected by a third factor. For example, large changes in oil prices can depress output and depreciate the real exchange rate, causing it to move in an opposite direction. It is therefore important to monitor macroeconomic conditions and to distinguish between exchange rate movements that can be considered as exogenous policy shocks and those that are reactions to macroeconomic events.

This work focuses on full vector autoregression (VAR) models, consisting of six endogenous variables: real output [as measured by the seasonally adjusted Industrial Production Index (IPI) (Y)]; real exchange rate (RER); current account to GDP(CA); price level (as measured by the Consumer Price Index (CPI)]; and real money supply (real M2). As a short-term interest rate, the three-month money market interest rate enters the VAR as the sixth variable.

In addition, two exogenous variables, the foreign IPI (Y^*) and the foreign interest rate (i^*), are incorporated to capture external shocks. The short-term money market interest rate and euro area real GDP are used as the foreign interest rate and foreign real output. In addition, although Uhlig (2005) and Mountford and Uhlig (2009) did not include deterministic terms (e.g. a constant or a time trend) in their VAR models, we include a time trend to obtain a better impulse response. In addition, we retain the VAR(p) model with p^*=1 (a lag), which minimizes the information criteria of Akaike and Schwarz in our case. Interception and time trend are also contained in the VAR.

The real money supply is included in our study. According to Shahbaz et al. (2012), money supply affects both investment and production. An increase in the money supply lowers the interest rate, reduces borrowing costs, and encourages investment that can increase domestic production. In addition, a larger money supply will reduce the value of domestic money. This work also incorporates the price level to control the price environment of the economy.

According to Mejía-Reyes *et al.* (2010), an inflationary environment can have a negative impact on output because it can lead to an inefficient allocation of resources due to relative price distortions and higher administrative costs for firms. Current accounts are included for two reasons. On the one hand, this allows direct examination of the effect of exchange rate fluctuations on output through the demand channel (net exports). On the other hand, the current account implicitly includes information on capital flows, as the current and capital accounts represent a symmetrical picture of each other. Information on capital flows is extremely important. According to Kamin and Rogers (2000), capital flow shocks have played an important role in changes in the real exchange rate and output in Mexico. Reinhart (2000) also argued that devaluation can lead to a loss of access to international financial markets and thus contractionary effects on output. Kim and Ying (2007) also included this variable in their model.

The short-term interest rate and the euro zone IPI are included to take into account European market conditions. According to Kim, Ren and Lian (2014), two exogenous variables are including, foreign (US) GDP and the foreign interest rate (the three-month US Treasury bill rate) to capture external shocks. Real output and the interest rate are naturally included in this work.

These data come from three different sources: the International Financial Statistics (IFS); the Directorate of Trade Statistics (DOTS); and the Central Bank. They are quarterly, seasonally adjusted, and cover the period 1995Q1 to 2019Q1.

Equation (1) summarizes the model in a compact and reduced form:

$$\begin{bmatrix} Y_t \\ TCR_t \\ CPI_t \\ \mathrm{Re}al\ M2_t \\ CA_t \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \end{bmatrix} + A_{ij}(L) \begin{bmatrix} Y_{t-1} \\ TCR_{t-1} \\ CPI_{t-1} \\ \mathrm{Re}al\ M2_{t-1} \\ CA_{t-1} \end{bmatrix} + B_{ij}(L) \begin{pmatrix} \Delta Y^*_{t-1} \\ \Delta i^*_{t-1} \end{pmatrix} + \begin{bmatrix} e^1_t \\ e^2_t \\ e^3_t \\ e^4_t \\ e^5_t \end{bmatrix} \quad (1)$$

All variables are expressed in logarithms, except for the interest rate and the current account-to-GDP ratio. There are several features of the model. First, the VAR model takes into account internal and external shocks that may simultaneously induce devaluation (depreciation) and contraction of the economy, such as a reversal of capital inflows or a decline in the GDP of foreign countries, leading to a spurious correlation between the two variables. Second, although we have tried to be exhaustive in taking into account various factors, parsimony is also called for in our study. For example, we do not include the capital account in our model as in the empirical study by Kim and Ying (2007). Since current and capital accounts reflect each other, the inclusion of both variables will result in redundant information. Third, instead of using the nominal exchange rate, as Kim and Ying (2007) did, we choose to use the real exchange rate. This can be explained by the fact that, in the long run, nominal depreciations are estimated to lead to a proportional increase in prices that leaves the real exchange rate and economic activity unchanged, as the analysis based on the nominal exchange rate is usually limited to short-term effects (see Lizondo and Montiel 1989).

Moreover, a key element of the traditional conception of devaluation is that it is the improvement in the relative domestic price of tradable versus non-tradable goods, i.e. the depreciation of the real exchange rate that generates the process of expenditure transfer, balance of payments improvement, and economic expansion.

3.2 Identification of Structural Shocks by Imposing Sign Restrictions

Researchers in economics have discussed how to decompose forecast errorst hat are functions of orthogonal structural innovations, *i.e.* how to identify structural shocks to the variation of forecast errors at different horizons. Five methods are present in the literature, four of which are parametric restrictions. These parametric restrictions can vary depending on the individual set of parametric equations, the existence of a recursive causal structure (Sims 1988), and whether the shocks have known short- or long-term effects or a combination of both (Blanchard and Quah 1989). Each type has its own disadvantages and advantages.

For example, there is no clear consensus regarding the order of variables in the system of equations used to specify the VAR model, some orders may not be justified by the economic structure, and standard recursive identification assumptions may be superior in identifying restrictions that have developed over time in the same way as data mining, as researchers have sought restrictions that may yield reasonable results (see Rudebusch 1998).

The contemporary impact of zero may not be compatible with other classes of general equilibrium models (Canova and Pina 1999). In addition, Faust and Leeper (1997) showed that substantial biases in the estimates are possible due to small sampling biases and measurement errors when using zero restrictions in long-term effects.

Alternatively, the alternative proposed is to continue Uhlig's (2005) recent approach of restricting signs to identify exchange rate shocks using the median response calculated by Fry and Pagan (2011). The method of approach "Uhlig (2005)"is more appropriate here for some reasons. First, Uhlig used a different approach to identify structural shocks; they used the restriction of signs. The idea of this approach is to constrain the direction of the response functions due to a specific shock so that they are based on economic theory. Second, this approach is less restrictive than the recursive approach. However, it can lead to biased estimates when the signs of the response functions are misidentified.

This approach thus allows for greater freedom in the definition of identifying shocks, such as the combination of restrictions on the timing of impacts, on the signs, or the expected magnitude of the response of given variables to a single shock (see, *e.g.,* Rafiq and Mallick 2008; Lian An 2006; Uhlig 2005).

Our main interest in this work is to obtain evidence on how exchange rate depreciation affects production in particular. Instead of identifying all structural disturbances, we use minimal restrictions that are sufficient to identify the exchange rate depreciation shock and examine its effect on output. For this purpose, this work circumvents the “incredible” zero restrictions on the contemporaneous and long-run impact of shocks.

This is because the restrictions on signs do not impose any quantitative restrictions on responses, regardless of the definition of the variable used (see Rafiq and Mallick 2008). Moreover, compared to the traditional structural VAR model, the restrictions that are often used implicitly, in line with the conventional view, are made more explicit in the sign restriction approach. Granville and Mallick (2010) argued that the sign restriction method of response is robust to the non-stationarity of the series, including structural breaks. The advantage is that the identification of sign restrictions allows shocks to be identified using limited restrictions over multiple time series. Moreover, the sign restriction method does not limit impulse responses. A pure restriction approach explicitly uses restrictions that researchers implicitly use and are therefore agnostic (Rafiq and Mallick 2008).

Nevertheless, it is important to note that the constraints on the signs of shocks are not without criticism. For example, Fry and Pagan (2011) questioned the shocks identified and the optimal responses based on median criteria. Specifically, if only one shock is identified, i.e. exchange rate shocks, combinations of other shocks could resemble exchange rate shocks. One way to avoid this problem is to explicitly identify other shocks. According to Uhlig (2005), the problem of multiple shocks is not unique to the sign restriction method. For example, if the true data-producing mechanism has more shocks than variables, and if a classical Cholesky decomposition is used to identify an exchange rate shock by classifying it in last order, the shocks identified will in fact be a linear combination of several underlying shocks. In summary, this study does not claim that the identification hypotheses used are irrefutable or perfect, but rather that they are particularly reasonable, minimal, and well-crafted.

Fry and Pagan (2011) pointed out that the optimal response, using median criteria for different shocks and horizons, can combine information from several identification schemes and is therefore a composite of different structural response functions. They proposed an alternative method to overcome this problem by choosing a response as close as possible to the median while requiring that responses be generated from a single identification matrix, called the below median target method. This is why we use both methods at the same time: Uhlig’s (2005) method to determine the exchange rate; and Fry and Pagan’s (2011) method to calculate the median response. We call this the Uhlig–Fry–Pagan method.

In what follows, we provide a brief overview of the method used. The detailed methodology can be found in Uhlig (2005). Let a vector of n endogenous variables containing time-t values whose dynamic relationships are described by the following order auto-regression vector (VAR(k)):

$$Y_t = B_{(1)}Y_{t-1} + B_{(2)}Y_{t-2} + \ldots + B_{(k)}Y_{t-k} + \nu_t, \quad t=1,\ldots,T \tag{2}$$

where $B_{(k)}$ are matrices of coefficients of size n×n and ν_t is the one-step prediction error with the variance-covariance matrix $\sum$.W_t; let n×1 be a vector containing the time values of the structural perturbations. The reduced-form residuals and the structural perturbations are related by:

$$\nu_t = AW_t \tag{3}$$

where it is assumed that the structural perturbations are mutually independent and normalized to be of variance 1. It can therefore be written as follows: $E[W_t W_t^{'}] = I$.

In addition, the j-th column of A (or its negative value) represents the immediate impact on all variables of the j-th structural innovation (shock) of a standard error. The only restriction on A so far that emerges from the covariance structure is:

$$AA^{'} = \sum. \tag{4}$$

The problem of identification amounts to discovering $n(n-1)/2$ free elements in matrix A by imposing identification restrictions. According to Uhlig (2005), matrix A can always be written as follows:

$$A = X \wedge Q \tag{5}$$

Where X is an orthogonal matrix, whose columns are the ortho-normal eigenvectors of $\sum$, $\wedge$ represents a diagonal matrix with the eigenvalues of $\sum$ on its main diagonal, and Q represents an orthogonal matrix (i.e. $QQ^{'} = I$).

Equation (5) shows that the choice of elements in an orthonormal set can determine the elements whose coordinates are free of A. Since we are only interested in the responses (reactions) to a particular shock, the exchange rate shock, the problem is to determine an orthonormal vector q in the following equation:

$$c = X \wedge^{1/2} q. \tag{6}$$

Where c is a column of A, called the impulse vector by Uhlig (2005), containing the contemporaneous responses of n endogenous variables to the exchange rate shock, and q is a column of Q at the corresponding location. The main idea of the identification scheme is to impose a set of inequality constraints. This not only identifies the c, but also supports diversities of possible responses consistent with the sign restrictions.

In addition, we describe here how we explore the space of orthogonal decompositions. It is well known that, if we exclude the case of recursive models, the set of possible identifications is innumerable and it is difficult to search for them efficiently. The algorithm we use follows Canova and de Nicol (2002); we consider that for any orthogonal decomposition of A, we can find an infinite number of possible orthogonal decompositions $\sum$, such as $\sum = AQQ'A'$, where Q is any ortho-normal matrix ($QQ' = I$).

A Choleski decomposition, for example, would assume a recursive structure on A so that A is a lower triangular matrix. Another candidate for A is the decomposition of eigenvalues and eigenvectors, $\sum = X \wedge X' = AA'$, and, following Canova and de Nicol (2002), we consider that:

$$X = \prod_{m=1}^{N-1} \prod_{n=m+1}^{N} Q_{m,n}(\theta)$$

where $Q_{m,n}(\theta)$ is an ortho-normal rotation matrix of the form:

$$Q_{m,n} = \begin{bmatrix} 1 & 0 & \dots & 0 & 0 \\ 0 & cos(\theta) & \dots & -sin(\theta) & 0 \\ \dots & \dots & 1 & \dots & \dots \\ 0 & sin(\theta) & \dots & cos(\theta) & 0 \\ 0 & 0 & \dots & 0 & 1 \end{bmatrix}$$

Where $0 < \theta \leq \frac{\pi}{2}$ and the indices (m,n) indicate that the rows m and n rotate at an angle θ .

To translate this result into an algorithm that looks for the space of orthogonal decompositions, first note that in a system of N variables there are $(N(N-1)/2)$ bivariate rotations and $(N(N-1)/4)$ combinations of bivariate rotations of different elements of the VAR, for a fixed θ . Thus, for N=5, there are 15 possible rotation matrices. Second, since $Q_{m,n}(\theta)$ is ortho-normal:

$$\sum = AQ_{m,n}(\theta)Q_{m,n}(\theta)'A' = X \wedge^{0.5} Q_{m,n}(\theta)Q_{m,n}(\theta)' \wedge^{0.5} X'$$

is a permissible decomposition.

Thus, based on an eigenvalue–eigenvector decomposition, it can be “multiplied” tenfold in one direction or the other, for each θ.

Third, we quadrant the interval (0, π/2) into M points, and construct 15M orthogonal decompositions of $\sum$. This last step transforms an incalculable number into a large but finite search. Furthermore, we consider that $R_{j,t+k}$ is the matrix of impulse responses at horizon k. In order to identify the interesting q shock, sign restrictions can be imposed on $X \leq n$ variables on the horizon 0,...,K.

The sign restrictions are imposed according to Uhlig’s (2005) open economy model, as summarized below for the time horizon k=0,...,K. Details on the number of periods for which the restrictions apply are given below.

To identify an exchange rate shock, we impose the following restrictions:

$$R_{j,t+k}^{CPI} \geq 0, \ k=0,...,4$$

$$R_{j,t+k}^{TCR} \geq 0, \ k=0,1$$

$$R_{j,t+k}^{Re\,alM2} \leq 0, \ k=0,...,4$$

Consequently:

By definition, the exchange rate will not decline (≥0) in response to its own positive shock.

The price level does not fall (≥0) in response to a positive exchange rate shock, *i.e.* a depreciation of the exchange rate, because the price level is likely to be pushed up by an increase in net exports due to the depreciation of the exchange rate (for further discussion, see Ahmed *et al.* 2002). In general, the depreciation of the exchange rate should theoretically generate inflationary pressures, especially in a small open economy such as that of Morocco, through its effects on demand and supply. The latter effect flows through a channel of imported inputs: the depreciation increases inflation by leading to an increase in production costs. The first effect comes from the channel of expenditure transfers: depreciation stimulates aggregate demand by increasing the demand for goods and services through net exports. The increase in aggregate demand can lead to higher input prices and nominal wages, *i.e.* inflation.

The real money supply does not increase (≤0) in the face of exchange rate depreciation for two reasons. First, when the price level rises in response to exchange rate depreciation, the real money supply declines. Second, as the exchange rate depreciates, central banks will tend to reduce the money supply to support the currency. For example, Rogers and Wang (1995), among others, empirically demonstrated that a depreciation of the real exchange rate leads to a significant reduction in the money supply.

The nominal interest rate will be considered positive (≥0) in the face of the depreciation of the domestic currency through its effect on inflation. As inflation increases, the real money supply decreases and thus nominal interest rates increase. Generally, depreciation improves the trade balance through expenditure transfers and expenditure reduction effects. The former effect shifts demand towards domestically produced goods, while the latter reduces domestic consumption due to the effect of real cash balances and higher interest rates.

These restrictions seem reasonable, as they appeal only to a priori attractive and consensual views on the effects of the exchange rate shock on prices, the exchange rate, and the money supply. Since the output response is the focus of this study, we leave it to the data to determine this, without imposing restrictions on the possible outcome. The current account is not restricted because it reflects the response of the trade balance to the exchange rate. Therefore, the method remains agnostic with respect to the responses of key interest variables.

Therefore, for each set of estimates (B, ∑), impulse vectors and thus impulse response functions corresponding to different unit vectors in an n-dimensional sphere can be calculated. We generate n numbers from a normal distribution with a mean of zero and a standard deviation of 1, treat them as coordinates, and normalize the resulting vector to a unit vector. The normalized n-dimensional vector corresponds to each point of the sphere. We can repeatedly generate n-dimensional vectors to cover the sphere uniformly.

The sampling uncertainty of the VAR parameters (B, ∑) is covered in a Bayesian manner. According to Uhlig (2005), we assume that the anterior and posterior distributions for (B, ∑) belong to the Normal–Wishart family. We simulate 500 pairs of (B, ∑). For each pair, we evaluate 500-unit vectors on the n-dimensional sphere. Thus, a total of 250,000 q and impulse vectors are evaluated. After calculating each set of impulse response functions corresponding to each unit vector, we check whether the sign restrictions are met. Only those impulse vectors that meet the restrictions used are stored.

4. Results and Discussion

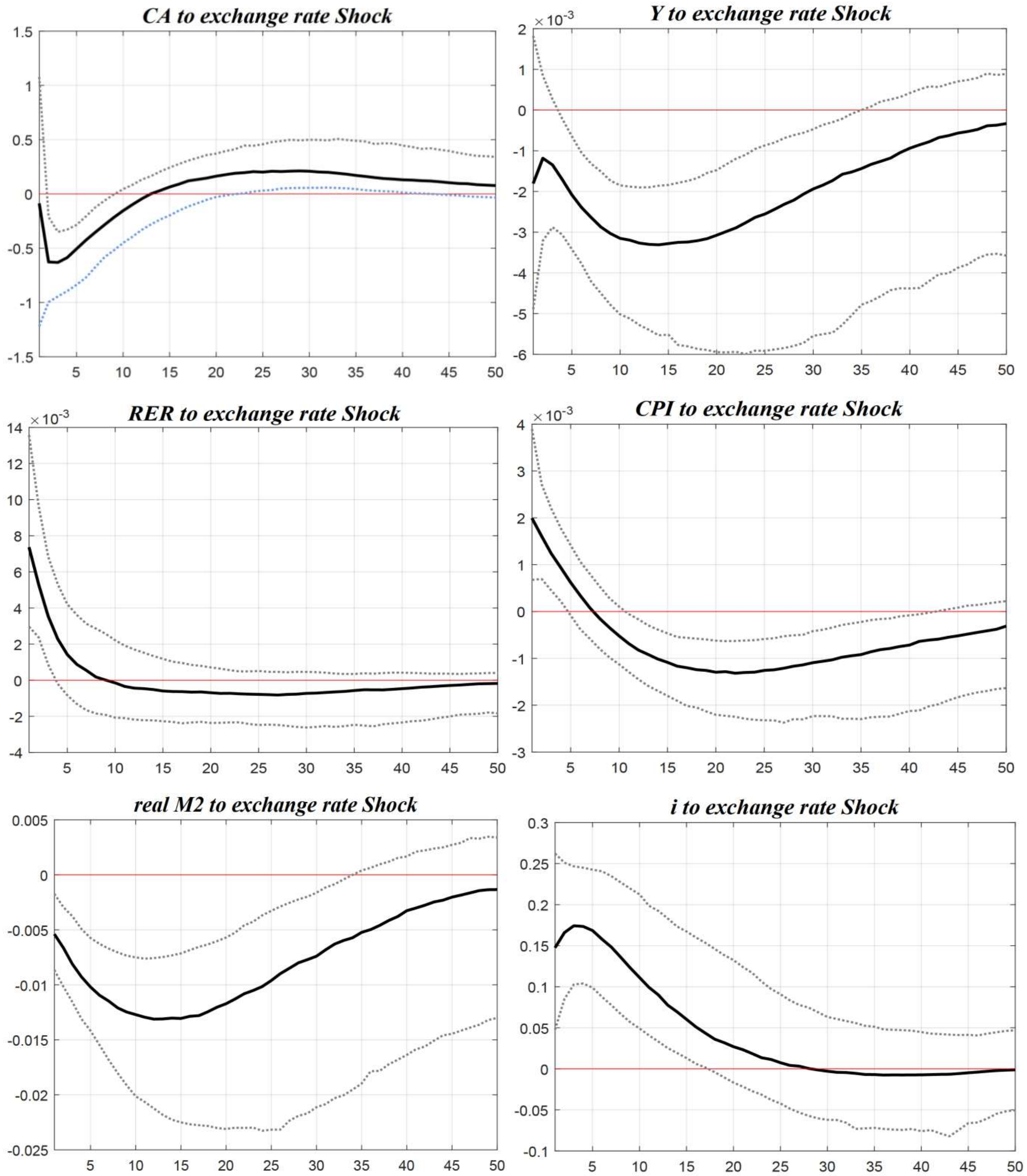
Figure 2 shows the impulse responses of each of the six variables (at a change of one standard deviation) to the positive exchange rate shock (indicating a depreciation) over a 50-quarter period. Responses are below the median target in each graph in Figure 2 and are represented by quintiles of 16% and 84%.

As shown in Figure 2, it is interesting to note that the current account shows the phenomenon known as the "J-curve," *i.e.* in response to exchange rate depreciation, the current account first deteriorates, marginally significantly, before improving and finally reaching long-term equilibrium (Bahmani-Oskooee and Ratha 2004; Bahmani-Oskooee and Hegerty 2010; Bahmani Oskooee *et al*. 2013). The J-curve highlights the fact that the positive effects (volume effects) do not come into play immediately, whereas the negative effects (price effects) come into play immediately: this curve is therefore based on a time horizon (in our case, quarterly).

The question that now arises is whether the improvement in the current account, after exchange rate depreciation, implies an unambiguous expansion of output. The answer is shown to be not necessarily. It should be noted that the current account generally improves and output deteriorates in response to exchange rate depreciation.

Diaz-Alejandro (1963) pointed out that an observer of depreciation might be surprised to see that depreciations have led to an improvement in the trade balance, accompanied by a decline in the level of total production. Kim and Ying (2007) revealed similar findings. This is not an odd result. First, the observed improvement in the current account balance may not be the result of a boom in exports, but of a deep contraction in imports resulting from the contraction in production (see Frankel, 2005). Second, the restrictive effect of exchange rate depreciation may offset the expansionary effect on the trade balance, leading to a decline in aggregate output.

Figure 2. The impulse responses of different interest variables to an exchange rate shock.



Source: Authors' calculations.

Note:X-axis denotes quarters; vertical axis denotes percentage. We assume that the anterior and posterior distributions for (B, ∑) belong to the Normal–Wishart family. We simulate 500 pairs of (B, ∑). For each pair, we evaluate 500 unit vectors on the six-dimensional sphere. Thus, a total of 250,000 *q* and impulse vectors are evaluated.

The structuralist view argues that devaluation has contractionary effects on production. It is also in line with the priorities of a recent study by An, Kim and Ren (2014) that showed that devaluation by contraction can occur both in developed and developing countries on the basis of data from 16 countries in three groups: Latin American countries; Asian countries; and non-G3 developed countries (see also Kandil 2013; Kim *et al.* 2007). Similarly, contractionary devaluation could exist in any exchange rate regime, be it a floating exchange rate regime, a fixed exchange rate regime, or a common currency area. Therefore, devaluation through contractionary may not be a function of exchange rate regimes or types of economies. Ahmed *et al.* (2002)

reported that devaluation leads to greater economic contraction in developing countries than in developed countries.

Generally, the reaction of monetary policy variables, including the interest rate (*i*) and the real money supply (real M2) to the exchange rate shock, in fact reflects the reaction of the monetary authorities to this type of shock. The third row, under column 2 of the graphs in Figure 2, reveals that interest rate (*i*) reacts positively, almost immediately, to an exchange rate shock, indicating that Moroccan monetary policy is not neutral in the face of an exchange rate shock and that the central bank plays its role as a macroeconomic actor.

In addition, in the first column of row 3 of the graphs in Figure 2, the real money supply declines in response to an exchange rate shock, indicating the central bank's efforts to control inflation. These results clearly show that the monetary policy authorities act by raising rates to mitigate the negative effects of depreciation on inflation and economic activity. Bjornland and Halvorsen (2014) reached similar conclusions for six open economies (Australia, Canada, New Zealand, Norway, Sweden, and the UK). Their results revealed that central banks respond immediately to exchange rate depreciation and thus reduce the negative effects of depreciation on output and inflation.

This finding is theoretically consistent with Svensson's (2000) view that, in the real world, inflation-targeting economies are generally very open economies where capital can move freely. Therefore, shocks from the rest of the world are essential, and the exchange rate plays a significant role in the transmission of monetary policy in these economies.

Aiming to take better account of external shocks that affect countries and their exchange rates, Svensson (2000) extended the formal analysis of closed-economy inflation targeting to a small open economy where the exchange rate and shocks from the rest of the world are important for formulating monetary policy. He argued that including the exchange rate in the analysis of the inflation-targeting regime has important consequences. First, the exchange rate provides an additional channel for the transmission of monetary policy. Second, the exchange rate (as an asset price) is a forward-looking variable, the value of which is determined by expectations. It therefore contributes to better forward-looking decision-making and strengthens the role of expectations in monetary policy. Third, some foreign shocks are transmitted to the domestic economy through the exchange rate (i.e. foreign inflation, foreign interest rates, and foreign investors' exchange risk premiums). Therefore, when developing a small open economy model with an inflation-targeting regime, it is important to place particular emphasis on exchange rate channels in monetary policy.

Overall, our results show that there has been a deep recession and high inflation in the Moroccan economy following the depreciation of the dirham. In other words, the depreciation has created serious deflationary effects. Our results suggest that the monetary authorities reacted immediately to the exchange rate shocks by raising their interest rate. However, these measures seem to have had a limited impact on mitigating the deflationary effects. The challenge for monetary authorities is therefore to act preventively to avoid the economy falling into deflation.

This can be explained by the fact that the exchange rate shock has the main effect of passing through the supply channels, in particular the cost of imported inputs, due to Morocco's strong dependence on inputs imported from the euro zone especially. In this sense, structural reforms aimed at reducing this dependence can help to mitigate the negative effects of currency depreciation on macroeconomic performance. Finally, our findings clearly show that the exchange rate shock is transmitted mainly to economic activity and inflation through import variations.

Table 3. Variance decomposition of interest variables due to exchange rate shocks

	RER	Y	RealM2	CPI	CA	i
1	0.27	0.18	0.03	0.004	0.006	0.51
2	0.55	0.23	0.10	0.02	0.10	0.004
3	0.49	0.18	0.19	0.04	0.10	0.002
4	0.46	0.17	0.22	0.04	0.10	0.002
5-long-terme	0.45	0.16	0.23	0.05	0.10	0.002

Source: Authors' calculations.

Notes: RER=real exchange rate (EERI); CPI=inflation; RealM2=real money supply; i=interest rate; CA=current account; Y=output.

This is consistent with Morocco's heavy dependence on imports and with the findings of Kandil's (2015) study, which examined how exchange rate fluctuations are transmitted to the real economy in developed and developing countries.

While impulse response functions reveal the dynamic effects of a one-off shock, variance decompositions are a practical measure of the importance of such shocks in the system. Table 3 shows the proportion of fluctuations in the current account, output, real exchange rate, inflation, money supply, and interest rate attributable to exchange rate shocks at horizons of 0, 4, 8 and 12 quarters.

Exchange rate shocks account for between 0.6% and 10% of the change in the current account and between 16% and 23% of the change in real output. After the real exchange rate variable, exchange rate shocks are the most important factors of output and account for over 18% of the variance of output.

In summary, two key conclusions can be drawn:

1.In times of real depreciation, whether output increases or not has little to do with the improvement in the current account.

2.Morocco is fairly homogeneous in that the current account generally improves while output declines, which is consistent with the uniform negative correlations between the real exchange rate and output with negative lags.

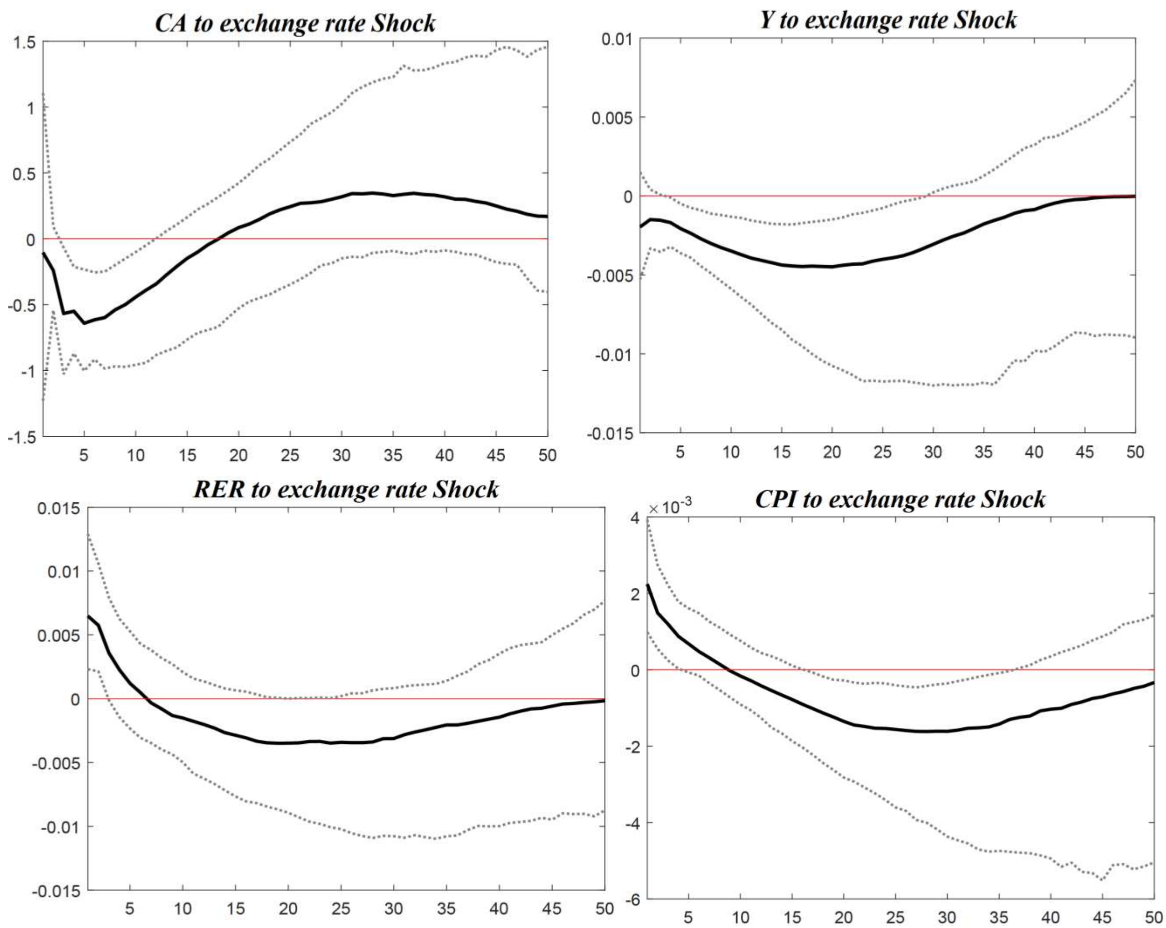
5. Robustness Check: Estimation of Alternative Models

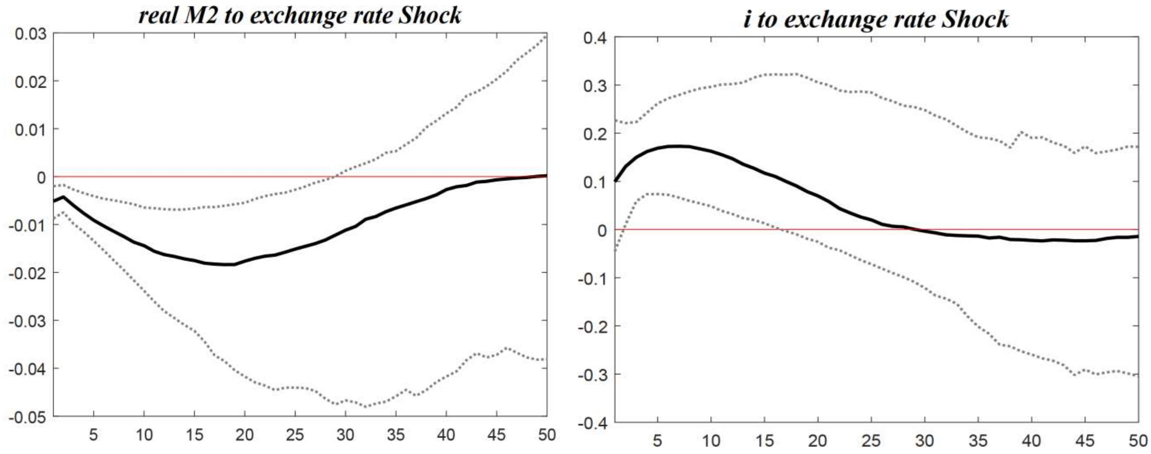
Empirical results often depend on modeling assumptions and variable definitions. Thus, in this section, we estimate different VAR model specifications and also use other variable definitions to assess the robustness of our results.

5.1. Alternative Measurement of the Exchange Rate

We test the sensitivity of the results by using the variable of the bilateral real exchange rate of the dirham vis-à-vis the euro zone instead of the real effective exchange rate.

Figure 1. Impulse responses of different interest variables to an exchange rate shock.





The Moroccan economy is heavily dependent on European Union (EU) countries for its exports, tourism revenues, remittances, and FDI flows. In addition, the economic proximity of the country with Europe explains the sensitivity of Morocco to various exogenous shocks. This makes Morocco potentially vulnerable to fluctuations in EU growth, and in particular to the unprecedented recession recently experienced by EU economies. Similarly, according to the IMF, the trade balance has been structurally in deficit over the period 1990–2017. Further, Morocco's productive base remains relatively weak relative to its full potential and the country remains partly vulnerable to exogenous macroeconomic shocks.

The crucial point here, in the extended model, when using the bilateral real exchange rate, is that the depreciation only has an effect in the long run (almost 17 quarters compared to the basic model in which the current account adjustment does not exceed eight quarters). Thus, the trade balance has evolved in the form of "J." It is evident that it is preferable to choose to study the effective exchange rate instead of using the bilateral exchange rate. In this context, the effective exchange rate provides a better indicator of the macroeconomic effects of exchange rates than bilateral rate. This is because the real effective exchange rate is adjusted for some measures of relative prices or costs; changes in the real effective exchange rate therefore take into account both changes in the nominal exchange rate and the inflation differential vis-à-vis trading partners. In both monetary policy and market analysis, the advantage is that it serves a variety of purposes: as a measure of international competitiveness; as a component of monetary and financial conditions indices; as an indicator of the transmission of external shocks; and as an intermediate objective of monetary policy. For the other variables of interest, the results are similar to those of the basic model (see Figure 3).

Conclusion

In this article, the effects of real exchange rate changes on real output have been analyzed by using quarterly data from 1995Q1 to 2019Q1. This is the first time such a study has been undertaken on the depreciation of the Moroccan dirham, and we have presented empirical results obtained using a VAR model with sign restrictions. We have established this type of model for a small subset of variables allowing the identification of the exchange rate shock. It important to note that the current account exhibits the phenomenon known as the "J-curve," *i.e.* in response to the exchange rate depreciation, the current account initially deteriorates marginally (statistically) significant, then improves and finally reaches long-term equilibrium (Bahmani-Oskooee and Ratha, 2004; Bahmani-Oskooee and Hegerty, 2010; Bahmani Oskooee et al., 2013). Overall, our results show that there has been a deep recession and high inflation in the Moroccan economy following the depreciation of the dirham. Our results suggest that the monetary authorities reacted immediately to the exchange rate shocks by raising their interest rate. However, these measures appear to have had a limited impact on mitigating the deflationary effects. The challenge for the monetary authorities is therefore to act preventively in order to prevent the economy from falling into deflation. In summary, two key conclusions emerge: in times of real depreciation, whether output increases or not has little to do with the improvement in the current account; and Morocco is fairly homogeneous in that the current account balance generally improves while output declines, which is consistent with the consistent negative correlations between the real exchange rate and output with negative lags.

References

[1] Armington, P. S. 1969. A Theory of Demand for Products Distinguished by Place of Production (Une Théorie de La Demande de Produits Différenciés d'après Leur Origine) (Una Teoría de La Demanda de Productos Distinguiéndolos Según El Lugar de Producción). *Staff Papers (International Monetary Fund),* 16(1): 159–78. DOI: https://doi.org/10.2307/3866403

[2] Bahmani-Oskooee, Mohsen, and Abera Gelan. 2013. Are Devaluations Contractionary in Africa?" *Global Economic Review,* 42(1): 1–14. DOI: https://doi.org/10.1080/1226508X.2013.769798

[3] Bahmani-Oskooee, Mohsen, and Artatrana Ratha. 2004. The J-Curve: A Literature Review. *Applied Economics,* 36(13): 1377–98. DOI: https://doi.org/10.1080/0003684042000201794

[4] Bahmani-Oskooee, Mohsen, and Kandil, M. 2009. Are Devaluations Contractionary in MENA Countries? *Applied Economics,* 41(2): 139–50. DOI: https://doi.org/10.1080/00036840600994195

[5] Bjørnland, H.C., and Halvorsen, J. I. 2014. How Does Monetary Policy Respond to Exchange Rate Movements? New International Evidence*. *Oxford Bulletin of Economics and Statistics,* 76(2): 208–32. DOI: https://doi.org/10.1111/obes.12014

[6] Blanchard, O.J., and Quah, D. 1989. The Dynamic Effects of Aggregate Demand and Supply Disturbances. *The American Economic Review,* 79(4): 655–73. DOI: http://www.jstor.org/stable/1827924

[7] Boyer, R. S. 1978. Optimal Foreign Exchange Market Intervention. *Journal of Political Economy,* 86(6): 1045-1055. DOI: https://www.journals.uchicago.edu/doi/abs/10.1086/260727

[8] Canova, F., and Pires Pina, J. 2000. Monetary Policy Misspecification in VAR Models. SSRN Scholarly Paper. Rochester, NY: Social Science Research Network, August 9, 2000. DOI:https://doi.org/10.2139/ssrn.224529

[9] Cooper, R.N. 1969. Currency Devaluation in Developing Countries: A Cross- Sectional Assessment. *Discussion Papers*, July 1, 1969. Available at: https://elischolar.library.yale.edu/egcenter-discussion-paper-series/80

[10] Díaz, A.C.F. 1963. A Note on the Impact of Devaluation and the Redistributive Effect. *Journal of Political Economy,* 71(6): 577–80. DOI: http://www.jstor.org/stable/1828441

[11] Faust, J., and Leeper, E. M. 1997. When Do Long-Run Identifying Restrictions Give Reliable Results? *Journal of Business & Economic Statistics,* 15(3): 345–53. DOI: https://doi.org/10.2307/1392338

[12] Frankel, J. A. 2005. Mundell-Fleming Lecture: Contractionary Currency Crashes in Developing Countries in: IMF Staff .Papers Volume 2005 Issue 002. Available at: https://www.elibrary.imf.org/view/journals/024/2005/002/article-A001-en.xml

[13] Fry, R., and Pagan, A. 2011. Sign Restrictions in Structural Vector Autoregressions: A Critical Review. *Journal of Economic Literature,* 49(4): 938–60. DOI: http://www.jstor.org/stable/23071662

[14] Granville, B., and Mallick, S. 2010. Monetary Policy in Russia: Identifying Exchange Rate Shocks. *Economic Modelling,* 27(1): 432–44. DOI: https://doi.org/10.1016/j.econmod.2009.10.010

[15] Gylfason, T., and Schmid, M. 1983. Does Devaluation Cause Stagflation? *The Canadian Journal of Economics / Revue Canadienne d'Economique,* 16(4): 641–54. DOI: https://doi.org/10.2307/135045

[16] Kamin, S. B., and Rogers, J. H. 2000. Output and the Real Exchange Rate in Developing Countries: An Application to Mexico. *Journal of Development Economics,* 61(1): 85–109. Available at: https://econpapers.repec.org/article/eeedeveco/v_3a61_3ay_3a2000_3ai_3a1_3ap_3a85-109.htm

[17] Kandil, M. 2015. The Adverse Effects of Real Exchange Rate Variability in Latin America and the Caribbean. *Journal of Applied Economics,* 18(1): 99–120. DOI: https://doi.org/10.1016/S1514-0326(15)30005-2

[18] Karahan, Ö. 2020. Influence of Exchange Rate on the Economic Growth in the Turkish Economy. *Financial Assets and Investing*, 11(1): 21–34. DOI: https://doi.org/10.5817/FAI2020-1-2

[19] Kim, Y., and Yung Hsiang Ying. 2007. An Empirical Assessment of Currency Devaluation in East Asian Countries. *Journal of International Money and Finance,* 26(2): 265–83. DOI:https://doi.org/10.1016/j.jimonfin.2006.11.004

[20] Krugman, P., and Taylor, L. 1978. Contractionary Effects of Devaluation. *Journal of International Economics*, 8(3): 445–56. DOI: https://doi.org/10.1016/0022-1996(78)90007-7

[21] Krugman, P.R, Obstfeld, M. and Melitz, M.J. 2018. *International Economics: Theory & Policy*, 2018. Available at: https://www.pearson.com/us/higher-education/program/Krugman-International-Economics-Theory-and-Policy-RENTAL-EDITION-11th-Edition/PGM1838559.html

[22] Lian, A., Gil Kim, and Xiaomei Ren. 2014. Is Devaluation Expansionary or Contractionary: Evidence Based on Vector Autoregression with Sign Restrictions. *Journal of Asian Economics,* 34: 27–41. DOI:https://doi.org/10.1016/j.asieco.2014.03.003

[23] Lizondo, J. S., and Montiel, P. J. 1989. Contractionary Devaluation in Developing Countries: An Analytical Overview. *Staff Papers (International Monetary Fund)*, 36(1): 182–227. DOI:https://doi.org/10.2307/3867174

[24] Mejía-Reyes, P., Osborn, D. R. and Sensier, M. 2010. Modelling Real Exchange Rate Effects on Output Performance in Latin America. *Applied Economics,* 42(19): 2491–2503. DOI:https://doi.org/10.1080/00036840701858117

[25] Mohsin S. K. and Choudhri, E. U. 2004. Real Exchange Rates In Developing Countries: Are Balassa-Samuelson Effects Present? *IMF Working Papers,* 2004(188). Available at: https://www.elibrary.imf.org/view/journals/001/2004/188/001.2004.issue-188-en.xml

[26] Mountford, A., and Uhlig, H. 2009. What Are the Effects of Fiscal Policy Shocks? *Journal of Applied Econometrics,* 24(6): 960–92. DOI: https://doi.org/10.1002/jae.1079

[27] Mundell, R. A. 1963. Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates. *The Canadian Journal of Economics and Political Science / Revue Canadienne d'Economique et de Science Politique* 29(4): 475–85. DOI: https://doi.org/10.2307/139336

[28] Peersman, G. 2005. What Caused the Early Millennium Slowdown? Evidence Based on Vector Autoregressions. *Journal of Applied Econometrics,* 20(2): 185-207. DOI: https://doi.org/10.1002/jae.832

[29] Rafiq, M. S., and Mallick, S. K. 2008. The Effect of Monetary Policy on Output in EMU3: A Sign Restriction Approach. *Journal of Macroeconomics* 30(4): 1756–91. DOI: https://doi.org/10.1016/j.jmacro.2007.12.003

[30] Rudebusch, G. D. 1998. Do Measures of Monetary Policy in a Var Make Sense? *International Economic Review* 39(4): 907–31. DOI: https://doi.org/10.2307/2527344

[31] Shaghil, A. *et* al. 2002. Are Depreciations as Contractionary as Devaluations? A Comparison of Selected Emerging and Industrial Economies. SSRN Scholarly Paper. Rochester, NY: Social Science Research Network, September 1, 2002. DOI: https://doi.org/10.2139/ssrn.333403

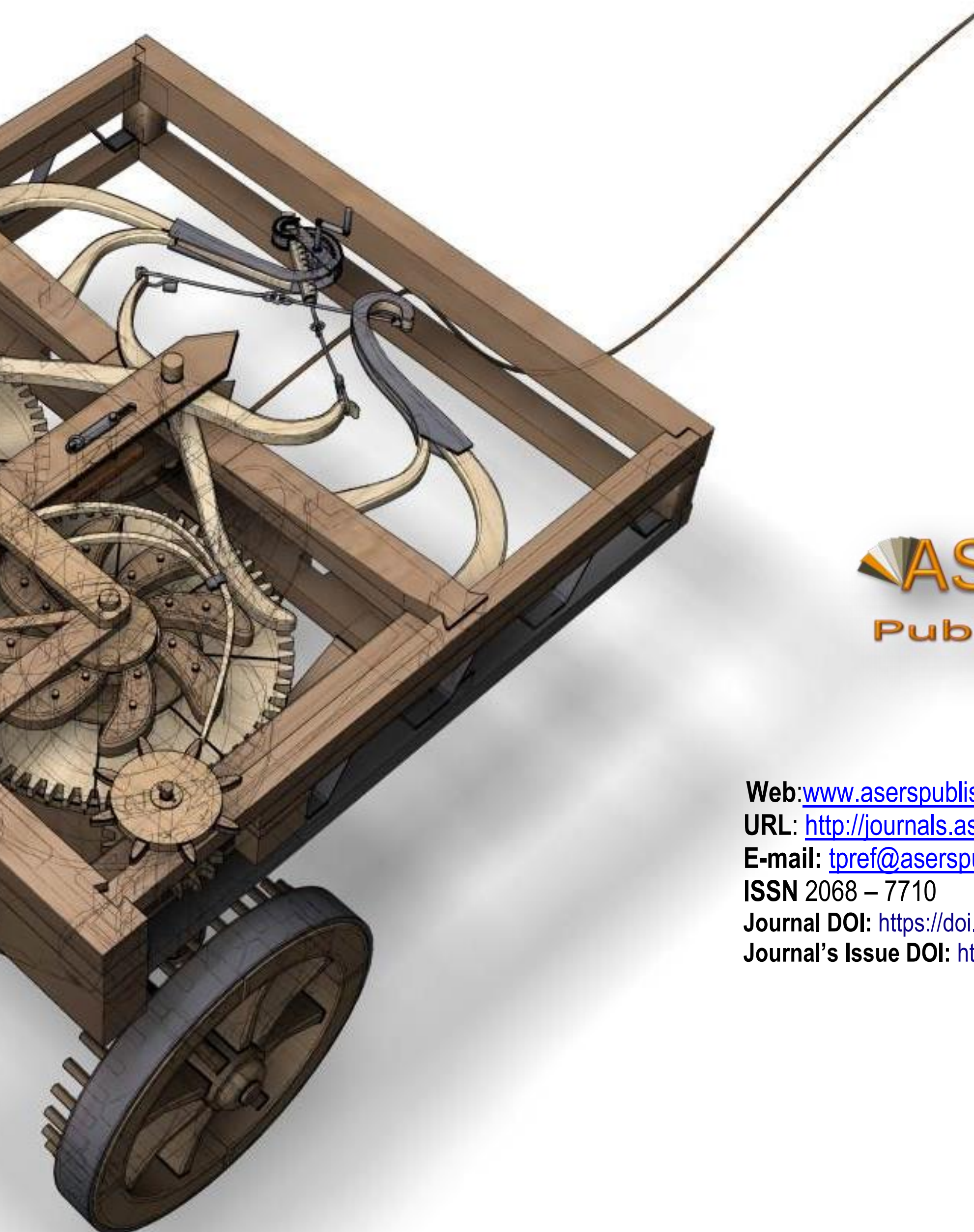
[32] Sims, C.A. 1988. Bayesian Skepticism on Unit Root Econometrics. *Journal of Economic Dynamics and Control,* 12(2): 463–74. DOI: https://doi.org/10.1016/0165-1889(88)90050-4

[33] Svensson, Torsten. 2000. Reviews. *Economic and Industrial Democracy* 21(2): 269–71. DOI:https://doi.org/10.1177/0143831X00212009

[34] Turner, P., and Van 't Dack, J. 1993. Measuring International Price and Cost Competitiveness. BIS Economic Papers, 39. DOI: https://www.bis.org/publ/econ39.htm

[35] Uhlig, H. 2005. What Are the Effects of Monetary Policy on Output? Results from an Agnostic Identification Procedure. *Journal of Monetary Economics,* 52(2): 381–419. DOI:https://doi.org/10.1016/j.jmoneco.2004.05.007

ASERS



ASERS
Publishing

Web:www.aserspublishing.eu
URL: http://journals.aserspublishing.eu/tpref
E-mail: tpref@aserspublishing.eu
ISSN 2068 – 7710
Journal DOI: https://doi.org/10.14505/tpref
Journal's Issue DOI: https://doi.org/10.14505/tpref.v12.2(24).00