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Original Paper

Optimality of Morocco's Currency Basket

AZZOUZI Asmae[1*] & BOUSSELHAMI Ahmed[1]

[1] Economics and Social Sciences of Tangier, Research Group on Economics, Finance and Development (EFED), Abdelmalek Essaâdi University, Morocco

[*] AZZOUZI Asmae, Research Group on Economics, Finance and Development (EFED), Abdelmalek Essaâdi University, Morocco

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Abstract

The objective of this article is to analyze the behavior of the monetary authorities of Morocco in the readjustment of the official weights of anchor currencies in Dirham basket on April 13, 2015. To do this, we are taking into account the objective of the external financing constraints for comparing, with different scenarios, the optimal weights with the implicit weights of the currencies. Such a comparison proves that the authorities take more into consideration the structure of the commercial exchanges than that of the debt for the choice of the optimal weight of the anchor currency. In the final part of the paper, we have delved deeper into this issue by estimating the price and income elasticities of Morocco's external trade in light of the disaggregated data by sectors. Our intention is to find out which foreign currency seems more volatile against the local currency in order to lead the economy to manage the stability of dirham by increasing its weight in the basket. As a result, the higher price elasticity of the Dollar against the dirham encourages monetary authorities to increase its weight in the basket.

Keywords

Currency weights, dollar, optimal weight, activity sector, price elasticity

1. Introduction

Pegging the Moroccan dirham to a basket of currencies of its major trading and financial partners has provided a useful nominal anchor to the economy. The International Monetary Fund's (IMF) staff and the authorities, however, agree that a more flexible exchange rate regime aims at the enhancement of the current diversification of trade and financial flows. It also seeks to increase the perception that the country's competitiveness is strengthening and the economy is resilient in the face of exogenous shocks.

Our study analyses and shows the reasons for the change executed by the monetary authorities on the currency basket of Moroccan dirham that occurred on 13 April 2015. The last similar revision of this basket of currencies dates back to 2001 following the advent of the euro, which led to a profound change in the exchange rate policy of Morocco. This change was justified primarily by the automatic component of the dirham exchange rate adjustment: its shift according to the inflation differential between Morocco and its partners has been abandoned. Additionally, domestic inflation stabilized at a level comparable to that of developed economies. Lastly, by the substitution of European national currencies by the euro, the Dirham has become anchored to the euro, the dollar, and the Euro/Dollar parity, which determines the value of the dirham as well as its quotation in relation to other international currencies.

The new currency weightings are now set at 60% for the euro against 40% for the dollar. Previously weightings were set against the euro and dollar 80% and 20% respectively. The updating of the weightings of the basket has no impact on the value of the dirham, which is in line with the fundamentals of the Moroccan economy, this takes into account the significant improvement in the current account and foreign exchange reserves, as evidenced by the IMF's Article IV for 2014. This update also remains dependent on the fluctuations of each currency basket.

In the emerging economies, however, capital markets are not as deep and liquid as those in developed markets. This can be explained by the monetary authorities' interventions each time they are needed. Moreover, they are often unable to borrow abroad in their own currency and have to resort to third currencies such as the euro and the dollar in most cases (Note 1). In this respect, anchoring to a composite basket of currencies preserves a certain flexibility of the exchange rate in the presence of the intervention of the authorities, especially in the case of countries that are sensitive to shocks of a real and nominal nature, for example, a variation terms of trade. This leads us to note that adopting a more flexible exchange rate regime, whether it is floating (the case of Tunisia) or crawling peg (Morocco), allows arbitration between nominal stability and maintaining competitiveness while limiting the risk of speculative attacks in a gradual process of financial liberalization (Levy-Yeyati & Sturzenegger, 2005; Genberg & Swoboda, 2005). In addition, the adoption of such a regime of exchange rate based on a basket of currencies may cause the risk of discordance between the debt denominated in foreign currencies and the distribution of trading partners (Benassy-Quere, 1999). Indeed, a depreciation of the domestic currency increases the value of the debt, then increases the default risk of debtors and weakens the banking system, this mechanism is well known in the literature as the "Balance sheet effect". Hence a subtle arbitration between the objective of maintaining competitiveness and the stabilization of the external debt burden; As such, anchoring to a trade-weighted basket remains the best way if the debt is denominated in the currency of the trading partners. Morocco finds itself in this present financial situation. Hence, the geographical distribution seems to coincide with the currency breakdown of external debt.

The geographical distribution of Moroccan trade with the outside world shows that the exchange transactions invoiced in dollars has improved in recent years. This improvement has been of around 32%, while they are almost 62.4% with the euro area according to the data provided by Moroccan exchange office. In addition, Moroccan debt is denominated 61.24% in euros, 20.89% in US dollars and 17.87% in the other currencies according to Bank Al-Maghrib.

This balance shows that anchoring on a basket composed of two strong currencies such as the euro and the dollar can then be optimal if we take into consideration both the objective of competitiveness and the debt burden.

Therefore, we will start with the question, how can we know if Moroccan authorities take into account the dual objective of external competitiveness and the constraint of debt's denomination currency in the readjustment of the dirham's basket? Or more specifically: which one of these dual objectives the policy-takers are based on more accurately? In other words, we want to know exactly which of these objectives was sought in this switchover. Our goal is to contribute to better understanding of such a decision of the authorities.

The structure of this article is as follows:

Section II is used to determine the best currency or currencies that well suited to the dirham's anchoring strategy as reference currency (ies) over the period 1973 to 2014. Section III gives the point of view of the normative economy; this section is used to analyze the real anchoring strategy. This is understood as the currency or the currencies against which Moroccan authorities should try to stabilize their exchange rate by calibrating a simple model based on both trade relations and its external debt. Section IV is used to investigate possible asymmetries in the reactions of real exports/imports to changes in relative export/import price or real exchange rate and foreign/domestic economic activity, after disaggregating Moroccan trade flows by sectors using quarterly data for the period 1999:1 to 2014:4. This part of the study is done by estimating the price and income elasticities of the different exporting/importing sectors in relation to the euro-zone and the rest of the world, and is based on the Marshall-Lerner condition and the J-curve Phenomenon to find out how the monetary authorities can manage their currency to boost the trade balance. This is done by studying the price estimates of different sectors to realize which is the currency or the most volatile currency (with high price-elasticity), which requires intervention of the central bank of Morocco (Bank Al-Maghrib) to maximize its weight attached in the basket in order to stabilize its volatility. Conclusion section sums up the results.

2. Nominal Anchorage of the Dirham

Before May 13, 1973, the first Moroccan exchange rate was attached to a key currency that was the French Franc (FF). Later, the dirham became attached to a basket of currencies best reflecting the structure of Moroccan foreign trade with the outside world. Aqllal (1988) pointed out:

It was a question of stabilizing the corresponding variations of the dirham, and thus of avoiding the vague disturbances suffered by the FF to which it was attached. Indeed, the dirham is attached to each of the currencies in the basket, which is based on a weighting coefficient corresponding to it (The Moroccan Balance of Payments, Printing press Fédala).

It was only after the advent of the euro that the central bank announced the rule of intervention. One of the measures was setting objectives for the exchange rate with the intention of it reaching the weight given to the currencies reference in the basket. Since the collapse of the Bretton Woods system in the early 1970s and the adoption of the second amendment to the IMF's Articles of Agreement, countries have been free to adopt the exchange rate regime, which is best suited to their needs based on their own criteria.

Exchange rate crises, which have affected the emerging countries (Mexico in 1994; Thailand, Indonesia and South Korea in 1997; Russia and Brazil in 1998; Argentina in 2000; Turkey in 2001; Argentina in 2002) contain a common characteristic. This can be explained by the fact that they have chosen nominal anchoring strategies that can be assimilated to an intermediate exchange rate regime. This gives monetary policy greater autonomy in comparison with fixed exchange systems. This succession of crises has come together with the consensus that intermediate exchange rate regimes are intrinsically fragile and cannot constitute a credible policy. This new consensus is based on the recognition of corner solutions. That means that the choice is between the two extreme regimes (fixed and floating) as the only sustainable solutions in the new international monetary environment marked by the increasing mobility of capital.

Emerging countries are preparing to integrate more and more international capital markets, as is the case in Morocco. As a result, these countries are confronted, not with the choice of one of the two solutions in corners; but rather with the choice of the degree of rigidity or floating of the exchange rate.

The official nominal exchange rate remains the main measure on which the IMF relies to identify exchange rate regimes to which other variables such as foreign exchange reserves or interest rates are attached as emphasized by Reinhart and Rogoff (2004). The IMF classification is known as the official classification or de jure classification. In the theoretical and empirical economic literature, the inconsistencies between the regimes declared by the countries and those they actually pursue have led to the development of new categorizations based on countries' exchange practices. This is called the de facto regime. This type of classification of exchange rate regimes is known by the most famous authors as Reinhart and Rogoff (2004), Ghosh, Jonathan and Qureshi (2010). Misidentification can complicate the IMF's monitoring of exchange rate policies by reducing the transparency of member countries policies according to the study of Bubula and Ötker-Robe (2002).

We have decided that it would be useful to compare the actual exchange rate policy followed by Moroccan authorities and the one they should follow during the period 1973 to 2014. We will present the assessment of exchange rate systems based on these two basic approaches, the first one focuses on the official classification of the regimes declared by the IMF (de jure behavior) while the second approach is based on the regimes effectively pursued (de facto behavior). In this framework, with the help of a cluster analysis, the annual report on the exchange rate regimes and restrictions (AREAER) of 2014, under article XIV of section 3, the main purpose of which is the action of the Restriction Fund, did not provide information regarding the exchange rate policies actually or effectively followed. But this does not prevent to assess between the policies by using descriptive statistics according to Reinhart and Rogoff in their classification of exchange rate regimes in 2004. Then, when the official system corresponds to what a country's government actually does in regard to its exchange rate system, the exchange system is known as de jure. If they differ, the exchange rate system is known as de facto classified based on the volatility of the nominal exchange rate.

To determine de facto behavior, the countries choosing intermediate solutions propose the creation of objective-zones, the establishment of a quasi-fixed parity regime between major currencies. In the current situation, we are trying to find the main currency area filling the usual criterion of an optimal currency area. For this purpose, the Optimum Currency Area theory (OCA) was developed in 1961 by the Canadian economist Robert Mundell, sought to determine the currency or currencies best suited for an anchoring strategy to determine de facto behavior. In the same context, the reference currency used to calculate the nominal exchange rate is the official currency of reference declared by countries with a fixed or quasi-fixed exchange rate system.

For Levy-Yeyatii and Sturzenegger (2002), countries that do not reveal their anchor currency retain the currency against which the national currency has the lowest volatility. In order to compare these currencies we began by computing the volatility. Volatility is measured by the standard deviation of the monthly changes in the logarithm of the exchange rate. Volatility, calculated in relation to each referenced currency "i", is noted "σ_i". The main reference currencies are the dollar, the yen and the deutsche mark that was being considered as the representative core of the European Monetary System "SME" before the advent of euro in 1999.

The relative volatility of the exchange rate against the currency "i" is calculated by relating the volatility to total volatility in relation to the three currencies: $\lambda_i = \frac{\sigma_i}{(\sigma_\$ + \sigma_y + \sigma_{DM})}$ (according to Benassy, 1995). In order to determine whether a currency belongs to a monetary zone (dollar, yen or mark/euro), it is sufficient to check if λ_i<0.25. If none λ_i is less than 0.25 (or 25%), we conclude that there is no nominal anchor in any of the three specified currencies.

Obviously, the study of the exchange rate is in variations and not in level because it makes it possible to consider some sliding exchange rate regimes like nominal anchoring regimes on a currency or a basket.

The study covers the period 1973-2014. This period is divided into five sub-periods according to the major elements of Moroccan economy. Exchange rates are monthly averages taken from Bank-AL-Maghreb statistics.

-The first period from 1973-1979 is characterized by the connection of the dirham to a basket of currencies by Moroccan authorities. This period was characterized by the appearance and acceleration of current account deficits.

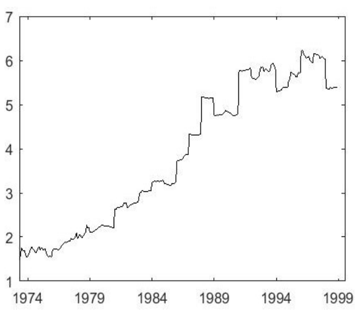
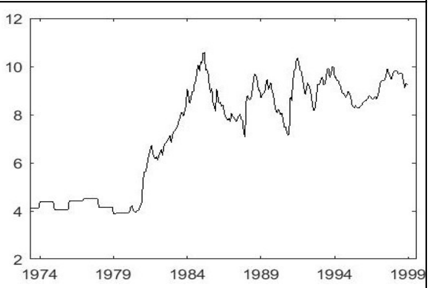
-The second period from 1980-1993 is characterized by the establishment of the structural adjustment program in (1983-1992) and the devaluation of the dirham of 16.4% (1983-1985) and 9.3% in 1990 in the goal of maintaining the competitiveness of Moroccan exports. Whereas 1993 was marked by the emergence of the convertibility of current balance of payments transactions within the meaning of Article 8 of the IMF's Articles of Agreement.

-The third period from 1994-1998 is characterized by the creation of the foreign exchange market open to banks from 1996 (Note 2). The same date also corresponds to the transition from the exchange rate regime to a band of fluctuation around a central parity against a basket of currencies.

-The fourth period from 1999-2007 is characterized by the change in the composition of the anchor basket by the advent of the euro as well as by the gradual and accelerated liberalization of the exchange rate system from 2005.

-The fifth period from 2008-2014 started with the period of economic and financial crisis until 2010. Then, from 2010 up to now, the international economic integration process has speeded up in Morocco, leading to an improvement in the competitive environment.

Before proceeding to the results, we presented below the evolution of the dirham with respect to the various specified currencies. Through these graphs, we can see that the advent of the euro is considered a mechanism for exchange stabilization for the dirham against the Deutsch mark, which was very volatile in the first period. From 1999 to early 2001, the overview of the history of the euro shows that the dirham depreciates (appreciates) in nominal value against the euro (dollar). The euro destabilizes rapidly against the dirham.

<table>
<tr><td colspan="2">Historical evolution of currencies</td></tr>
<tr><td>«DEM»</td><td>«Dollar»</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>«Yen»</td><td>«Yen»</td></tr>
</table>

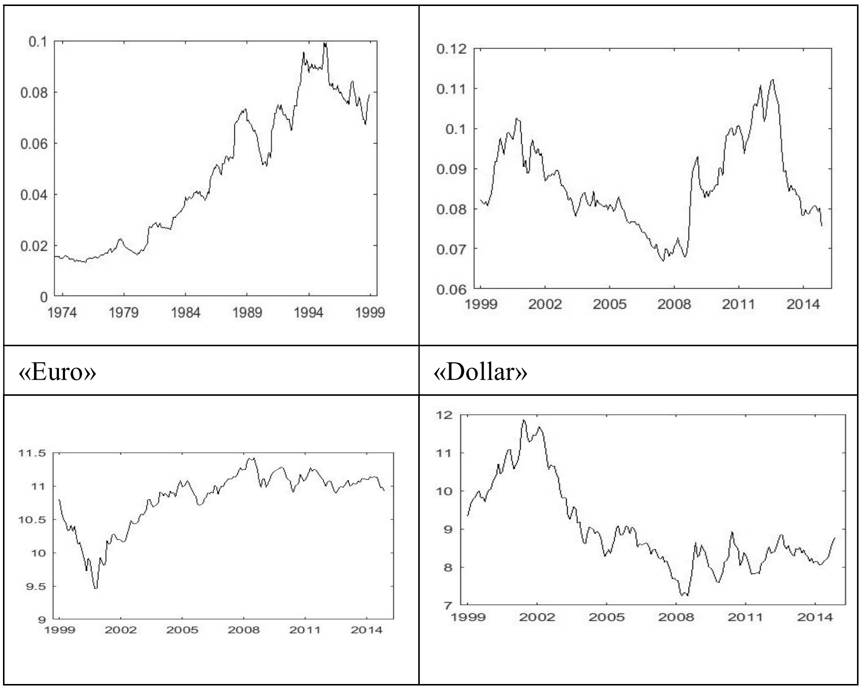


Figure 1. Evolution of the Main Currencies

Table 5 in appendices shows that during the five sub-periods mentioned before the Moroccan dirham has low volatility relative to dollar. The volatility against dollar is close to 25% except for the period 1999-2006 when it becomes higher. This is explained by the strong appreciation that the dollar experienced during the entry of the euro of 1999 until early 2004 from early 2005 to early 2006 (see historical graph above). This appreciation would have reduced US exports. The beneficial effect of this incident was to encourage the promotion of Moroccan exports invoiced in dollar. Regarding the volatility compared to the DEM is close to 25% during the period 1994-1998 and not for other periods. This could be explained by the appreciation of the Deutsche Mark "DEM" against the weak currencies of the exchange rate mechanism, including Moroccan dirham. Furthermore, volatility of dirham remains very low against euro. In this case, we can say that the dirham belongs to a euro area. We can also notice the high volatility of the dirham compared to the Yen. To conclude, during 1999-2006, dirham belongs only to euro monetary zone due to the strong appreciation that dollar experienced during the advent of the euro of 1999 to early 2006. It was only span a period of 2006 to 2014, dirham belongs to both euro and dollar monetary zones.

The calculation of volatility against the potential anchor currencies in this section has allowed us to describe the effectiveness of the Moroccan exchange rate regime. The latter is also generally measured by the estimation of the weighting of the different currencies comprising the dirham anchor basket in case in which the management of the central bank is discretionary. The second axis of this paper allows us to calculate the optimal weight of the anchor basket currencies by integrating the external financing constraint. The comparison of the optimal weights with the re-weighting allows us to find out which objective is integrated by Bank-Al Maghreb while the re-adjustment of the basket.

3. Real Anchorage of the Dirham

François Perroux (1903-1987) found that "The act of integrating gathers elements to form a whole, or it increases the consistency of a whole already existing" (The economics of the twentieth century). A regional currency union is seen as a way of reconciling the need for a degree of flexibility and the need for a stable monetary environment. The regional integration process makes it possible to have both irrevocably fixed exchange rates between highly integrated partner countries, and a certain flexibility vis-à-vis the currencies of the rest of the world.

According to Williamson (1999) in his study on nine East Asian emerging economies, the adoption of a common basket peg ensures intra-regional exchange rate stability while allowing some flexibility against the dollar, the yen and the euro. The results are surprisingly similar to those of the economies that have made separate in an optimal anchor basket defined according to their commercial structure.

For Benassy (2000), the anchor to a common basket (dollar-euro-yen) are the weights attributed to each key currency differ from one country to another. However, the most important is that the main currencies are present while the basket is the same for all member countries of the same region. In this case, intra-regional exchange rates are automatically stabilized at least in the short term, and concerted realignments are possible in case of shocks. Taking into consideration the case of Morocco and Tunisia, using a common basket (euro-dollar) shares many characteristics stabilizes the exchange rate between the two countries (intra-regional) without needing mutual consultation.

Emerging countries are faced with financial constraints that lead them to focus on external intermediate objectives. This leads us to analyze the strategy of optimal real anchoring that means the currency or the currencies on which they should attempt to stabilize their real exchange rate, based on a model that considers the behavior of two identical countries since we assume that Morocco takes into account the exchange rate evolution of competing countries like Tunisia.

3.1 Exchange Rate Theory and the External Constraint

An intermediate regime in emerging economies allows monetary authorities to counteract erratic exchange rate fluctuations that may undermine the competitiveness of exporting firms or increase the burden of foreign currency debt. Some theories on equilibrium real exchange rates help to establish the link between the real exchange rate and a broad set of economic fundamentals, the precursors of such theories are Nurkse (1944) Edwards (1988), Williamson (1983, 1994) and Stein (1995). For Williamson, in the medium-term, the economy is should be in full employment and maintaining a stable price (internal balance) while the current account balance corresponds to sustainable financing flows (external equilibrium). This mechanism of adjustment between the internal and the external equilibrium is meant to restore and maintain equilibrium at the national level. In that way, we could say that Williamson's theory is both descriptive since it aims at predicting the equilibrium level at the medium-term and normative when it determines the equilibrium real exchange rate level.

In fact, these theories seem more likely to explain the misalignment of the equilibrium real exchange rate of countries that have suffered significant exogenous shocks especially in the case of emerging economies. This misalignment is measured by adjusting the nominal exchange rate for the cumulative difference between domestic and foreign inflation.

Among the fundamentals of the economy is the public external debt. Indeed, researchers are often interested in debt sustainability for developing countries. In the literature, the concept of sustainability has been analyzed in two parts. The first emphasizes fiscal sustainability as a budget balance that is consistent with a stable public-debt-to-GDP ratio as has been shown (Krugman, 1989), Sachs (1988), Husain (1997), Ricci and alii (2002), Eggertsson (2010), Leeper et al. (2010a), Challe et Ragot (2011). Whereas the second, is concerned with the sustainability of the current account, which is understood as a situation where the balance of the current account is compatible with a situation of solvency. In fact, the distinction between the two sides of literature is not the subject of our study. Therefore, we will focus only on the second part addressing the sustainability of the current account.

As we have already seen, normative work relating to the real exchange rate is usually based on the Fundamental Equilibrium Exchange Rate (FEER). Indeed, the external equilibrium indicates the combinations of the real exchange rate and the activity for which the current account reaches its equilibrium level. According to Marshall-Lerner's condition, a real depreciation of the currency causes a surplus in the current account balance if the absolute sum of the long-term export and import demand elasticities is greater than unity. In the opposite direction, the depreciation of national currency increases the cost of servicing of foreign currency-denominated debt. In the last two decades, we noticed that foreign currency debt has increased in several major emerging market economies.

In the case where the geographical structure of trade flows corresponds to the external-debt composition. Anchoring on a weighted basket of trade remains the best way of focusing on external intermediate objectives, since competitiveness and debt service will remain stable. This is particularly the case of the Moroccan economy as shown in the graphs in the appendix. In addition, the balance between the distribution of trade and the currencies of debt denomination leads us to say that the anchoring of the Moroccan dirham on a "euro-dollar" basket constitutes a good strategy for the authorities if they seek both the stabilization of external competitiveness and that of the price of the debt.

3.2 The Optimum Currency Weights

3.2.1 The Model

Assume that the monetary authorities in the two Maghreb countries of Morocco (M) and Tunisia (T) that are identical in terms of their objectives and the structure of their trade and debt (k=M, T) sought to minimize adverse effects of the real effective exchange rate volatility by taking into account both external competitiveness and debt service. This is done well through a combination of (c_k) and (f_k), which are two real effective exchange rates that are based on different weights (these two aspects are expressed in logarithmic form), in the following combination:

$$MinL_k = 1/2\left(c^2{}_k + \beta f^2{}_k\right)\left(k = M,T\right) and \beta \succ 0 \quad (1)$$

Where c_k is a real effective exchange rate based on trade weightings while f_k is a real effective exchange rate based on the distribution of debt by foreign currencies. This loss function can be derived from a function in terms of trade balance (which depends on c_k) and the weight of external debt (which depends on f_k). Always in the loss function, β determines the weight of f_k relative to c_k. It is assumed that each country controls its bilateral exchange rate against the U.S. dollar, denoted $e_{k\$}$ expressed in logarithm. Then we try to determine to what extent it would be optimal to modify $e_{k\$}$ when the euro varies with respect to the dollar.

Consider that « a_j » is the weight of country "j" as a trading partner, « b_j » the weight of the currency of country j-denominated debt. To simplify, we apply the same indices to countries and currencies: ($) refers to the dollar and the United States, (E) are to the Euro and the euro zone. The real effective exchange rates c_k and f_k can be written as follows:

$$\begin{aligned} c_M &= a_\$ e_{M\$} + a_E e_{ME} + \left(1 - a_\$ - a_E\right) e_{MT} \\ f_M &= b_\$ e_{M\$} + b_E e_{ME} + \left(1 - b_\$ - b_E\right) e_{MT} \end{aligned} \quad (2), (3)$$

Where e_{Mj} is the logarithm of bilateral real exchange rate of country (M) facing (j) (j=$, E, T).

Knowing that $e_{kj} = e_{k\$} - e_{j\$}$, we have:

$$e_{MT} = e_{M\$} - e_{T\$}$$
$$e_{ME} = e_{M\$} - e_{E\$}$$

We can rewrite the previous system of equations as follows:

$$c_M = a_\$ e_{M\$} + a_E \left(e_{M\$} - e_{E\$}\right) + \left(1 - a_\$ - a_E\right)\left(e_{M\$} - e_{T\$}\right)$$
$$f_M = b_\$ e_{M\$} + b_E \left(e_{M\$} - e_{E\$}\right) + \left(1 - b_\$ - b_E\right)\left(e_{M\$} - e_{T\$}\right) \Leftrightarrow$$

$$c_M = e_{M\$} - a_E e_{E\$} - \left(1 - a_\$ - a_E\right) e_{T\$} \quad (4)$$

$$f_M = e_{M\$} - b_E e_{E\$} - \left(1 - b_\$ - b_E\right) e_{T\$} \quad (5)$$

We get similar relations for country T. In case each country minimizes its loss function without taking into account the reaction of its partner (Note 3), the Nash equilibrium is obtained as follows:
By replacing these two expressions in the loss function, we obtain:

$$L_M = 1/2\left(c^2{}_M + \beta f^2{}_M\right)$$

$$L_M = 1/2\left\{\left[e_{M\$} - a_E e_{E\$} - \left(1 - a_\$ - a_E\right) e_{T\$}\right]^2 + \beta\left[e_{M\$} - b_E e_{E\$} - \left(1 - b_\$ - b_E\right) e_{T\$}\right]^2\right\} \quad (6)$$

The minimization of the loss function assumes that this function is twice differentiable with respect to $e_{M\$}$; the first derivative is zero while the second derivative is positive.

$$\delta L_M / \delta e_{M\$} = e_{M\$} - a_E e_{E\$} - (1 - a_\$ - a_E) e_{T\$} + \beta \left[e_{M\$} - b_E e_{E\$} - (1 - b_\$ - b_E) e_{T\$} \right] = 0 \Leftrightarrow \quad (7)$$

$$e_{M\$} \left[(a_\$ + a_E) + \beta (b_\$ + b_E) \right] = (a_E + \beta b_E) e_{E\$} \Leftrightarrow \quad (8)$$

$$e_{M\$} = e_{T\$} = (a_E + \beta b_E) e_{E\$} / (a_\$ + a_E) + \beta (b_\$ + b_E)$$

Equation (8) describes the optimal relationship of the exchange rate against the dollar to the variations of the euro/dollar exchange rate for both countries M and T. This optimal response depends on the relative weight of trading partners and debt currencies, as well as the preference parameter β.

In the particular case where $a_E = b_E = a_\$ = b_\$ = 0.5$, that means when all, trade and capital flows, are made equally with the United States and the euro area. Then equation (8) becomes $e_{M\$} = e_{T\$} = 1/2 * e_{E\$}$. When the euro appreciates against dollar, each country (M, T) that can control its exchange rate against the dollar, appreciates its currency by 0.5% against the dollar, which means a depreciation of 0.5% against euro. This rule preserves the stability of the real effective exchange rate in terms of both trade weights and the weighting of foreign currencies in the debt denomination, so that deterioration in the capital account will be offset by an improvement in the current account. In fact, the weight of the United States as an outlet for Moroccan exports between 1999-2014 was 3.57%, while dollar-denominated debt was 21.79%. Also in the same period, the weight of the euro area as the recipient of Moroccan exports was around 70.27%, while euro-denominated debt was 60.29%. By this, we can say that the distribution of the structure of trade and that of foreign currencies-denominated debt seem to be in agreement with the Moroccan situation. These are key parameters for defining optimal real anchor basket.

Therefore, to match exactly the optimal weights in a country's own basket, the authorities are mainly interested on the weight of the "commercial" exchange rate and the "financial" exchange rate in the loss function, meaning the determination of the value β. Thus, if the monetary authorities have the current account as a target they will have to be indifferent between the variation of 1% of GDP in the trade balance and the variation of 1% of the GDP in the debt service.

On the one hand, the response of the current account ratio (relative to GDP) to a depreciation of c_k is equal to $\Delta c\%$, where Δc is given by Marshall, Lerner and Robinson formula. On the other hand, the debt service (relative to GDP) to a depreciation of 1% of f_k is $\Delta f\%$. If the authorities are indifferent between an improvement in the current balance and a decrease in the debt service, they should be indifferent between a depreciation of 1% of c_k and a depreciation of $\Delta c / \Delta f$ % of f_k.

Therefore, the coherent value of β is the following:

$\beta = \Delta^2 f / \Delta^2 c$.

Δc is given by the formula of Marshall, Lerner and Robinson (1949):

$$\Delta c = M / PIB . \left[-1 + \eta_M + \eta_X . (M / X) \right] \quad (9)$$

It is necessary that the sum of the price elasticities of foreign export demand (η_X) and national import demand (η_M) in absolute terms is greater than one. To calculate the elasticity the price elasticities of the local import demand and the external export demand (see appendices). The debt service (%GDP) response to a depreciation of 1% of f_k is $\Delta f\,\%$, is written as follows:

$$\Delta f = SD / PIB \tag{10}$$

Therefore, if $\beta \to \infty$ meaning that the authorities will focus on stabilizing the real effective exchange rate (REER) expressed in financial terms rather than commercial terms. On the other hand, if $\beta \to 0$ means that the authorities will stabilize a real effective exchange rate expressed in commercial terms. Regarding the intermediate values of β this pushes the authorities to make an arbitration between the stabilization of c_k and f_k .

3.2.1.1 Trade Price Elasticities

The results are summarized in the Table 9 (See appendices).

Since we have to calculate trade elasticities, we employed the real effective exchange rate as a measure of relative prices. By doing so, we measure the sensitivity of import and export demand to movements in the real effective exchange rate. Since the Marshall-Lerner condition is a long-run condition, the appropriate method of estimation would be cointegration analysis. Specifically, we employ Johansen-Juselius (1990) which is a Full Information Maximum Likelihood (FIML) estimation method. This method makes use of the information incorporated in the dynamic structure of the model; it also estimates the entire space of the long-run relationships between variables, without imposing normalization on the dependent variable a priori. The selected data are quarterly and transformed by the application of logarithms because of their generally superior fit and ease of interpretation (see Appendices for more details).

3.2.1.2. Results and Discussions

Table 1. Results

	Benassy 1998	**2014**
M/PIB: Share of imports in GDP	29%	39.61%
X/M: Coverage rate	83%	71.68%
η(M): Price elasticity of import demand.	_	0.74
η(X): Price elasticity of export demand.	_	0.63
Δc: Sensitivity of the trade balance to the commercial exchange rate	0.115	0.076
Δf(%): Sensitivity of the debt service to the financial exchange rate	10.5%	4.468%
« β »	0.83	0.34

Based on the estimated result of trade elasticities in Morocco, we conclude that all variables in both cases carry their expected signs. The results confirm the existence of long-term relationship between export and import demand and relative prices and income. On one hand, we find an evidence for high import elasticity on domestic income changes and relatively significant export elasticity to changes in the world income. In other words, the higher income elasticity of import than the income elasticity of exports indicates the trade balance deterioration. On the other hand, the estimated price elasticities are lower, which is consistent with previous literature. We note that the imports are more sensitive on price variations than the exports. This can be explained by the fact that domestic economic agents are more sensitive to price changes than foreigners are.

Furthermore, we find that the sum of the absolute value of long-term exchange rate elasticities of export and import demand is greater than unity. The Marshall-Lerner condition is satisfied implying that real depreciation of dirham will have a favorable long-term effect on trade.

The price elasticities have allowed us to calculate both the elasticity of the current account balance relative to the real effective exchange rate and that of the value of β which has decreased over time from 0.83 to 0.34. This indicates that Moroccan monetary authorities are paying more attention to its external competitiveness than to the valuation of its debt by stabilizing a real effective exchange rate, which is expressed in commercial terms. The weakening in the value of Δf (%) stems from the government's ability to service its debt on time. The Table above shows a decrease in the current account ratio (Δc) that can be explained by the very low coverage rate during the observation period (no more than 49% in January 2014 according to the statistics of the Exchange office of Morocco). Therefore, the sharp decrease in the debt service was the main reason of the decrease in the value of β.

The coefficients a_E and $a_\$$ are calculated as the shares of each partner in Morocco's foreign trade. That means, a_E the relative weight of European countries as trade partners' currencies, $a_\$$ relative weight of the United States (US) as trade partner' currency. The purpose is to breakdown the "Other exchanges with the rest of the world" according to three different hypotheses that have been considered.

- In the high hypothesis: This is the first scenario where trade with the rest of the world is considered as trade with the euro zone. This scenario favors the euro, and the resulting share of the euro reflects its maximum weight.
- In the intermediate hypothesis: This is the second scenario where trade with the rest of the world is ignored. This amounts to distributing trade with the rest of the world between the two zones in proportion to their relative share. This scenario favors neither the euro nor the dollar in the anchoring basket of the dirham.
- In the low case: We are talking about the third scenario where trade with the rest of the world is considered as trade with the United States. This assumption favors the dollar in the anchor basket and the resulting share of the US dollar reflects its maximum weight.

Regarding the treatment of external debt in currencies other than the dollar and the euro is identical in all three scenarios. This means that the external debt in other currencies will be divided between the euro and the dollar in proportion to their relative weight. However, we do not favor the euro or the dollar as currency of indebtedness.

Table 2. Optimal Baskets for 1998-2014

		1998*	2014
Scenario 1	a_E	0.88	0.947
	$a_\$$	0.10	0.052
	Maximum share of the euro	69%	86%
	Minimum share of the dollar	31%	14%
Scenario 2	a_E	0.65	0.84
	$a_\$$	0.33	0.16
	Intermediate share of the euro	56%	78%
	Intermediate share of the dollar	44%	22%
Scenario 3	a_E	0.59	0.647
	$a_\$$	0.39	0.353
	Minimum share of the euro	47%	63%
	Maximum share of the dollar	53%	37%

* For the year 1998, the share of the euro returns to the share of the European currencies, these results come from the work of Bénassy before the adoption of the euro.

Source: Author's calculations for the period (1999-2014).

The Table above shows that in 2014, the maximum part of the US dollar in the basket is 37% and that the part of the euro is 63%. This combination is very close to the updated weighting by the Moroccan monetary authorities of April 13, 2015. Therefore, the comparison between the updated weight and the normative weight currencies that compose the dirham basket shows that the updated weights are closer to scenario three "3" that favors the dollar in the basket. This gives the appearance that the authorities favor the dollar in the anchoring basket of the dirham. In the same way, such a comparison proves that the authorities are increasingly considering the structure of the commercial exchanges for the choice of the optimal weight of the anchor currency.

In the context of the third scenario, we propose going deeper by using more-detailed sectoral study to examine the impact of real exchange rate movements on trade for each sector of economic activity for the same period of 1999-2014.

The statistics of the foreign exchange office show an improvement currently observed on the part of dollar in terms of trade. There are several possible reasons for this. We start by the fact that Morocco had for the first time in 2011 entered the "Top Five Arab Markets" where it was ranked the fourth in the Arab world as a destination market for US exports after the United Arab Emirates, Saudi Arabia, followed by Egypt. Similarly, since 2014, Morocco has been rethinking its strategy of diversifying trading partners by developing economic cooperation with sub-Saharan Africa. This strategy aims to position Morocco as a regional platform to take advantage of its positioning close to Africa, the Middle

East, America and Europe. In fact, this strategy resulted in an increase in trade with sub-Saharan Africa of 13% in 2014 and numerous agreements signed following the King's visit in West and Central Africa.

4. Price and Income Elasticities for Sectoral Exports and Imports in Morocco

Theoretically, the depreciation in local currency can affect the balance of trade of an economy either positively or negatively. The subsequent lower value of the currency will make exports relatively cheaper and imports relatively more expensive. A country's exports start to rise as increase in foreign demand for the lower-price option. The rise in exports is also aided by the fact that local consumers purchasing more from local produce rather than more expensive imported products because they have become more affordable. This leads to a gradual improvement of the external balance.

In accordance with the theory, a change in the exchange rate has two effects on the flow of trade known as "Price Effect" and "Volume Effect". This gradual adjustment of a country's balance of trade to a change in its exchange rate (a devaluation or depreciation of its currency) has been called the "J-curve" phenomenon. Generally, this term has received considerable attention and it is used to describe a phenomenon of initial deterioration followed by an improvement or a recovery.

In other words, the currency of countries running a persistent trade deficit would be expected to fall in relationship to its trade partner. For example, the Moroccan dirham purchases less foreign currency, such as dollars and euros, because it has run a persistent deficit over the past decade. This can be explained by the fact that imported products will costs more because it would take more dirhams for each unit of foreign currency, which would cause imports to decline. In addition, Moroccan exports should expand as foreigners can buy more of its local products to receive more units of the foreign currency. As a result, the trade balance would eventually recover.

Using a battery of times series models, an experimental situation can be used to investigate the effect of real exchange rate movement. Generally, the dynamic model in which the effect of a given set of explanatory variables on a response variable occurs over time rather than all at once is known as distributed-lag models. Therefore, lags of the variables involved in the regression equation are included to accommodate elasticity dynamics. These lags are caused by the time required for the exports and imports to adjust to the new exchange rate (after the currency dropped). They are also cause by importers and exporters having to honor Pre-existing national contracts law meaning that the trade volumes remain unchanged for the short run. As the volume of trade begins to respond to the depreciation, the so-called "volume-effect" will reverse the trade balance movement and improve it. The phenomenon of the domination of the volume effect over the price effect in the long run is what we mentioned before as the Marshall-Lerner condition.

This study particularly assesses the validity of Marshall-Lerner Condition to estimate the price elasticities of demand for Morocco's sectoral foreign trade composition with both the European Union and the rest of the world in the context of the third scenario. This time, we will not just be estimating the trade elasticity as we did in the second section, but we will also be able to treat it in various sectors for the same period 1999-2014. This will help us better explain the increase of the dollar's part in the basket change.

We assumed that the exchanges with the European Union were those undertaken with the countries of the European zone in which the euro is used as the invoicing currency. While all trade that is not made with the countries of Europe (EU), are considered to be made with the United States where the dollar is the invoicing currency. In fact, in 2013, the euro accounted for only 55% of the total compared to 60% in 2009. In contrast, the part of the dollar has increased from 36% in 2009 to 42% in 2013. These statistics also show us that the invoicing portion in other currencies (3%) remains very low.

When looking at the case of Morocco it becomes evident that there is a gap in the literature on this subject. Trade in small open economies tends to be more affected by exchange rate volatility than in larger open economies. In our conceptual framework, we will focus on identifying similar works and showing the strategies and methods applied.

As it is mentioned above, the theoretical framework describes the theory that the long-run effect of exchange rate on trade balance is explained by Marshall-Lerner while the short-run effect by J-curve.

Table 3. Inventory of Empirical Work on the Relationship between Exchange Rates and Foreign Trade

Studies	Sample Period	Price Measurement	Technique of estimation used	Main Result
Akhtar and Hilton (1984)	1974-1981T	Nominal Exchange Rate	MCO	Negative Effect
Bailey, Tavlas and Ulan (1986)	1973-1984T	Nominal Exchange Rate	MCO	Not significant, mixed effects
Belanger, Gutiérrez, Racette, and Raynauld (1988)	1976-1987T	Nominal Exchange Rate	Instrumental variables approach	Exchange rate variability has not significantly depressed the volume of trade
Hwang and Lee (2005)	1990-2000M	Real Exchange Rate	GARCHM	Positive effect in imports and insignificant effect on exports
Kadievska-Vojnovic and Unevska (2007)	1998-2005Q	Relative prices of exports and imports	ARDL	Significant and negative effects on Importations/Exportations
FEDOSEEVA (2015)	1988- 2013M	Relative price	NARDL	Presence of a non-linear and negative effect of the exchange rate on exports
SUWANHIRUNKUL & MASIH (2018)	1994- 2017Q	Real Exchange Rate	NARDL	Presence of long-term nonlinear effects between the exchange rate and Imports/Exports
BENLI (2018)	2000- 2016M	Relative price of exports, Nominal exchange rate	NARDL	Presence of a positive nonlinear effect of the exchange rate on exports

Note. A=ANNUAL; T=QUARTERLY; and M=MONTHLY.

4.1 Source and Availability of Data

As a first step, it is a question of determining and describing the variables used, while respecting the theoretical framework of the study, and then to present the methods of calculation if there are indices or indicators to be recalculated.

In a second step, it is necessary to specify the approach of construction of the database and to face the problems of data availability and their homogeneity, which requires a restructuring of the level of aggregation and a careful choice of activity sectors of the data, as well as products selected for each sector. A work of harmonization of reconstitution and correspondence of data is necessary in the present work.

4.2 Identification of Variables

The analysis of Moroccan foreign trade was developed using detailed foreign trade statistics from the Office des Changes (ODC) database. This database provides data by product according to the SITC nomenclature (Note 4). The format for presenting these statistics on ODC follows that of the Harmonized Commodity Description and Coding System, known as the "Harmonized System". The data were collected using correlation Tables between the third revised version of SITC and the version of the Harmonized System (HS 02) published by the United Nations Statistics Division.

Subsequently, we will calculate a synthetic index to measure exports and imports by volume. For this, we have the quantity q(i) and the price p(i) for each product (i) considered between date 0 and t by weighting them with a fixed basket of prices from the initial period.

In general, there are two most commonly used index formulae of calculation for volume estimation. These are the Laspeyres and Paasche indices, which are defined as a weighted average of the price and quantity data for a specific basket of goods and services. These two basic indices are expressed in terms of price or volume index.

The calculation method used, in our case, is that of the Laspeyres volume index. The latter is most commonly used to aggregate products and thus build volume indices.

Laspeyres-quantity index: $\Delta Q_L = \dfrac{\Sigma\ p_{0,i} \times q_{t,i}}{\Sigma\ p_{0,i} \times q_{0,i}}$

Regarding the calculation of the Real Exchange Rate (RER) which is defined as bilateral real exchange rate between Morocco and foreign country (European currencies or US dollar): $TCR = TCN \cdot \dfrac{P_F}{P_D}$

Where TCN is the nominal exchange rate of the Dirham in terms of another currency, P(D) and P(F) are the consumer price indexes in Morocco and another country. Thus, an increase (decrease) in the RER implies a real depreciation (real appreciation) of the dirham. The nominal exchange rate data are collected from AL-Maghreb bank.

All the data used are quarterly for the period 1999Q1-2014Q4. The other data that we use are extracted from various national and international databases: The index of average values for imports and exports (use by product group), real GDP by sector of activity and the Consumer Price Index by product group is from the High Commissioner for the Plan (HCP) and Real Effective Exchange Rate (from the International Monetary Fund). For data collected by the OECD, the partner countries' GDP by volume for agriculture-forestry and fisheries was used as well as the CPI of foreign countries, and the industrial production index (European countries and United States).

The time series used in this analysis are adjusted by a logarithmic transformation. This helps to reduce asymmetry, heteroscedasticity and to stabilize the fluctuation around the trend.

All data are indexed in 1999=100 and seasonally adjusted if necessary.

Table 4. Aggregation Adopted for Classification of Product Groups

Classification by type	Numbering		Classification by type
Agriculture, hunting and foresty	1	14	Leather and Fur industry
Fishing	2	15	Manufacture of wood and of products of wood and cork
Raw Materials	3	16	Paper and board industry
Food and tobacco Industry	4	17	Non-metallic mineral products
Soft drink	5	18	Textile Industry
Alcoholic drinks	6	19	Electrical Industry
Mining Industry	7	20	Mechanical Industry
Non-ferrous metals	8	21	Automobile Industry
Chemical and Parachemical Industry	9	22	Manufacture of Office machinery and computers
Plastics Materials, Industry	10	23	Household Equipment
Iron and Steel Production	11	24	Travel items
Rubber Industry	12	25	Shoe
Articles of Metal	13	26	Miscellaneous manufactured articles

4.3 Specification of the Trade-Elasticities

Our study relies on disaggregated sector level data. Working with disaggregated data has many advantages according to Riedal (1995), Funke and Ruhwedel (2001), and Panagariya et al. (1996); the results are less likely to be biased by the endogenously between the dependent variable and the repressors. By this way, we make sure that there are no huge outliers or structural breaks. In addition, income and price elasticity's vary across commodity groups and the exchange rate can reasonably be presumed to affects sectors differently as argued by Goldstein and Khan (1985).

4.3.1 Specification of the Import Demand Models

As a starting point, it is assumed that imports can be described by reduced-form demand functions, which are widely used to estimate a disaggregate import demand behavior in the field of applied econometrics. Thus, the basic models of import demand functions can be written as follows:

$$M_t = \phi_0 * RER_t^{\phi_1} * Y_t^{\phi_2} \ (1)$$

$$M_t = \phi'_0 * REER_t^{\phi'_1} * Y_t^{\phi'_2} \ (2)$$

$$M_t = \phi''_0 * (IVM / CPI)_t^{\phi''_1} * Y_t^{\phi''_2} \ (3)$$

Where, M_t are the Moroccan imports from the Eureopean Union (EU) or US at the time (t), $\phi_0, \phi'_0, \phi''_0$ which are determined by some constant parameter, Y_t is the Moroccan demand to US/EU, and the Real Exchange Rate (RER), Real Effective Exchange Rate (REER) and relative price of imports (IVM / CPI).

Taking logs of equations (1), (2) and (3) results in equation (A-C), which represents the long-run relationship between imports and its determinants.

Since we intend to estimate the import price elasticities for 26 sectors of activity, in order to try to distinguish between different ways of estimating, we will study each of the equations as below:

$$(A) M_t = \phi_0 + \phi_1 (RER)_t + \phi_2 Y_t + \nu_t$$

$$(B) M_t = \phi'_0 + \phi'_1 (REER)_t + \phi'_2 Y_t + \nu'_t$$

$$(C) M_t = \phi''_0 + \phi''_1 (IVM / CPI)_t + \phi''_2 Y_t + \nu''_t$$

Where ν_t, ν'_t, ν''_t are disturbance terms, $\phi_1, \phi'_1, \phi''_1$ are the elasticity coefficients of imports relative to prices (price-elasticity) and $\phi_2, \phi'_2, \phi''_2$ are the elasticity coefficients of imports relative to real GDP (Income elasticity).

M: denotes the logarithm of real Imports;

Y:is the logarithm of a measure of domestic economic activity.

IVM: the index of the value of Imports by UG;

CPI: Consumer Price Index (Local). (IVM/CPI) is the logarithm of relative price of imports

4.3.2 Specification of the Export demand Models

$$X_t = \gamma_0 * RER_t^{\gamma_1} * FY_t^{\gamma_2} \ (4)$$

$$X_t = \gamma'_0 * REER_t^{\gamma'_1} * FY_t^{\gamma'_2} \ (5)$$

$$X_t = \gamma''_0 * IVX / CPPI_t^{\gamma''_1} * FY_t^{\gamma''_2} \ (6)$$

Where, X_t are the Moroccan exports to the (EU) or US at the time (t), $\gamma_0, \gamma'_0, \gamma''_0$ which are determined by some constant parameter, FY is the EU/US demand to Morocco, and the real exchange rate (RER), Real effective exchange rate (REER) and relative price of exports $(IVX / CPPI)$.

Taking logs of equations (4), (5) and (6) results in equation (D-F), which represents the long-run relationship between exports and its determinants.

The same thing for the exports, the formulation of the statistical specification of exports models is as follows:

$$(D)\ X_t = \gamma_0 + \gamma_1 (RER)_t + \gamma_2 (FY)_t + \mu_t$$
$$(E)\ X_t = \gamma'_0 + \gamma'_1 (REER)_t + \gamma'_2 (FY)_t + \mu'_t$$
$$(F)\ X_t = \gamma''_0 + \gamma''_1 \left(IVX/CPPIpr\right)_t + \gamma''_2 (FY)_t + \mu''_t$$

Where (FY) is the logarithm of a measure of foreign economic activity (GDP of trading partners to capture its effect on the sharing between the local market and the global market). (X) denotes the logarithm of real exports; IVX is the export value index and CPPI is the weighted average of the consumer price indices of partner or importing countries. (IVX/CPPI) is the logarithm of export relative price.

The six equations above can be modified and extended to asymmetric long-term equations as follows:

$$(A')\mathrm{M}_t = \beta_0 + \beta_1 POS_t + \beta_2 NEG_t + \beta_3 Y_t + \varepsilon_t$$
$$(B')\mathrm{M}_t = \beta'_0 + \beta'_1 POS_t + \beta'_2 NEG_t + \beta'_3 Y_t + \varepsilon'_t$$
$$(C')\mathrm{M}_t = \beta''_0 + \beta''_1 POS_t + \beta''_2 NEG_t + \beta''_3 \mathrm{Y}_t + \varepsilon''_t$$

$$(D')X_t = \alpha_0 + \alpha_1 POS_t + \alpha_2 NEG_t + \alpha_3 \mathrm{FY}_t + \upsilon_t$$
$$(E')X_t = \alpha'_0 + \alpha'_1 POS_t + \alpha'_2 NEG_t + \alpha'_3 FY_t + \upsilon'_t$$
$$(F')X_t = \alpha''_0 + \alpha''_1 POS_t + \alpha''_2 NEG_t + \alpha''_3 FY_t + \upsilon''_t$$

Where,

$\alpha_0, \alpha'_0, \alpha''_0, \alpha_1, \alpha'_1, \alpha''_1, \alpha_2, \alpha'_2, \alpha''_2, \alpha_3, \alpha'_3, \alpha''_3, \beta_0, \beta'_0, \beta''_0, \beta_1, \beta'_1, \beta''_1, \beta_2, \beta'_2, \beta''_2, \beta_3, \beta'_3, \beta''_3$ are parameters to estimate in the long run, $\varepsilon_t, \varepsilon'_t, \varepsilon''_t, \upsilon_t, \upsilon'_t, \upsilon''_t$ are white noises. The constants $\alpha_0, \alpha'_0, \alpha''_0, \beta_0, \beta'_0, \beta''_0$ integrate all exogenous factors such as a constant term, and/or a linear trend and dummy variables for structural breaks, if any.

Starting from the equation A' to F', POS and NEG represent the element of asymmetry of the Non-linear autoregressive distributed-lag model "ARDL". In which POS and NEG are generated by calculating:

$$(A'),(D')POS_t = \Sigma_{j=1}^{t} \Delta RER_j^{+} = \Sigma_{j=1}^{t} \max(\Delta RER_j, 0);$$
$$(B'),(E')POS_t = \Sigma_{j=1}^{t} \Delta REER_j^{+} = \Sigma_{j=1}^{t} \max(\Delta REER_j, 0);$$
$$(C'),(F')POS_t = \Sigma_{j=1}^{t} \Delta(IVM(IVX)/CPI(CPPI))_j^{+} = \Sigma_{j=1}^{t} \max(\Delta(IVM(IVX)/CPI(CPPI)_j, 0)$$
$$and$$
$$(A'),(D')NEG_t = \Sigma_{j=1}^{t} \Delta RER_j^{-} = \Sigma_{j=1}^{t} \min(\Delta RER_j, 0);$$
$$(B'),(E')NEG_t = \Sigma_{j=1}^{t} \Delta REER_j^{-} = \Sigma_{j=1}^{t} \min(\Delta REER_j, 0);$$
$$(C'),(F')NEG_t = \Sigma_{j=1}^{t} \Delta(IVM(IVX)/CPI(CPPI))_j^{-} = \Sigma_{j=1}^{t} \min(\Delta(IVM(IVX)/CPI(CPPI)_j, 0)$$

POS and NEG are the processes of partial sums of price changes. POS is the partial sum of positive changes of the exchange rate (currency depreciation) and NEG is the partial sum of negative exchange rate changes (currency appreciations). The impact of an exchange rate appreciation on the volume of trade may be asymmetrical with respect to depreciation. This assumption can be tested by evaluating $\beta_1, \beta_2, \beta'_1, \beta'_2, \beta''_1, \beta''_2, \alpha_1, \alpha_2, \alpha'_1, \alpha'_2, \alpha''_1, \alpha''_2$ in the equations, as they reflect the macroeconomic effects of the appreciation (increase) and depreciation (decrease) of the exchange rate (relative price) on trade. According to Marshall-Lerner theory, depreciation of domestic currency decreases relative price of exporting goods and increases relative price of importing goods.

In the case where the exponents «+» and «- » are equal ($\beta_1 = \beta_2 ; \beta'_1 = \beta'_2 ; \beta''_1 = \beta''_2$) or ($\alpha_1 = \alpha_2 ; \alpha'_1 = \alpha'_2 ; \alpha''_1 = \alpha''_2$), this indicates that there is no asymmetry between the volume of imports/exports and exchange rate fluctuations. If ($\beta_1 \neq \beta_2 ; \beta'_1 \neq \beta'_2 ; \beta''_1 \neq \beta''_2$) ($\alpha_1 \neq \alpha_2 ; \alpha'_1 \neq \alpha'_2 ; \alpha''_1 \neq \alpha''_2$) Then the presence of non-linear relation is concluded.

The expected signs of $\beta_1, \beta_2, \beta'_1, \beta'_2, \beta''_1, \beta''_2, \alpha_1, \alpha_2, \alpha'_1, \alpha'_2, \alpha''_1 \, and \, \alpha''_2$ are empirically ambiguous because there are explanations which are theoretically contradictory. On the one hand, a positive value of $(\alpha_1 ; \alpha'_1 ; \alpha''_1)$ or $(\beta_1 ; \beta'_1 ; \beta''_1)$ and a negative value of $(\alpha_2 ; \alpha'_2 ; \alpha''_2)$ or $(\beta_2 ; \beta'_2 ; \beta''_2)$ corroborates the approach of economic and financial flows between residents and non-residents, which suggests that a depreciation of the value of the national currency causes both an increase in the volume of exported goods and a decrease in imported goods. In short, the appreciation and depreciation of the currency could have both a negative and a positive effect on trade volume (see Table 10 in the appendices).

Many studies have been conducted to explain better the choice of our models such as Bussiere (2013) that describes how non-linearities and asymmetries in the trade balance in relation to the exchange rate can be attributed to adjustment cost, price rigidies, and quantity restrictions. On one hand, in the case of depreciation of domestic currrency, exporters try increasing profit margins by producing more under the assumption that their prices remain the same in their domestic currency. It seems, however, that exporters cannot increase the quantity of their goods due to full capacity or adjustment costs that are too high; in this case they should increase their price instead.

On the other hand, in the case of appreciation, exports become more expensive and less competitive. For this reason, exporters should decrease the price of their goods. In addition, the asymmetric nature may be caused by the government interventions.

To assess the J-curve outcome, a short run analysis is required. As such, an error correction format modeling from Pesaran et al. (2001). Shin et al. (2014) established a similar process developed by Pesaran et al. (2001) to evaluate a non-linear ARDL model.

Therefore, according to Shin et al. (2014), the equations (A' to F') can be estimated as in standard ARDL model leads to the following general form of NARDL model where RER, REER and relative price in equation (A' to F') will be replaced by POS and NEG to as follows:

$$\left\{\begin{array}{l} \Delta M_t = \lambda_0 + \lambda_1 M_{t-1} + \lambda_2 POS_{t-1} + \lambda_3 NEG_{t-1} + \lambda_4 Y_{t-1} + \sum_{P=1}^{n1} \theta_1 \Delta M_{t-P} + \sum_{P=0}^{n2} \theta_2 \Delta POS_{t-p} + \sum_{P=0}^{n3} \theta_3 \Delta NEG_{t-p} + \sum_{P=0}^{n4} \theta_4 \Delta Y_{t-p} + \psi_t \\ \Delta M_t = \lambda'_0 + \lambda'_1 M_{t-1} + \lambda'_2 POS_{t-1} + \lambda'_3 NEG_{t-1} + \lambda'_4 Y_{t-1} + \sum_{P=1}^{n1} \theta'_1 \Delta M_{t-P} + \sum_{P=0}^{n2} \theta'_2 \Delta POS_{t-p} + \sum_{P=0}^{n3} \theta'_3 \Delta NEG_{t-p} + \sum_{P=0}^{n4} \theta'_4 \Delta Y_{t-p} + \psi'_t \\ \Delta M_t = \lambda''_0 + \lambda''_1 M_{t-1} + \lambda''_2 POS_{t-1} + \lambda''_3 NEG_{t-1} + \lambda''_4 Y_{t-1} + \sum_{P=1}^{n1} \theta''_1 \Delta M_{t-P} + \sum_{P=0}^{n2} \theta''_2 \Delta POS_{t-p} + \sum_{P=0}^{n3} \theta''_3 \Delta NEG_{t-p} + \sum_{P=0}^{n4} \theta''_4 \Delta Y_{t-p} + \psi''_t \end{array}\right\} ?$$

$$\left\{\begin{array}{l} \Delta X_t = \rho_0 + \rho_1 X_{t-1} + \rho_2 POS_{t-1} + \rho_3 NEG_{t-1} + \rho_4 FY_{t-1} + \sum_{P=1}^{n1} \varphi_1 \Delta X_{t-P} + \sum_{P=0}^{n2} \varphi_2 \Delta POS_{t-p} + \sum_{P=0}^{n3} \varphi_3 \Delta NEG_{t-p} + \sum_{P=0}^{n4} \varphi_4 \Delta FY_{t-p} + \omega_t \\ \Delta X_t = \rho'_0 + \rho'_1 X_{t-1} + \rho'_2 POS_{t-1} + \rho'_3 NEG_{t-1} + \rho'_4 FY_{t-1} + \sum_{P=1}^{n1} \varphi'_1 \Delta X_{t-P} + \sum_{P=0}^{n2} \varphi'_2 \Delta POS_{t-p} + \sum_{P=0}^{n3} \varphi'_3 \Delta NEG_{t-p} + \sum_{P=0}^{n4} \varphi'_4 \Delta FY_{t-p} + \omega'_t \\ \Delta X_t = \rho''_0 + \rho''_1 X_{t-1} + \rho''_2 POS_{t-1} + \rho''_3 NEG_{t-1} + \rho''_4 FY_{t-1} + \sum_{P=1}^{n1} \varphi''_1 \Delta X_{t-P} + \sum_{P=0}^{n2} \varphi''_2 \Delta POS_{t-p} + \sum_{P=0}^{n3} \varphi''_3 \Delta NEG_{t-p} + \sum_{P=0}^{n4} \varphi''_4 \Delta FY_{t-p} + \omega''_t \end{array}\right\}$$

Where $\lambda_0, \lambda_1, \lambda_2, \lambda_3, \lambda_4, \rho_0, \rho_1, \rho_2, \rho_3, \rho_4 ; \lambda'_0, \lambda'_1, \lambda'_2, \lambda'_3, \lambda'_4, \rho'_0, \rho'_1, \rho'_2, \rho'_3, \rho'_4 ; \lambda''_0, \lambda''_1, \lambda''_2, \lambda''_3, \lambda''_4, \rho''_0, \rho''_1, \rho''_2, \rho''_3, \rho''_4$ are long-run parameters while $\theta_1, \theta_2, \theta_3, \theta_4, \varphi_1, \varphi_2, \varphi_3, \varphi_4 ; \theta'_1, \theta'_2, \theta'_3, \theta'_4,$

$\varphi'_1, \varphi'_2, \varphi'_3, \varphi'_4; \theta''_1, \theta''_2, \theta''_3, \theta''_4, \varphi''_1, \varphi''_2, \varphi''_3$, and φ''_4 are short-run parameters. As in any dynamic model, information criteria will be used to decide the lag length. In our models, we chose AKAIKE's Information Criterion (AIC).

The specification of the equations is finalized when they are exempt from erroneous specification biases, in particular the problem of the correlation between the time series and the instability of the parameters. To detect short-term and long-term relationships between interest variables, Pesaran and Shin's (1999) "ARDL Bound Testing" cointegration approach was used. For this purpose, we will compute the null hypothesis Wald statistic according to which the coefficients of the variables in level are all equal to zero. $H_0: \begin{cases} \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0; \rho_1 = \rho_2 = \rho_3 = \rho_4 = 0 \\ \lambda'_1 = \lambda'_2 = \lambda'_3 = \lambda'_4 = 0; \rho'_1 = \rho'_2 = \rho'_3 = \rho'_4 = 0 \\ \lambda''_1 = \lambda''_2 = \lambda''_3 = \lambda''_4 = 0; \rho''_1 = \rho''_2 = \rho''_3 = \rho''_4 = 0 \end{cases}$. Where the null hypothesis of "no long-run relationship exists" using the F-test of Pesaran et al. (2001) and Narayan (2005).

Calculated F-Statistics will be compared to the lower and upper limits of the Pesaran, Shin and Smith (PSS) critical procedure band at the 95% confidence level. Three cases occur: If F-statistic>upper-bound then we reject H0 and we conclude that there is a long-term equilibrium relationship between macroeconomic variables studied; subsequently, indicating the presence of a cointegrating relationship. If F-statistic<lower bound, then we cannot reject the null hypothesis, and in such a situation, there is no long-term equilibrium relation. Finally, if lower bound<F-stat<upper bound then the test is inconclusive and in this case, the order of integration of the underlying variables must be studied more deeply.

To examine the long-run asymmetries of the models, the Wald test is applied ($H_0: \frac{-\lambda_2}{\lambda_1} = \frac{-\lambda_3}{\lambda_1}$); ($H_0: -\frac{\rho_2}{\rho_1} = -\frac{\rho_3}{\rho_1}$); ($H_0: \frac{-\lambda'_2}{\lambda'_1} = \frac{-\lambda'_3}{\lambda'_1}$); ($H_0: -\frac{\rho'_2}{\rho'_1} = -\frac{\rho'_3}{\rho'_1}$); ($H_0: \frac{-\lambda''_2}{\lambda''_1} = \frac{-\lambda''_3}{\lambda''_1}$); ($H_0: -\frac{\rho''_2}{\rho''_1} = -\frac{\rho''_3}{\rho''_1}$) according to Greenwood-Nimmo and Shin (2013) and Shin et al. (2014). For short-run asymmetries ($H_0: \sum_{P=0}^{n2} \theta_2 = \sum_{P=0}^{n3} \theta_3$); ($H_0: \sum_{P=0}^{n2} \varphi_2 = \sum_{P=0}^{n3} \varphi_3$); ($H_0: \sum_{P=0}^{n2} \theta'_2 = \sum_{P=0}^{n3} \theta'_3$); ($H_0: \sum_{P=0}^{n2} \varphi'_2 = \sum_{P=0}^{n3} \varphi'_3$); ($H_0: \sum_{P=0}^{n2} \theta''_2 = \sum_{P=0}^{n3} \theta''_3$); ($H_0: \sum_{P=0}^{n2} \varphi''_2 = \sum_{P=0}^{n3} \varphi''_3$).

4.4 Results and Discussion

Before analyzing the variables using the NARDL approach, the stationarity of all variables was tested using the following procedures: In addition to the Augmented Dickey-Fuller "ADF" test we applied the Phillips test -Perron "PP", which takes into account the presence of heteroscedasticity and autocorrelation. We also confirmed our results by using ADF tests with endogenous structural break taking the date of rupture as endogenous as Perron (1997).

The choice of the lag length for the ADF test is based on the Schwartz Information Criterion (SIC) and the maximum number of lags is 10. The bandwidth selections and the spectral estimates in the Phillips test-Perron are based on Newey-West and the approach of Bartlett Kernel. A single asterisk (*) indicates a rejection of the null hypothesis at the 1% threshold, two asterisks (**) indicate a rejection of the null hypothesis at the 5% threshold.

We found that the values of the Wald statistic in most sectors (in the models) exceed critical limits greater than 95%. This result confirms the existence of a cointegration relationship between the variables studied. Therefore, these results prove the reason for estimating the long-run elasticities of each variable as a function of export and import volume variables.

We first evaluated the suitability of the dynamic specification of all the models by various diagnostic tests. These tests include the "Jarque-Bera test" for the study of error normality, the "LM test" for autocorrelation of residuals of order 1 and the "Ramsey Reset test" to check if the model is well specified. The CUSUMSQ plot (95% bounds) is used for model stability to check if there is a structural change in the relationship between the variables used in each model; due to this change the values of the model parameters did not remain the same throughout the observation period.

The results of the diagnostic tests show that some estimated models have violated the normality error assumption. Therefore, it is necessary to detect inconsistencies in each specification. It seems that some models do not satisfy these diagnostic tests, as the serial correlation tests and the stability of the error variance. In addition, the values of the error correction term, which suggest that the long-term relationship is an error-correcting mechanism, were validated in each specification, in which any short-term deviations occurred in the import and export volumes. In other words, there is an important feedback coefficient that implies a quick adjustment to the long-term equilibrium state.

Since the majority of models have passed most of the adequacy tests, especially the critical non-correlation hypotheses and the absence of parameter instability (Pesaran & Shin, 1999), and further extended by Pesaran et al., 2014), we conclude that these models are correctly specified for the NARDL estimation.

The Table 10 (in the appendices) presents the asymmetric short-term and long-term trade elasticities. Based on the information presented in the table we concluded that the effect of the increase in the exchange rates (depreciation effect) is much higher in absolute terms than the effect of the lower exchange rate (appreciation effect). This is favorable for both Moroccan exports to the RDM (US) and to the European Union.

The main potential sectors of Moroccan exports include agri-food products, the automotive industry, textiles, the chemical and para-chemical industry, and the extractive industry. Our findings show that the depreciation of Moroccan dirham has a very significant long-term impact on the real exports. Especially, the benefits result has been particularly marked in extractive industry due to the continued upturn of phosphate production. In addition, we found that agriculture, fishing, manufacturing, leather goods, textiles, and automotive sectors have a very significant effect. This tallies with the "Ecofin

Agency", which highlights that the automotive sector becomes the leading export sector in 2014 ahead of phosphates according to the statement published on 16 January by the Exchange Office of 2014. The real appreciation of dirham did not discourage the exports of Moroccan goods to the same extent as exporters benefit from the depreciation more generally.

In the long term, taking the agricultural sector, an additional appreciation of the value of the euro against the dirham by 1% (which means a depreciation of dirham by 1%) will lead to an increase in volume of Morocco's exports go to Europe of 4.5%. While the appreciation of the dollar against the dirham by 1%; increased only 2.27% in volume of Morocco's exports to the rest of the world. Regarding the automotive sector, an increase of the exports volume to the EU by 3.58 and 1.98 to the RDM followed by 1% decline in the dirham. In the same context, relative price of export POS and relative price export NEG are—1.13 and—1.50 respectively. Therefore, we may conclude that a one percent increase in the relative price leads to a 1.13 percent decrease in real exports to the euro-zone. Similarly, a one percent decrease in relative price leads to a 1.50 percent decline in real exports. Hence, our results indicate that the greater effect is coming from negative changes since it is larger in absolute value than the one for positive changes.

When looking at imports, the depreciation of dirham has important effects, in the long-run, in real imports rather than the appreciation. This time, the effect of the depreciation of dirham against foreign currencies is around 56%. This is more significant in absolute terms than the effect of appreciation (nearly 44%). Concerning the effect of the depreciation in relative prices (import price relative to domestic price) is much more significant after the bilateral real exchange rate, almost 68% against the U.S. dollar and about 32% against the euro. Thus, the effect of the dirham's decline against the dollar in imports is much larger and more important than the effect of the dirham's decline against the euro. This is especially notable when using the price-relative indicator.

Consequently, a higher weight of the U.S. dollar in Morocco's currency basket would limit fluctuations in the exports competitiveness to the RDM and domestic firms that are competing with imports from the rest of the world.

In the same Table, we find the Wald test for long-run asymmetry of the export demand and the imports for all the different sectors. The test results indicate that the null hypotheses of long-run symmetry can be rejected in the great majority of cases at 5% significance level. Consequently, the appreciations and depreciations of the dirham seem to have a different impact on the country's trade. For certain sectors such as fishing in imports, the effects of exchange rate changes (appreciation or depreciation) are symmetric that is why the J-curve outcome is not observed, as argued by Bahmani-Oskooee (2015) and Fariditavana (2016) and Bahmani-Oskooee et al. (2016).

Generally, short-run dynamics do not seem to play an important role in Morocco's foreign trade structure. In contrast, as has been shown (Ahmad, Ahmed, Khoso, Palwishah, & Raza, 2014) to find the inverse J-curve in which depreciation, in the very short-term, improves the trade balance sharply. However, we found that in some sectors the results are consistent with Ahmad et al. (2014)'s study while some sectors found to be extremely sensitive to imports and exports in the short-run, for example some of the main sectors. Generally, the results are more significant in relation to imports than exports. The main sectors of activity such as: Agriculture, fishing and the agro-food industry give very significant results in the short term. This can be explained by the fact that Morocco is working in the framework of the Green Morocco Plan "GMP" for the reinforcement of the competitiveness of its agricultural products and the implementation of the integrated Halieutis strategy to boost the fishing sector (the high price elasticity with the euro area for export).

Our findings imply that there is a tradeoff of depreciation between short-term and long-term, and between importing and exporting sectors.

Generally, the results obtained differ somewhat from one sector to another. This may be due to various factors, including the intensity of competition that exporters face and to the composition of exported or imported products. In fact, the increase of the price elasticity in certain sectors can be justified by the level of production range (talking about the quality, sophistication, product differentiation). We can say that the demand for low-end product groups is very sensitive to the prices of the products since the products are little differentiated. Conversely, the demand for high-end products is considered insensitive to price variations, which allows for higher prices. For an economy to benefit from a depreciation of its currency, its production style needs to be unsophisticated while still having a large industry and a high price elasticity of exports.

With regard to income elasticity, the results show a higher income elasticity of demand for imports than foreign income elasticity of demand for exports, which means that imports growing faster than exports, a deterioration in the trade balance and eventual pressure on its exchange rate. This can be explained by the fact that Morocco has not possessed the capacity to grow at the rate of its partners countries. This is due to its slow rate of export growth caused by the low-income elasticity of demand for Moroccan exports in world markets, insofar as an increase in partner countries' incomes of 1% causes an increase in demand for Moroccan export by 1.77% in the agri-food sector. In general, the elasticity of income whether on the import or export side, remains significant in the majority of sectors.

Globally, on one hand, we found that more than 62.5% of sectors have a higher elasticity coefficient in dollars than in euros (37.5%) regarding the long-term effect of the exchange rate on imports. The change in the dirham against the dollar remains larger and faster than that against the euro because of the dirham's elasticity against the dollar is stronger than that of the dirham against the euro. On the other hand, regarding the long-term effect of the exchange rate on exports, we found as of more than 54% of sectors with higher coefficients in terms of the euro than the dollar. Thereby the price elasticity is stronger in euro than in dollar. As a result, the weight of the dollar dominates in Morocco's foreign exchange. Therefore, the higher price elasticity of the dollar against the dirham encourages Moroccan monetary authorities to maximize the part of dollar in its basket of currencies.

5. Conclusion

This paper has contributed to a better understanding of the decisions made by the Moroccan monetary authorities in their last readjustment of the weights of anchor currencies in the Dirham basket. We compared the exchange rate policy effectively followed by the Moroccan authorities and the exchange rate policy that the authorities pursue in practice while taking into account the objective of external competitiveness and the external debt constraints between 1999 and 2014.

We presented the assessment of the Moroccan exchange system based on the distinction between the official classification of the IMF and the de facto one. The latter classification was deduced from the dirham volatility calculations against a set of foreign currencies in Moroccan dirham's currency peg. With the advent of the euro, Bank Al-Maghreb has announced to the public the weight of the currencies in its basket. Thus, the management rule followed by Bank-Al Maghreb is said to be formal and not discretionary as is the case for Tunisia.

Over the last few decades, new economic challenges have emerged in the international environment, which have undergone profound changes in favor of the dynamics of globalization.

Morocco has engaged on a process of gradual liberalization of its foreign trade working towards a successful integration into the world economy. This has been done most notably through the signing of a set of free trade agreements and considerable efforts in favor of foreign trade promotion, which were deployed in parallel. This encouraged the Moroccan authorities to rethink the exchange rate policy. In the present work, we have been able to show that Morocco has found it beneficial to stabilize the dirham against the dollar in real terms.

Comparing updated weights to optimal weights shows that the readjustment of the weights is closer to the third scenario, which favors the dollar in the basket than the other two scenarios. The behavior of the Moroccan authorities is reflected concretely by the gradual opening of the capital account in the last two decades.

Regarding the last section of this study, following the long-term effect of the exchange rate on trade balance that is explained by Marshall-Lerner, our findings prove the existence of long-term cointegration between the variables of interest. The results show that the trade balance is quite sensitive to the real exchange rate and the relative price than to the real effective exchange rate.

The depreciation of dirham has important effects in real imports and real exports rather than the appreciation effects for improving the balance of trade. It may take several quarters to realize the full effects of depreciation, because importers and exporters have to honor pre-existing national contracts law, which means that trade volumes remain unchanged in the short-term.

Policy makers such as Bank Al-Maghreb and relevant government agencies should also consider the effects of various sectors. Although many sectors have benefited from the depreciation of the currency such as the main potential sectors; including agri-food products, agriculture, fishing, manufacturing, leather goods, textiles, automotive sectors, the chemical and para-chemical industry, and the extractive industry. Our findings show that the depreciation of Moroccan dirham has a very significant long-run impact on real exports. Especially, the benefits result has been particularly marked in the extractive industry due to the continued upturn of phosphate production. Additionally, as is states by the "Ecofin Agency" the automotive sector became the leading export sector in 2014 ahead of phosphates. The appreciation of dirham did not discourage the exports of Moroccan goods to the same extent as exporters benefit from the depreciation more generally.

Therefore, it is suggested that policymakers find the optimal exchange rate leading to the right result, taking into account both short- and long-term costs. The monetary authority could modestly depreciate the currency if necessary to stimulate economic growth but should not ignore the costs.

Given that the trade balance is deemed sensitive to the exchange rate, an immediate and sudden depreciation is not recommended as it could create serious problems to the importing sectors especially. Since Morocco imports more than it exports, the volatility of the dollar appears as a source of risk in the presence of strong price elasticity (U.S. dollar/MAD) than that of the (Euro/MAD). This encourages the monetary authorities to integrate immediately to increase the weight of the dollar in its basket in order to maintain the dirham's stability.

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Notes

Note 1. The doctrine of "original sin" formulated by Eichengreen and Hausmann (1999).

Note 2. It is circular n1633 of the Exchange Office which announced the institution of the foreign exchange market. It is dated on 01/04/1996 while the start is launched on 03/06/1996.

Note 3. It reminds us that the two countries that adopt uniform strategies of anchoring to a basket of key currencies do not have to work together to stabilize their exchange rate between them.

Note 4. The fourth revised version of the SITC was adopted by the United Nations Statistical Commission at its 37th session in 2006 to propose a harmonized list of products for the purposes of international trade analysis. A correspondence Table exists with the Harmonized System (HS).

Appendices

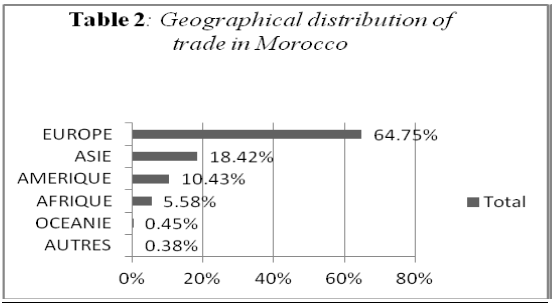
Section I

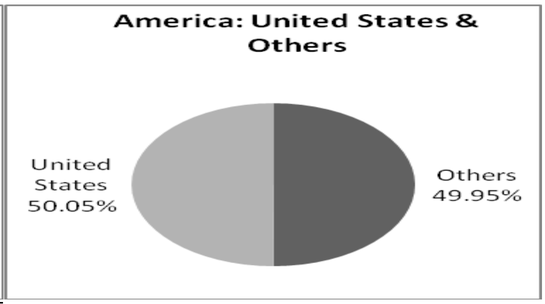
Table 5. Presents the Results of the Relative Volatilities of the Dirham in Relation to the Different Key Currencies

Periods/Currencies	*US Dollar*	*DEM*	*YEN*
05:1973-1979	16	34.2	49.8
1980-1993	23.7	31.3	45
1994-1998	28.9	28	43.1
1999-2006*	43.3	19.3	37.4
2007-2014*	22.04	12	65.96

Source: Author's calculations.

Section II_





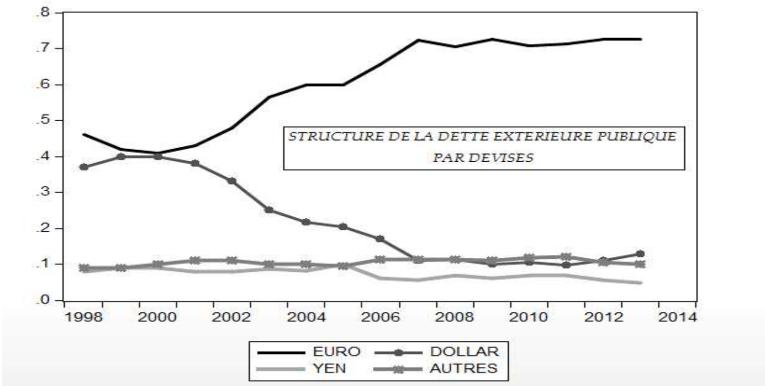


Figure 2. Structure of Public External Debt by Currency

Source: Author's calculations made from the statistics of the exchange office over the period 1999M1, 2014M12.

Table 6. Some Macroeconomic Indicators of the Moroccan Economy between 1980-2015

Periods	Inflation (% annual)	Current account (% by GDP)	Trade balance (% by GDP)	Debt service (% by GDP)
1980-1997(a)	6.312	-3.817	-4.557	8.55
1998-2015	1.872	-2.051	-15.24	5.14

Source: These data are collected from the African Development Bank Group and the World Bank. (a) Represents the European currencies of the European system before the adoption of the euro.

Source: Author's calculations made from the financial statistics of the Al-Maghreb Bank and the Foreign Exchange Office.

Estimating Trade Elasticities between Morocco and His Trading Partners for the period 1999-2014:

THE IMPORT AND EXPORT DEMAND MODELS*:*

We will measure the sensitivity of import and export demand to movements in the real effective exchange rate REER. Thus, we assume Moroccan import demand from trading partner "j" takes the form as follows: $LogM_{jt} = \alpha_0 + \beta \log REER_{jt} + \gamma \log Y_t + \varepsilon_t$

Where M (j) is the real import from trading partner "j"; REER is the real effective exchange rate; Y indicates Real GDP. The REER is used as a measure of relative prices to reflect a real depreciation of the dirham. Theoretically, a depreciation of the value of the domestic currency will make exports relatively cheaper and imports relatively more expensive. Then it will improves the external balance automatically which means an increase in domestic GDP (γ >0). In such way, the increase in GDP tend to stimulate imports that is why we are expecting β>0.

Export demand equation can be formulated in the same way,

$$LogX_{jt} = \alpha'_0 + \beta' \log REER_{jt} + \gamma' \log Y_{jt} + \varepsilon'_t$$

Where X(j) exports to trading partners and Y(j) indicates trading partners real GDP. Moreover, we use Johanson's cointegration technique by using the "urca" package of the statistical software R 3.5.1. The selected data are quarterly and transformed by the application of logarithms.

Before any analysis, it is important to proceed by an analysis of the statistical properties of the data. This preliminary analysis of the series therefore requires the use of the unit root test and co-integration.

I. *Data Processing*:

Study of Stationarity:

The study of the stationarity of the series is essential, since it seems as it conditions the choice of the econometric model. We used the test, ur.df, offered by the urca package of the software R. The latter gave us the following results:

Table 7. Test ADF of the Unit Root

Variables	Deterministic terms	Lags	Test Value	Critical Value at 5%
Log(M)	Constant, trend	2	(-) 2.80	(-) 3.45
Diff(log(M))	Constant	1	(-) 3.10	(-) 2.89
Log(PIBréel)	Constant, trend	2	(-) 3.13	(-) 3.45
Diff(log(PIBréel))	Constant	1	(-) 6.42	(-) 2.89
Log(X)	Constant, trend	2	(-) 3.18	(-) 3.45
Diff(log(X))	Constant	1	(-) 3.17	(-) 2.89
Log(PIBréelfr)	Constant, trend	2	(-) 2.05	(-) 3.45
Diff(log(PIBréelfr)	Constant	1	(-) 3.65	(-) 2.89
Log(TCER)	Constant, trend	2	(-) 3.19	(-) 3.45
Diff(log(TCER))	Constant	1	(-) 5.13	(-) 2.89

According to the table above, we find that all the variables of the model are non-stationary in level, and stationary in difference. Therefore, the variables of the model are all integrated of order 1.

Co-intégration test of Johansen:

The first step in the Johansen procedure is to determine the number of lags length. we used the VARselect command, which offers 4 criteria for selecting the number of delays, namely: the Akaike criterion (AIC), the Hannan-Quin criterion (HQ), the Schwaz Criterion (SC) and the Forecast

Prediction Error (FEP), which show that the appropriate order of VAR in level is equal to 2 quarters (p=2) for imports, (p=3) for exports. As a result, we chose a VAR (2) in the first case and VAR with p=3 for the calculation of export price elasticities.

Co integration Test:

This test uses the maximum likelihood method to test the existence of a long-term relationship between the variables and to obtain the number of co-integration vectors in a multivariate framework. The principle of this test is based on the comparison of the likelihood ratio to the critical value through the Johanson approach, we will use the trace test with a trend, which assumes that the rank of the cointegration vector equal to $r<n$.

Below is the summary of the Johansen co-integration test using the R software, and the results are shown in the following Table:

Table 8. Results of the Co-Integration Test

		Trace test			
	H0	Statistics	10%Critical value	5%Critical value	1%critical value
Import demand	R=0	46.83	39.06	42.44	48.45
	R≤1	23.84	22.76	25.32	30.45
	R≤2	6.20	10.49	12.25	16.26
Export demand	R=0	44.18	39.06	42.44	48.45
	R≤1	23.62	22.76	25.32	30.45
	R≤2	6.00	10.49	12.25	16.26

For both cases, the result of the Johansen test reveals the existence of a single co-integration relationship between the three variables because one obtains trace values of (46.83) and (44.18) that are greater than their critical value at the 5% threshold (42.44).

Thus, for each case we only report one vector in which all variables carry their expected signs. All vectors are normalized on logM and logX by setting their coefficients to -1 so that we can easily read the elasticities.

Table 9. Estimates of the Cointegrating Vectors: 1999-Q1-2014Q4

İmport Demand Estimates			Export Demand Estimates		
LogM	LogY	logREER	LogX	LogY	LogREER
-1	1.64	0.74	-1	0.44	-0.63
	(25.33)	(3.17)		(4.18)	(-2.037)

Between brackets: is the value of the t-statistic.

Section III

Explanatory schemas that emphasized the Variable effects according to price elasticity:

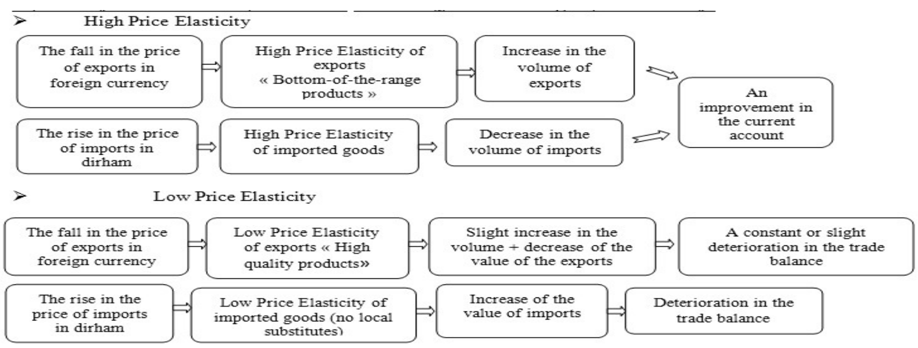


Table 10. Result of the Elasticity of Trade-Elasicities

Sectors	Imports Short-run							Exports Short-run					
		With EU			With United- States			With EU			With United-States		
		A'	B'	C'	A'	B'	C'	D'	E'	F'	D'	E'	F'
1	POS	3.57 (0.25)	(-) 4.98 (0.56)	(-) 2.39 (0.32)	(-) 0.49 (0.47)	0.73 (0.83)	1.06 (0.20)	4.67 (0.02)	(-) 2.25 (0.65)	(-) 2.17 (0.03)	1.91 (0.03)	(-) 2.42 (0.51)	(-) 1.96 (0.01)
	NEG	(-) 2.32 (0.47)	(-) 3.34 (0.52)	(-) 4.84 (0.04)	(-) 1.06 (0.05)	(-) 1.82 (0.33)	0.47 (0.51)	3.46 (0.17)	(-) 3.43 (0.49)	(-) 2.48 (0.01)	1.11 (0.03)	(-) 1.50 (0.50)	(-) 1.59 (0.04)
	ΔR	(-) 2.15 (0.02)	(-) 2.32 (0.02)	(-) 1.24 (0.07)	(-) 0.97 (0.01)	(-) 1.08 (0.01)	(-) 0.62 (0.03)	3.50 (0.67)	(-) 2.27 (0.43)	(-) 2.53 (0.37)	(-) 1.22 (0.21)	0.69 (0.61)	(-) 1.60 (0.10)
	EC_{t-1}	(-) 0.91 (0.00)	(-) 1.02 (0.00)	(-) 1.12 (0.00)	(-) 0.68 (0.00)	(-) 1.27 (0.00)	(-) 0.70 (0.00)	(-) 1.02 (0.00)	(-) 1.47 (0.00)	(-) 1.49 (0.00)	(-) 0.84 (0.00)	(-) 0.82 (0.00)	(-) 2.45 (0.00)
	LAG	(1,0,0,0)	(5,0,0,0)	(5,0,0,0)	(1,0,0,0)	(6,0,0,0)	(1,0,0,0)	(1,0,0,0)	(2,0,0,0)	(3,0,0,3)	(1,0,0,0)	(1,0,0,3)	(9,0,0,0)
	F-S	9.87*	2.98	4.44*	6.51*	4.29*	8.22*	13.36*	16.06*	11*	10.88*	9.51*	7.93*
2	POS	2.07 (0.07)	2.72 (0.40)	3.62 (0.18)	(-) 2.50 (0.19)	2.76 (0.71)	(-) 1.76 (0.58)	(-) 2.84 (0.01)	2.96 (0.36)	1.35 (0.09)	2.96 (0.12)	3.65 (0.57)	3.34 (0.04)
	NEG	3.49 (0.05)	1.46 (0.44)	(-) 1.58 (0.22)	(-) 2.02 (0.18)	1.52 (0.73)	(-) 1.07 (0.71)	(-) 2.06 (0.14)	3.06 (0.12)	1.83 (0.04)	3.46 (0.04)	3.16 (0.45)	3.46 (0.03)
	ΔR	(-) 0.65 (0.06)	(-) 0.74 (0.03)	(-) 0.82 (0.05)	0.43 (0.48)	(-) 0.10 (0.83)	0.49 (0.58)	1.13 (0.55)	0.04 (0.97)	(-) 0.81 (0.70)	(-) 1.38 (0.51)	0.69 (0.73)	2.11 (0.35)
	EC_{t-1}	(-) 1.10 (0.00)	(-) 1.03 (0.00)	(-) 1.34 (0.00)	(-) 0.61 (0.00)	(-) 0.59 (0.00)	(-) 0.61 (0.00)	(-) 0.84 (0.00)	(-) 0.79 (0.00)	(-) 1.07 (0.00)	(-) 0.72 (0.00)	(-) 0.94 (0.00)	(-) 1.14 (0.00)
	LAG	(3,0,0,0)	(4,0,0,0)	(2,3,0,2)	(1,0,0,0)	(1,0,0,0)	(1,0,0,1)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)
	F-S	5.30*	4.46	7.75*	5.67*	5.07*	5.33*	8.70*	7.73*	5.01*	6.97*	12.03*	17.87*

3	POS	2.86 (0.00)	2.18 (0.39)	(-) 1.75 (0.08)	(-) 3.18 (0.00)	(-) 2.99 (0.37)	0.32 (0.79)	2.41 (0.37)	(-) 4.25 (0.43)	(-) 3.93 (0.03)	(-) 4.22 (0.04)	(-) 3.34 (0.61)	(-) 3.60 (0.23)
	NEG	(-) 0.27 (0.58)	(-) 2.78 (0.08)	3.16 (0.00)	(-) 0.03 (0.96)	(-) 2.81 (0.46)	3.37 (0.01)	2.35 (0.54)	(-) 3.17 (0.33)	(-) 3.02 (0.12)	(-) 2.21 (0.08)	(-) 2.75 (0.67)	(-) 3.06 (0.28)
	ΔR	0.10 (0.41)	0.26 (0.23)	(-) 0.06 (0.71)	0.26 (0.51)	0.41 (0.40)	(-) 0.08 (0.84)	(-) 4.93 (0.31)	(-) 3.50 (0.30)	(-) 0.28 (0.91)	0.61 (0.77)	(-) 0.60 (0.77)	0.59 (0.76)
	EC_{t-1}	(-) 1.31 (0.00)	(-) 1.04 (0.00)	(-) 1.95 (0.00)	(-) 0.72 (0.00)	(-) 0.77 (0.00)	(-) 0.84 (0.00)	(-) 0.65 (0.00)	(-) 0.86 (0.00)	(-) 1.03 (0.00)	(-) 1.39 (0.00)	(-) 0.83 (0.00)	(-) 1.01 (0.00)
	LAG	(2,0,0,0)	(2,0,0,0)	(3,2,0,0)	(2,0,0,0)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(2,0,0,0)	(4,0,0,0)	(5,0,0,0)	(1,0,0,0)	(3,0,0,0)
	F-S	9.91*	6.04*	8.63*	3.83	5.22*	6.38*	5.11*	4.00	5.44*	5.22*	7.82*	4.58
4	POS	0.46 (0.87)	1.87 (0.80)	1.55 (0.48)	(-) 0.14 (0.63)	3.16 (0.02)	1.34 (0.01)	0.98 (0.57)	(-) 3.42 (0.53)	(-) 2.14 (0.02)	1.12 (0.02)	(-) 3.94 (0.07)	1.77 (0.15)
	NEG	2.38 (0.58)	1.46 (0.78)	1.83 (0.43)	2.52 (0.02)	1.85 (0.02)	0.84 (0.11)	2.47 (0.41)	(-) 1.37 (0.79)	1.84 (0.02)	(-) 1.64 (0.27)	(-) 2.14 (0.09)	0.86 (0.49)
	ΔR	(-) 2.56 (0.70)	2.13 (0.75)	(-) 2.76 (0.69)	0.27 (0.79)	0.56 (0.58)	0.65 (0.59)	1.70 (0.33)	1.43 (0.45)	2.18 (0.01)	4.90 (0.09)	0.52 (0.52)	0.38 (0.61)
	EC_{t-1}	(-) 0.57 (0.00)	(-) 1.11 (0.00)	(-) 0.62 (0.00)	(-) 1.83 (0.00)	(-) 2.03 (0.00)	(-) 1.62 (0.00)	(-) 0.96 (0.00)	(-) 1.06 (0.00)	(-) 0.71 (0.00)	(-) 0.89 (0.00)	(-) 1.24 (0.00)	(-) 0.77 (0.00)
	LAG	(2,0,0,0)	(9,0,0,0)	(2,0,0,0)	(4,0,1,4)	(4,0,0,0)	(2,0,0,0)	(3,0,0,0)	(5,0,0,0)	(2,0,1,2)	(3,0,1,2)	(5,0,0,0)	(3,0,0,0)
	F-S	4.25*	2.93	3.77	10.23*	13.75*	23.75*	7.82*	7.12*	5.14*	17.51*	12.43*	5.18*
5	POS	(-) 1.63 (0.56)	(-) 1.30 (0.81)	0.98 (0.67)	3.25 (0.65)	(-) 2.32 (0.95)	(-) 2.43 (0.75)	1.19 (0.46)	0.77 (0.90)	1.99 (0.44)	(-) 2.62 (0.21)	0.89 (0.76)	2.23 (0.24)
	NEG	(-) 1.80 (0.65)	0.78 (0.82)	1.17 (0.62)	3.10 (0.65)	2.49 (0.93)	(-) 2.11 (0.76)	1.68 (0.47)	0.46 (0.89)	2.18 (0.43)	0.73 (0.12)	0.68 (0.80)	(-) 1.91 (0.31)
	ΔR	2.40 (0.75)	(-) 0.39 (0.92)	2.23 (0.76)	(-) 2.38 (0.89)	(-) 1.16 (0.95)	2.77 (0.88)	(-) 0.35 (0.84)	(-) 0.13 (0.94)	(-) 0.48 (0.78)	0.06 (0.96)	0.03 (0.97)	0.06 (0.59)
	EC_{t-1}	(-) 0.45 (0.00)	(-) 0.39 (0.00)	(-) 0.47 (0.00)	(-) 0.66 (0.00)	(-) 0.78 (0.00)	(-) 0.85 (0.00)	(-) 0.62 (0.00)	(-) 0.60 (0.00)	(-) 0.56 (0.00)	(-) 0.67 (0.00)	(-) 0.60 (0.00)	(-) 0.62 (0.00)
	LAG	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,1,0,0)	(1,0,0,0)	(1,0,1,0)
	F-S	2.89	2.30	2.33	3.55	2.93	7.44*	5.76*	4.45*	5.78*	6.90*	4.65*	4.46*
6	POS	2.87 (0.13)	(-) 4.54 (0.41)	2.32 (0.23)	(-) 4.43 (0.16)	(-) 4.44 (0.08)	(-) 3.68 (0.26)	(-) 4.94 (0.15)	(-) 4.22 (0.60)	(-) 3.83 (0.29)	(-) 0.28 (0.97)	(-) 1.38 (0.89)	2.83 (0.88)
	NEG	4.94 (0.09)	(-) 3.17 (0.56)	2.05 (0.28)	(-) 2.03 (0.27)	(-) 4.11 (0.12)	(-) 4.52 (0.16)	1.05 (0.83)	(-) 3.08 (0.69)	(-) 3.45 (0.36)	1.45 (0.78)	2.79 (0.78)	(-) 0.10 (0.99)
	ΔR	2.76 (0.55)	2.36 (0.63)	2.04 (0.71)	0.41 (0.96)	(-) 3.84 (0.68)	(-) 1.64 (0.87)	0.72 (0.00)	(-) 0.12 (0.20)	0.03 (0.52)	0.06 (0.75)	0.41 (0.12)	(-) 0.06 (0.75)

	EC_{t-1}	(-) 1.07 (0.00)	(-) 1.15 (0.00)	(-) 0.98 (0.00)	(-) 1.24 (0.00)	(-) 1.06 (0.00)	(-) 1.65 (0.00)	(-) 1.16 (0.00)	(-) 1.24 (0.00)	(-) 2.59 (0.00)	(-) 1.05 (0.00)	(-) 1.37 (0.00)	(-) 1.35 (0.00)
	LAG	(2,0,0,0)	(1,0,0,0)	(2,0,0,0)	(2,0,0,0)	(1,0,0,0)	(6,0,0,0)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(2,0,0,0)	(1,0,0,0)	(1,0,0,0)
	F-S	5.04*	10.44*	3.96*	7.54*	10*	4.24*	22.59*	21.42*	19.88*	5.82*	22.18*	27.25*
7	POS	1.15 (0.27)	2.06 (0.35)	(-) 0.94 (0.43)	1.71 (0.05)	(-) 3.93 (0.29)	(-) 1.01 (0.20)	3.00 (0.03)	2.03 (0.37)	(-) 2.10 (0.00)	(-) 2.08 (0.00)	(-) 0.84 (0.71)	(-) 0.74 (0.13)
	NEG	(-) 0.45 (0.78)	1.55 (0.53)	(-) 1.62 (0.13)	(-) 1.01 (0.63)	(-) 2.27 (0.57)	2.30 (0.04)	(-) 0.78 (0.55)	4.48 (0.06)	(-) 1.83 (0.00)	(-) 1.06 (0.01)	(-) 0.99 (0.67)	(-) 0.99 (0.10)
	ΔR	(-) 0.32 (0.26)	(-) 0.13 (0.64)	(-) 0.72 (0.48)	1.42 (0.00)	0.15 (0.74)	2.81 (0.11)	2.81 (0.00)	3.87 (0.00)	3.76 (0.00)	(-) 0.50 (0.48)	0.68 (0.36)	0.65 (0.33)
	EC_{t-1}	(-) 0.37 (0.00)	(-) 0.52 (0.00)	(-) 0.69 (0.00)	(-) 1.44 (0.00)	(-) 0.84 (0.00)	(-) 0.66 (0.00)	(-) 0.90 (0.00)	(-) 1.44 (0.00)	(-) 1.49 (0.00)	(-) 0.53 (0.00)	(-) 0.85 (0.00)	(-) 0.69 (0.00)
	LAG	(4,0,0,0)	(1,0,0,0)	(1,0,0,0)	(4,0,2,1)	(2,0,0,0)	(1,0,1,1)	(3,0,0,0)	(6,0,0,0)	(4,0,0,0)	(1,0,0,0)	(2,0,0,0)	(1,0,0,0)
	F-S	1.85	3.80	5.29*	7.05*	5.19*	5.29*	5.50*	6.79*	10.44*	3.99*	4.11*	5.18*
8	POS	1.63 (0.50)	(-) 3.26 (0.34)	(-) 1.17 (0.30)	2.59 (0.06)	2.01 (0.67)	1.26 (0.15)	(-) 2.26 (0.42)	(-) 3.97 (0.71)	3.48 (0.07)	1.86 (0.66)	2.48 (0.93)	1.77 (0.80)
	NEG	1.45 (0.48)	(-) 0.85 (0.82)	(-) 1.19 (0.29)	2.15 (0.15)	0.23 (0.93)	1.76 (0.06)	(-) 2.14 (0.57)	0.62 (0.95)	3.64 (0.07)	2.73 (0.38)	4.51 (0.87)	0.41 (0.95)
	ΔR	(-) 0.38 (0.72)	0.60 (0.47)	(-) 0.38 (0.67)	(-) 0.46 (0.55)	(-) 1.18 (0.24)	1.37 (0.17)	3.79 (0.13)	4.05 (0.17)	3.07 (0.16)	0.46 (0.00)	(-) 0.01 (0.96)	(-) 0.04 (0.78)
	EC_{t-1}	(-) 0.51 (0.01)	(-) 0.77 (0.00)	(-) 0.35 (0.00)	(-) 0.75 (0.00)	(-) 0.75 (0.00)	(-) 0.79 (0.00)	(-) 0.75 (0.00)	(-) 1.01 (0.00)	(-) 0.80 (0.00)	(-) 0.86 (0.00)	(-) 0.88 (0.00)	(-) 0.86 (0.00)
	LAG	(3,0,0,0)	(3,0,0,0)	(1,1,0,0)	(1,0,0,0)	(1,00,0)	(1,0,0,0)	(1,0,0,0)	(7,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)
	F-S	1.17	1.92	1.55	5.08*	5.81*	8.35*	5.21*	1.84	6.94*	10.05*	6.14*	9.02*
9	POS	2.48 (0.22)	(-) 2.60 (0.32)	1.91 (0.07)	(-) 0.36 (0.71)	(-) 0.95 (0.83)	0.96 (0.49)	(-) 0.60 (0.57)	(-) 3.20 (0.24)	(-) 2.52 (0.00)	(-) 2.09 (0.00)	3.30 (0.10)	(-) 2.82 (0.00)
	NEG	2.73 (0.22)	(-) 2.23 (0.42)	1.80 (0.08)	1.09 (0.20)	1.05 (0.70)	(-) 1.90 (0.13)	0.54 (0.70)	(-) 2.08 (0.41)	(-) 2.15 (0.03)	(-) 1.24 (0.00)	3.26 (0.10)	(-) 2.70 (0.00)
	ΔR	(-) 2.42 (0.05)	(-) 0.73 (0.37)	(-) 1.20 (0.24)	3.13 (0.12)	1.56 (0.39)	1.50 (0.26)	0.46 (0.00)	2.46 (0.10)	2.76 (0.00)	(-) 0.45 (0.51)	1.20 (0.09)	1.09 (0.11)
	EC_{t-1}	(-) 0.54 (0.00)	(-) 0.54 (0.00)	(-) 0.60 (0.00)	(-) 1.32 (0.00)	(-) 1.21 (0.00)	(-) 1.00 (0.00)	(-) 0.49 (0.00)	(-) 1.32 (0.00)	(-) 0.94 (0.00)	(-) 0.76 (0.00)	(-) 0.85 (0.00)	(-) 0.96 (0.00)
	LAG	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(4,0,0,0)	(4,0,0,0)	(1,0,0,0)	(1,0,0,0)	(4,0,0,0)	(3,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)
	F-S	6.63*	4.28	3.67	5.03*	4.02	8.92*	5.21*	4.80*	5.18*	10.18*	9.55*	13.22*
10	POS	1.03 (0.53)	(-) 1.53 (0.69)	(-) 1.25 (0.08)	1.39 (0.00)	(-) 2.74 (0.13)	(-) 0.53 (0.69)	(-) 2.23 (0.67)	(-) 3.47 (0.71)	(-) 3.88 (0.29)	0.86 (0.66)	0.50 (0.94)	(-) 2.49 (0.19)

	NEG	1.13 (0.53)	(-) 2.62 (0.52)	0.84 (0.12)	(-) 2.33 (0.06)	(-) 3.25 (0.08)	(-) 0.75 (0.63)	(-) 1.20 (0.88)	(-) 2.81 (0.79)	(-) 4.54 (0.23)	0.47 (0.72)	0.87 (0.89)	(-) 2.68 (0.18)
	ΔR	(-) 1.11 (0.28)	(-) 1.47 (0.36)	1.14 (0.24)	(-) 0.06 (0.93)	(-) 0.46 (0.33)	(-) 1.04 (0.28)	(-) 2.38 (0.57)	(-) 2.65 (0.59)	(-) 1.76 (0.73)	0.01 (0.90)	0.01 (0.85)	(-) 0.03 (0.42)
	EC_{t-1}	(-) 0.42 (0.00)	(-) 0.58 (0.03)	(-) 0.46 (0.00)	(-) 0.93 (0.00)	(-) 1.14 (0.00)	(-) 0.99 (0.00)	(-) 1.55 (0.00)	(-) 1.54 (0.00)	(-) 1.52 (0.00)	(-) 0.61 (0.00)	(-) 0.56 (0.00)	(-) 0.88 (0.00)
	LAG	(1,0,0,0)	(4,0,0,0)	(3,0,0,0)	(1,0,3,3)	(2,0,0,0)	(1,3,3,3)	(3,0,0,0)	(3,0,0,0)	(3,0,0,0)	(3,0,0,0)	(1,0,0,0)	(1,0,0,0)
	F-S	2.47	1.06	6.05*	12.06*	6.67*	7.85*	10.94*	10.92*	10.11*	1.91	10.46*	5.03*
11	POS	4.77 (0.02)	3.70 (0.32)	1.66 (0.01)	3.57 (0.22)	(-) 0.93 (0.93)	1.64 (0.58)	1.09 (0.61)	(-) 1.12 (0.88)	(-) 3.21 (0.35)	(-) 1.46 (0.27)	(-) 4.41 (0.47)	(-) 1.51 (0.16)
	NEG	(-) 4.07 (0.08)	(-) 3.84 (0.18)	1.95 (0.00)	1.49 (0.63)	(-) 4.27 (0.57)	2.18 (0.39)	1.35 (0.63)	(-) 2.08 (0.77)	(-) 2.37 (0.51)	2.83 (0.50)	(-) 3.83 (0.56)	(-) 1.54 (0.15)
	ΔR	(-) 2.15 (0.01)	(-) 1.24 (0.08)	0.37 (0.44)	(-) 0.31 (0.91)	(-) 1.86 (0.40)	0.43 (0.00)	3.76 (0.08)	2.21 (0.34)	5.63 (0.00)	1.06 (0.51)	1.21 (0.49)	1.93 (0.17)
	EC_{t-1}	(-) 1.49 (0.00)	(-) 0.75 (0.00)	(-) 1.27 (0.00)	(-) 1.44 (0.00)	(-) 0.86 (0.00)	(-) 0.84 (0.00)	(-) 0.74 (0.00)	(-) 0.51 (0.00)	(-) 1.29 (0.00)	(-) 1.02 (0.00)	(-) 1.13 (0.01)	(-) 1.19 (0.00)
	LAG	(4,0,0,0)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(1,0,0,0)	(1,0,0,0)	(2,0,0,0)	(1,0,0,0)	(4,0,0,0)	(1,0,2,0)	(8,0,0,0)	(4,0,0,0)
	F-S	5.25*	4.80*	4.49*	7.2*	8.22*	6.87*	4.78*	2.58	6.54*	13.37*	1.68	6.43*
12	POS	2.67 (0.44)	(-) 3.19 (0.71)	2.47 (0.00)	(-) 2.84 (0.01)	0.07 (0.98)	0.45 (0.56)	(-) 1.59 (0.84)	(-) 2.58 (0.88)	(-) 0.49 (0.93)	(-) 2.39 (0.70)	(-) 0.68 (0.96)	(-) 1.17 (0.93)
	NEG	2.83 (0.52)	(-) 3.63 (0.69)	1.91 (0.00)	0.11 (0.81)	2.49 (0.39)	1.59 (0.02)	1.68 (0.91)	(-) 0.27 (0.98)	(-) 1.45 (0.81)	(-) 1.67 (0.66)	1.30 (0.92)	2.25 (0.88)
	ΔR	(-) 2.38 (0.33)	(-) 1.22 (0.72)	0.64 (0.31)	0.01 (0.98)	(-) 0.48 (0.58)	0.56 (0.61)	0.15 (0.71)	0.06 (0.71)	(-) 0.05 (0.70)	0.05 (0.83)	0.08 (0.77)	0.15 (0.61)
	EC_{t-1}	(-) 0.63 (0.03)	(-) 0.75 (0.04)	(-) 0.60 (0.00)	(-) 0.97 (0.00)	(-) 0.51 (0.00)	(-) 0.96 (0.00)	(-) 1.31 (0.00)	(-) 0.89 (0.00)	(-) 0.40 (0.00)	(-) 0.80 (0.01)	(-) 0.91 (0.00)	(-) 0.93 (0.00)
	LAG	(3,0,0,0)	(6,0,0,0)	(1,0,0,0)	(4,0,0,0)	(2,0,0,0)	(1,0,0,0)	(8,0,0,0)	(7,0,0,0)	(3,0,0,0)	(8,0,0,0)	(8,0,0,0)	(8,0,0,0)
	F-S	0.86	0.80	4.56*	4.61*	2.67	3.20	6.08*	3.44	1.61	1.66	1.91	1.89
13	POS	(-) 1.25 (0.56)	1.51 (0.65)	2.95 (0.00)	(-) 1.65 (0.10)	2.40 (0.19)	1.56 (0.46)	2.87 (0.01)	(-) 0.67 (0.84)	(-) 3.48 (0.03)	(-) 2.33 (0.49)	2.58 (0.80)	(-) 3.85 (0.22)
	NEG	1.00 (0.42)	1.46 (0.69)	2.10 (0.05)	(-) 4.21 (0.02)	1.91 (0.35)	4.05 (0.03)	2.66 (0.06)	1.57 (0.66)	(-) 2.20 (0.16)	(-) 1.55 (0.39)	2.78 (0.79)	(-) 3.23 (0.32)
	ΔR	(-) 1.39 (0.16)	(-) 0.25 (0.73)	(-) 0.68 (0.29)	(-) 0.68 (0.21)	(-) 0.03 (0.96)	1.56 (0.00)	(-) 0.84 (0.52)	1.10 (0.31)	1.95 (0.05)	0.13 (0.97)	(-) 1.40 (0.65)	(-) 2.58 (0.33)
	EC_{t-1}	(-) 0.39 (0.00)	(-) 0.38 (0.01)	(-) 0.29 (0.00)	(-) 0.49 (0.00)	(-) 0.51 (0.00)	(-) 0.95 (0.00)	(-) 0.37 (0.00)	(-) 0.35 (0.00)	(-) 0.61 (0.00)	(-) 1.15 (0.00)	(-) 1.04 (0.00)	(-) 0.79 (0.00)

	LAG	(1,0,0,1)	(2,0,0,0)	(1,0,0,0)	(1,0,1,2)	(1,0,0,2)	(2,0,2,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(4,0,0,0)	(3,0,0,0)	(1,0,0,0)
	F-S	2.20	1.32	6.87*	4.57*	2.55	5.40*	5.50*	2.36	4.75*	5.88*	5.39*	8.05*
14	POS	(-) 1.74 (0.78)	(-) 1.01 (0.94)	0.72 (0.79)	(-) 4.74 (0.48)	1.28 (0.80)	(-) 2.01 (0.62)	(-) 0.31 (0.85)	1.09 (0.76)	(-) 1.06 (0.49)	0.80 (0.76)	2.11 (0.86)	2.31 (0.59)
	NEG	(-) 1.06 (0.92)	0.84 (0.91)	1.19 (0.68)	(-) 2.16 (0.51)	2.40 (0.66)	(-) 2.46 (0.58)	0.95 (0.66)	(-) 2.51 (0.56)	(-) 1.30 (0.41)	0.86 (0.77)	2.20 (0.90)	2.23 (0.60)
	ΔR	(-) 1.41 (0.81)	(-) 0.06 (0.99)	0.18 (0.97)	0.10 (0.58)	0.10 (0.46)	0.01 (0.91)	0.72 (0.63)	(-) 0.11 (0.01)	0.99 (0.41)	0.01 (0.80)	(-) 0.25 (0.18)	0.02 (0.77)
	EC_{t-1}	(-) 0.35 (0.01)	(-) 0.24 (0.02)	(-) 1.17 (0.00)	(-) 1.07 (0.00)	(-) 0.89 (0.00)	(-) 0.90 (0.00)	(-) 0.38 (0.00)	(-) 0.58 (0.00)	(-) 0.45 (0.00)	(-) 0.65 (0.00)	(-) 0.47 (0.00)	(-) 0.65 (0.00)
	LAG	(5,0,0,0)	(1,0,0,0)	(7,0,0,0)	(3,0,0,0)	(1,0,0,0)	(1,0,0,0)	(4,0,2,0)	(8,0,0,0)	(5,0,0,0)	(5,0,0,0)	(9,0,0,0)	(5,0,0,0)
	F-S	1.17	1.24	1.08	3.96*	7.27*	10.26*	2.58	6.83*	4.33	2.80	6.07*	2.57
15	POS	(-) 2.35 (0.53)	(-) 0.15 (0.97)	2.90 (0.03)	1.47 (0.56)	2.26 (0.80)	2.92 (0.09)	(-) 4.82 (0.00)	2.55 (0.26)	0.74 (0.19)	(-) 3.07 (0.05)	(-) 3.33 (0.55)	(-) 0.69 (0.44)
	NEG	1.15 (0.62)	(-) 1.50 (0.72)	2.08 (0.10)	2.51 (0.18)	2.63 (0.74)	(-) 0.90 (0.59)	2.77 (0.12)	1.97 (0.38)	0.97 (0.06)	1.75 (0.08)	(-) 3.85 (0.48)	1.40 (0.08)
	ΔR	(-) 1.26 (0.65)	(-) 0.88 (0.60)	(-) 2.31 (0.34)	0.30 (0.04)	0.02 (0.87)	0.57 (0.87)	(-) 0.99 (0.07)	0.61 (0.33)	(-) 0.37 (0.52)	(-) 2.86 (0.09)	(-) 0.18 (0.92)	(-) 1.94 (0.16)
	EC_{t-1}	(-) 0.62 (0.00)	(-) 0.66 (0.00)	(-) 0.58 (0.00)	(-) 0.52 (0.00)	(-) 0.47 (0.00)	(-) 0.60 (0.00)	(-) 1.45 (0.00)	(-) 2.13 (0.00)	(-) 0.55 (0.00)	(-) 0.87 (0.00)	(-) 1.54 (0.00)	(-) 0.67 (0.00)
	LAG	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(3,0,0,0)	(1,0,1,0)	(4,0,0,0)	(5,0,0,0)	(1,0,0,0)	(2,0,0,0)	(6,0,0,0)	(2,0,0,0)
	F-S	4.40*	4.76*	5.57*	1.59	2.11	4.69*	10.77*	11.04*	4.29*	8.88*	3.26	10.15*
16	POS	(-) 1.93 (0.04)	(-) 0.28 (0.86)	1.40 (0.09)	0.05 (0.98)	(-) 3.33 (0.74)	2.30 (0.43)	2.77 (0.50)	3.20 (0.63)	(-) 3.02 (0.22)	1.97 (0.75)	(-) 1.51 (0.93)	1.03 (0.84)
	NEG	(-) 0.37 (0.60)	2.05 (0.31)	2.14 (0.02)	2.56 (0.36)	(-) 3.18 (0.73)	3.88 (0.16)	2.92 (0.49)	1.16 (0.79)	(-) 2.98 (0.26)	(-) 0.38 (0.90)	0.92 (0.96)	1.59 (0.77)
	ΔR	1.60 (0.04)	1.21 (0.12)	1.39 (0.25)	1.91 (0.60)	0.02 (0.86)	2.68 (0.45)	(-) 2.14 (0.46)	(-) 1.93 (0.51)	(-) 0.04 (0.40)	(-) 0.08 (0.59)	0.06 (0.71)	0.09 (0.55)
	EC_{t-1}	(-) 0.77 (0.00)	(-) 0.67 (0.00)	(-) 0.47 (0.00)	(-) 1.17 (0.00)	(-) 1.18 (0.00)	(-) 1.22 (0.00)	(-) 0.62 (0.00)	(-) 0.65 (0.00)	(-) 0.97 (0.00)	(-) 0.54 (0.00)	(-) 0.61 (0.00)	(-) 0.55 (0.00)
	LAG	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(5,0,0,0)	(2,0,0,0)	(1,0,0,0)	(1,0,0,0)
	F-S	5.02*	4.01*	3.03	12.39*	16.21*	15.71*	6.52*	8.13*	4.11*	2.03	4.45*	4.39*
17	POS	1.65 (0.64)	(-) 2.05 (0.73)	(-) 1.35 (0.09)	(-) 4.22 (0.30)	(-) 3.17 (0.78)	3.60 (0.18)	(-) 1.36 (0.79)	2.12 (0.74)	1.22 (0.82)	(-) 3.43 (0.44)	2.22 (0.60)	2.70 (0.32)
	NEG	1.51 (0.63)	(-) 1.38 (0.82)	(-) 1.17 (0.07)	(-) 2.35 (0.29)	(-) 3.64 (0.76)	3.41 (0.15)	(-) 1.00 (0.88)	0.27 (0.96)	0.86 (0.89)	(-) 2.67 (0.37)	1.60 (0.71)	2.06 (0.49)

	ΔR	(-) 1.93 (0.21)	(-) 1.37 (0.44)	(-) 0.28 (0.39)	0.11 (0.39)	0.02 (0.83)	(-) 0.02 (0.82)	2.63 (0.57)	1.11 (0.84)	0.53 (0.92)	2.93 (0.66)	(-) 4.39 (0.53)	(-) 4.38 (0.52)
	EC_{t-1}	(-) 0.42 (0.00)	(-) 0.42 (0.00)	(-) 0.72 (0.00)	(-) 0.80 (0.00)	(-) 0.81 (0.00)	(-) 0.84 (0.00)	(-) 0.48 (0.00)	(-) 0.40 (0.02)	(-) 0.40 (0.02)	(-) 0.58 (0.00)	(-) 0.74 (0.00)	(-) 0.75 (0.00)
	LAG	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(4,0,0,0)	(4,0,0,0)	(4,0,0,0)	(1,0,0,0)	(3,0,0,0)	(3,0,0,0)	(5,0,0,0)	(6,0,0,0)	(6,0,0,0)
	F-S	4.40*	4.04*	4.65*	4.81*	4.41*	4.84*	3.37	1.01	1.04	3.86	4.66*	5.23*
18	POS	2.72 (0.00)	(-) 2.62 (0.59)	0.32 (0.55)	(-) 1.96 (0.03)	(-) 0.64 (0.85)	(-) 1.86 (0.00)	1.09 (0.05)	3.40 (0.03)	1.23 (0.10)	(-) 2.70 (0.05)	2.63 (0.60)	(-) 1.52 (0.16)
	NEG	(-) 1.72 (0.09)	2.12 (0.67)	1.96 (0.00)	0.32 (0.68)	2.45 (0.52)	1.90 (0.04)	(-) 0.99 (0.03)	(-) 1.67 (0.20)	1.06 (0.07)	1.90 (0.24)	2.99 (0.19)	(-) 0.42 (0.63)
	ΔR	0.17 (0.85)	0.33 (0.91)	2.45 (0.02)	1.65 (0.25)	0.72 (0.74)	3.44 (0.00)	0.13 (0.67)	0.71 (0.06)	0.31 (0.38)	(-) 0.32 (0.78)	0.18 (0.87)	(-) 0.80 (0.38)
	EC_{t-1}	(-) 0.76 (0.00)	(-) 0.65 (0.00)	(-) 0.72 (0.00)	(-) 0.76 (0.00)	(-) 0.65 (0.00)	(-) 0.83 (0.00)	(-) 0.81 (0.00)	(-) 0.87 (0.00)	(-) 0.88 (0.00)	(-) 0.72 (0.00)	(-) 0.71 (0.00)	(-) 0.64 (0.00)
	LAG	(3,0,0,0)	(1,0,0,0)	(3,0,0,0)	(2,0,0,0)	(1,0,0,0)	(2,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,3,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)
	F-S	118.8*	10.67*	81.56*	25.07*	8.12*	44.14*	7.06*	6.85*	7.49*	4.78*	4.59*	4.23
19	POS	(-) 1.61 (0.53)	(-) 2.28 (0.63)	0.27 (0.86)	(-) 2.01 (0.00)	(-) 1.80 (0.50)	2.02 (0.04)	3.07 (0.07)	(-) 3.54 (0.21)	1.35 (0.27)	(-) 0.74 (0.43)	(-) 2.02 (0.80)	3.74 (0.35)
	NEG	2.22 (0.22)	0.92 (0.81)	(-) 1.86 (0.32)	(-) 0.82 (0.15)	0.74 (0.74)	(-) 2.19 (0.01)	(-) 1.65 (0.50)	2.12 (0.33)	2.62 (0.03)	(-) 1.48 (0.03)	2.34 (0.64)	1.82 (0.50)
	ΔR	1.21 (0.32)	1.29 (0.24)	0.39 (0.73)	1.19 (0.01)	0.47 (0.38)	(-) 0.17 (0.75)	2.50 (0.00)	2.08 (0.01)	3.76 (0.00)	(-) 0.36 (0.72)	2.73 (0.27)	3.60 (0.17)
	EC_{t-1}	(-) 0.90 (0.00)	(-) 0.73 (0.00)	(-) 0.92 (0.00)	(-) 0.56 (0.00)	(-) 0.42 (0.00)	(-) 0.84 (0.00)	(-) 0.89 (0.00)	(-) 1.10 (0.00)	(-) 0.76 (0.00)	(-) 0.55 (0.00)	(-) 0.66 (0.00)	(-) 0.97 (0.00)
	LAG	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(4,0,0,0)	(4,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(3,0,0,0)
	F-S	37.19*	4.54*	39.93*	13.13*	1.78	20.54*	5.38*	9.74*	6.51*	4.55*	10.46*	6.88*
20	POS	(-) 1.53 (0.25)	4.57 (0.01)	(-) 0.21 (0.77)	(-) 3.37 (0.04)	(-) 0.44 (0.93)	(-) 0.48 (0.86)	(-) 0.60 (0.49)	3.78 (0.13)	0.58 (0.41)	2.28 (0.05)	3.10 (0.77)	3.75 (0.13)
	NEG	(-) 2.52 (0.04)	4.07 (0.02)	0.85 (0.21)	(-) 3.21 (0.06)	4.14 (0.29)	(-) 3.02 (0.30)	2.48 (0.22)	(-) 2.60 (0.19)	0.56 (0.37)	3.02 (0.00)	3.83 (0.46)	4.18 (0.04)
	ΔR	0.33 (0.50)	0.53 (0.00)	0.08 (0.89)	(-) 2.08 (0.16)	1.75 (0.12)	0.18 (0.90)	0.17 (0.89)	0.15 (0.77)	(-) 0.28 (0.82)	0.40 (0.00)	(-) 1.50 (0.58)	(-) 3.54 (0.06)
	EC_{t-1}	(-) 0.99 (0.00)	(-) 0.94 (0.00)	(-) 0.90 (0.00)	(-) 0.67 (0.00)	(-) 0.60 (0.00)	(-) 0.93 (0.00)	(-) 1.01 (0.00)	(-) 0.99 (0.00)	(-) 0.83 (0.00)	(-) 1.02 (0.00)	(-) 0.92 (0.00)	(-) 1.15 (0.00)
	LAG	(4,0,0,0)	(4,0,0,0)	(2,0,0,0)	(1,0,0,0)	(1,0,0,0)	(8,0,0,0)	(3,0,1,2)	(4,0,0,0)	(2,0,0,2)	(2,0,0,0)	(1,0,0,0)	(3,0,0,0)
	F-S	4.26*	32.69*	79.5*	13.33*	16.89*	16.58*	5.77*	4.38*	4.43*	4.43*	8.53*	4.86*

21	POS	3.35 (0.09)	0.95 (0.68)	0.77 (0.03)	(-) 3.88 (0.00)	1.97 (0.57)	1.01 (0.21)	(-) 0.88 (0.60)	(-) 3.70 (0.55)	(-) 1.01 (0.66)	(-) 1.62 (0.24)	0.22 (0.97)	(-) 4.42 (0.31)
	NEG	3.99 (0.03)	1.53 (0.51)	2.27 (0.00)	(-) 1.96 (0.02)	4.60 (0.25)	1.65 (0.02)	0.96 (0.66)	(-) 2.53 (0.70)	2.36 (0.26)	(-) 1.58 (0.16)	2.13 (0.80)	(-) 2.82 (0.41)
	ΔR	(-) 2.12 (0.00)	(-) 1.27 (0.02)	(-) 0.53 (0.15)	(-) 0.01 (0.98)	0.85 (0.28)	2.30 (0.02)	(-) 0.20 (0.89)	5.79 (0.01)	3.72 (0.04)	4.88 (0.14)	2.57 (0.54)	1.95 (0.58)
	EC_{t-1}	(-) 0.93 (0.00)	(-) 0.56 (0.00)	(-) 0.70 (0.00)	(-) 0.90 (0.00)	(-) 0.82 (0.00)	(-) 0.49 (0.00)	(-) 0.23 (0.00)	(-) 0.86 (0.00)	(-) 0.66 (0.00)	(-) 1.36 (0.00)	(-) 0.85 (0.00)	(-) 1.42 (0.00)
	LAG	(4,0,0,0)	(5,0,0,0)	(2,0,0,0)	(4,0,0,0)	(4,0,0,0)	(1,0,0,0)	(2,0,0,0)	(8,0,0,0)	(7,0,0,0)	(1,0,0,0)	(2,0,0,0)	(1,0,0,0)
	F-S	55.01*	5.75*	5.00*	8.76*	2.81	4.07*	2.95	5.14*	4.40*	18.81*	3.97	19.74*
22	POS	3.48 (0.18)	0.97 (0.41)	1.10 (0.36)	3.03 (0.01)	2.69 (0.35)	1.08 (0.11)	1.84 (0.35)	1.01 (0.95)	0.83 (0.69)	2.59 (0.72)	2.43 (0.88)	1.60 (0.84)
	NEG	0.13 (0.94)	(-) 0.64 (0.56)	(-) 0.37 (0.74)	(-) 0.17 (0.84)	(-) 4.49 (0.33)	(-) 0.82 (0.33)	1.51 (0.55)	(-) 2.62 (0.74)	0.30 (0.87)	(-) 0.35 (0.91)	(-) 3.80 (0.80)	(-) 0.36 (0.96)
	ΔR	1.24 (0.59)	3.16 (0.21)	3.31 (0.20)	2.88 (0.04)	2.57 (0.05)	1.10 (0.57)	(-) 1.72 (0.26)	(-) 0.78 (0.80)	(-) 0.84 (0.52)	(-) 0.25 (0.30)	(-) 0.33 (0.13)	(-) 0.14 (0.34)
	EC_{t-1}	(-) 1.05 (0.00)	(-) 0.83 (0.00)	(-) 0.88 (0.00)	(-) 0.64 (0.00)	(-) 0.62 (0.00)	(-) 0.76 (0.00)	(-) 0.67 (0.00)	(-) 1.02 (0.00)	(-) 0.77 (0.00)	(-) 2.20 (0.00)	(-) 1.97 (0.00)	(-) 2.20 (0.00)
	LAG	(2,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,2)	(1,0,2,2)	(1,0,1,2)	(2,0,0,0)	(10,0,0,0)	(4,0,0,0)	(5,0,0,0)	(6,0,0,0)	(5,0,0,0)
	F-S	4.55*	6.46*	6.50*	4.74*	5.06*	6.12*	4.41*	1.51	3.61	8.67*	4.09*	8.72*
23	POS	0.08 (0.92)	2.96 (0.03)	1.07 (0.08)	(-) 3.53 (0.03)	(-) 3.97 (0.15)	(-) 1.36 (0.09)	(-) 1.19 (0.16)	(-) 2.85 (0.12)	0.92 (0.19)	1.62 (0.21)	(-) 1.95 (0.43)	1.32 (0.28)
	NEG	(-) 1.05 (0.05)	(-) 1.12 (0.39)	0.41 (0.42)	1.31 (0.47)	5.41 (0.02)	(-) 2.79 (0.00)	1.02 (0.44)	0.22 (0.90)	1.84 (0.01)	(-) 0.46 (0.74)	(-) 1.20 (0.61)	(-) 0.59 (0.53)
	ΔR	(-) 0.47 (0.27)	(-) 0.11 (0.65)	0.25 (0.57)	0.16 (0.78)	0.96 (0.03)	(-) 0.22 (0.68)	2.11 (0.00)	1.82 (0.00)	2.18 (0.00)	(-) 0.54 (0.64)	(-) 1.93 (0.08)	0.69 (0.51)
	EC_{t-1}	(-) 0.87 (0.00)	(-) 1.64 (0.00)	(-) 0.98 (0.00)	(-) 0.58 (0.00)	(-) 0.86 (0.00)	(-) 0.88 (0.00)	(-) 0.55 (0.00)	(-)0.67 (0.00)	(-) 0.51 (0.00)	(-) 0.87 (0.00)	(-) 0.79 (0.00)	(-) 1.00 (0.00)
	LAG	(1,0,0,2)	(1,0,0,0)	(1,0,0,2)	(1,1,2,1)	(4,0,0,0)	(2,0,0,0)	(3,0,0,0)	(4,0,0,0)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(6,0,0,0)
	F-S	7.04*	6.71*	24.57*	4.95*	3.76	14.73*	6.19*	8.22*	4.09*	64*	40.82*	10.1*
24	POS	2.42 (0.20)	1.20 (0.76)	(-) 2.35 (0.09)	1.78 (0.59)	3.36 (0.49)	2.96 (0.23)	(-) 2.60 (0.00)	(-) 2.60 (0.49)	(-) 3.99 (0.00)	2.34 (0.05)	(-) 2.89 (0.58)	(-) 3.71 (0.05)
	NEG	(-) 2.04 (0.20)	2.23 (0.53)	(-) 1.38 (0.35)	(-) 4.75 (0.00)	3.21 (0.42)	3.55 (0.11)	(-) 2.10 (0.01)	(-) 3.01 (0.24)	1.69 (0.22)	1.85 (0.03)	(-) 3.31 (0.53)	(-) 3.55 (0.06)
	ΔR	(-) 2.50 (0.07)	(-) 3.28 (0.01)	(-) 1.70 (0.26)	2.09 (0.26)	(-) 0.18 (0.89)	0.96 (0.54)	0.60 (0.24)	(-) 0.28 (0.58)	(-) 0.60 (0.41)	(-) 4.04 (0.37)	4.78 (0.01)	4.45 (0.00)
	EC_{t-1}	(-) 0.93	(-) 0.58	(-)1.05	(-) 1.12	(-) 0.99	(-) 0.91	(-) 0.94	(-) 0.99	(-) 0.98	(-) 1.66	(-) 1.17	(-) 1.22

		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	LAG	(3,0,0,0)	(3,0,0,0)	(1,0,0,1)	(1,2,0,2)	(4,0,0,0)	(3,0,0,0)	(1,0,0,0)	(1,2,0,2)	(3,0,2,0)	(2,0,0,1)	(1,0,0,0)	(1,0,0,0)
	F-S	4.99*	3.88	10.21*	7.55*	2.44	5.77*	9.59*	10.59*	36.99*	12.86*	15.72*	21.95*
25	POS	(-) 2.02 (0.00)	0.13 (0.90)	2.60 (0.00)	0.30 (0.78)	1.49 (0.71)	(-) 0.16 (0.85)	1.29 (0.02)	2.57 (0.08)	(-) 1.38 (0.02)	(-) 2.86 (0.17)	1.15 (0.73)	1.15 (0.69)
	NEG	(-) 0.30 (0.65)	1.96 (0.12)	(-) 2.09 (0.00)	(-) 2.38 (0.00)	0.56 (0.89)	(-) 1.45 (0.16)	(-) 0.34 (0.39)	(-) 2.24 (0.03)	1.28 (0.02)	(-) 1.06 (0.28)	1.68 (0.48)	3.14 (0.33)
	ΔR	(-) 0.70 (0.39)	0.40 (0.68)	0.65 (0.39)	(-) 0.20 (0.84)	1.45 (0.56)	(-) 0.29 (0.81)	0.43 (0.10)	0.95 (0.00)	(-) 0.08 (0.79)	1.90 (0.28)	0.27 (0.02)	(-) 1.66 (0.72)
	EC_{t-1}	(-) 0.90 (0.00)	(-) 0.71 (0.00)	(-) 1.10 (0.00)	(-) 0.39 (0.00)	(-) 0.38 (0.01)	(-) 0.51 (0.00)	(-) 0.80 (0.00)	(-) 0.75 (0.00)	(-) 0.80 (0.00)	(-) 1.13 (0.00)	(-) 0.45 (0.00)	(-) 1.12 (0.00)
	LAG	(1,0,2,0)	(1,0,0,2)	(1,2,0,0)	(1,0,0,0)	(2,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(1,0,0,0)	(3,0,0,0)	(1,0,1,1)
	F-S	6.75*	6.15*	8.66*	4.77*	1.22	3.97*	5.97*	6.41*	6.09*	14.35*	3.84	9.53*
26	POS	1.45 (0.20)	(-) 2.08 (0.44)	2.91 (0.00)	(-) 0.47 (0.29)	0.53 (0.75)	1.93 (0.00)	(-) 0.75 (0.88)	(-) 2.42 (0.67)	(-) 0.76 (0.91)	(-) 2.47 (0.30)	(-) 3.29 (0.27)	0.88 (0.70)
	NEG	1.83 (0.14)	(-) 1.78 (0.51)	1.18 (0.03)	(-) 0.67 (0.14)	0.85 (0.59)	1.04 (0.00)	(-) 1.91 (0.79)	(-) 3.98 (0.53)	(-) 3.64 (0.66)	3.86 (0.04)	1.49 (0.66)	3.44 (0.09)
	ΔR	0.26 (0.81)	(-) 0.58 (0.47)	0.43 (0.71)	(-) 1.23 (0.03)	(-) 0.48 (0.32)	(-) 0.36 (0.33)	1.91 (0.67)	(-) 3.06 (0.47)	(-) 2.55 (0.60)	3.90 (0.03)	3.49 (0.01)	3.32 (0.00)
	EC_{t-1}	(-) 0.60 (0.00)	(-) 0.71 (0.00)	(-) 0.79 (0.00)	(-) 0.81 (0.00)	(-) 0.80 (0.00)	(-) 0.90 (0.00)	(-) 0.68 (0.00)	(-) 1.14 (0.00)	(-) 0.81 (0.00)	(-) 0.78 (0.00)	(-) 0.72 (0.00)	(-) 0.77 (0.00)
	LAG	(3,0,0,2)	(1,0,0,0)	(1,1,0,2)	(4,0,0,0)	(4,0,0,0)	(1,1,0,0)	(2,0,0,0)	(1,0,0,0)	(3,0,0,0)	(3,0,0,0)	(6,0,0,0)	(3,0,0,0)
	F-S	19.90*	48.28*	52.43*	65.15*	58.07*	156.76*	5.33*	8.06*	6.31*	6.07*	4.07	4.11*
Sectors	Imports Long-run							Exports Long-run					
		A'	B'	C'	A'	B'	C'	D'	E'	F'	D'	E'	F'
1	POS	3.92 (0.04)	(-) 4.85 (0.28)	(-) 2.13 (0.29)	(-) 0.71 (0.55)	0.57 (0.52)	1.50 (0.04)	4.55 (0.00)	(-) 1.53 (0.65)	(-) 1.13 (0.03)	2.27 (0.03)	(-) 2.92 (0.50)	(-) 0.80 (0.01)
	NEG	(-) 2.54 (0.18)	(-) 3.26 (0.32)	(-) 4.30 (0.03)	(-) 1.54 (0.00)	(-) 1.42 (0.03)	0.66 (0.54)	3.37 (0.00)	(-) 2.33 (0.49)	(-) 1.50 (0.01)	1.31 (0.04)	(-) 1.81 (0.50)	(-) 0.65 (0.04)
	R	(-) 2.36 (0.00)	(-) 2.60 (0.04)	(-) 1.11 (0.11)	(-) 1.41 (0.00)	(-) 0.84 (0.03)	(-) 0.87 (0.02)	3.41 (0.64)	(-) 1.54 (0.44)	(-) 3.73 (0.08)	(-) 1.45 (0.20)	0.83 (0.62)	(-) 0.65 (0.07)
	ASYM	0.00	0.04	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.04
	LM	0.27	0.25	0.21	0.29	0.13	0.16	0.22	0.63	0.24	0.94	0.53	0.16
	JB	0	0.03	0	0	0	0	0.43	0.19	0.01	0.14	0.99	0.43
	RAM	0.23	0.2	0.17	0.98	0.91	0.98	0.15	0	0	0.16	0.75	0.08
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S

2	POS	1.88 (0.02)	2.63 (0.01)	(-) 1.18 (0.00)	(-) 4.04 (0.43)	4.66 (0.72)	(-) 2.88 (0.30)	(-) 3.35 (0.00)	3.71 (0.18)	1.25 (0.05)	4.07 (0.11)	3.86 (0.39)	2.92 (0.04)
	NEG	3.17 (0.00)	1.41 (0.01)	(-) 1.17 (0.00)	(-) 3.26 (0.40)	2.58 (0.73)	(-) 1.74 (0.39)	(-) 2.43 (0.02)	3.83 (0.01)	1.69 (0.01)	4.76 (0.02)	3.34 (0.27)	3.02 (0.03)
	R	(-) 0.59 (0.15)	(-) 0.71 (0.10)	(-) 1.23 (0.05)	0.70 (0.32)	(-) 0.17 (0.84)	(-) 1.18 (0.33)	1.34 (0.61)	0.05 (0.97)	(-) 0.75 (0.70)	(-) 1.90 (0.51)	0.74 (0.67)	1.84 (0.35)
	ASYM	0.09	0.35	0.53	0.79	0.14	0.79	0.02	0.08	0.21	0.22	0.54	0.00
	LM	0.76	0.19	0.09	0.88	0.3	0.38	0.67	0.79	0.74	0.76	0.99	0.81
	JB	0.51	0.4	0.27	0	0.01	0.01	0.98	0.62	0.91	0.07	0	0.39
	RAM	0.92	0.19	0.39	0.23	0.85	0.36	0.39	0.24	0.14	0.61	0.47	0.46
	CSMSQ	S	S	S	S	U	S	S	S	S	S	S	S
3	POS	2.18 (0.00)	2.09 (0.21)	0.51 (0.03)	(-) 4.39 (0.00)	(-) 3.86 (0.29)	0.38 (0.76)	3.68 (0.00)	(-) 4.93 (0.08)	(-) 3.81 (0.04)	(-) 3.03 (0.03)	(-) 4.03 (0.41)	(-) 3.45 (0.03)
	NEG	(-) 0.20 (0.05)	(-) 2.66 (0.03)	1.61 (0.00)	(-) 0.04 (0.95)	(-) 3.64 (0.39)	3.99 (0.00)	3.60 (0.00)	(-) 3.69 (0.00)	(-) 2.93 (0.13)	(-) 1.59 (0.06)	(-) 3.32 (0.57)	(-) 2.93 (0.01)
	R	0.08 (0.13)	0.25 (0.04)	(-) 0.03 (0.67)	0.37 (0.39)	0.53 (0.45)	(-) 0.10 (0.79)	(-) 7.53 (0.00)	(-) 4.07 (0.12)	(-) 0.27 (0.91)	0.43 (0.85)	(-) 0.72 (0.78)	0.57 (0.67)
	ASYM	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.24	0.01	0.04	0.63	0.03
	LM	0.09	0.17	0.92	0.51	0.15	0.91	0.73	0.74	0.24	0.45	0.83	0.93
	JB	0.63	0.54	0.94	0.62	0.87	0.39	0	0	0.09	0	0	0
	RAM	0.18	0.91	0.22	0.17	0.26	0.22	0.38	0.73	0.65	0.18	0.2	0.67
	CSMSQ	U	S	S	S	S	S	U	S	S	S	S	S
4	POS	0.81 (0.87)	1.68 (0.81)	2.47 (0.48)	(-) 0.07 (0.63)	1.55 (0.01)	0.82 (0.01)	1.01 (0.32)	(-) 3.20 (0.04)	(-) 3.02 (0.00)	1.23 (0.00)	(-) 3.17 (0.00)	2.28 (0.00)
	NEG	4.15 (0.60)	1.31 (0.78)	2.91 (0.43)	(-) 0.06 (0.58)	0.91 (0.01)	0.52 (0.13)	2.56 (0.02)	(-) 1.28 (0.34)	(-) 2.78 (0.01)	0.63 (0.00)	(-) 1.72 (0.00)	1.11 (0.16)
	R	(-) 4.47 (0.70)	1.91 (0.75)	(-) 4.40 (0.68)	2.39 (0.03)	0.27 (0.58)	0.40 (0.59)	1.77 (0.03)	1.33 (0.47)	0.84 (0.06)	3.19 (0.00)	0.41 (0.19)	0.49 (0.30)
	ASYM	0.13	0.87	0.50	0.48	0.46	0.83	0.95	0.02	0.00	0.04	0.00	0.00
	LM	0.36	0.7	0.85	0.6	0.29	0.35	0.23	0.72	0.96	0.46	0.18	0.99
	JB	0.46	0.71	0.83	0.66	0.53	0.00	0.34	0.12	0.43	0	0	0
	RAM	0.36	0.31	0.07	0.04	0.21	0.25	0.63	0.85	0.18	0.29	0.81	0.19
	CSMSQ	S	S	S	S	S	S	S	S	U	S	S	S
5	POS	(-) 3.57 (0.13)	(-) 3.33 (0.74)	2.07 (0.67)	4.87 (0.65)	(-) 2.94 (0.94)	(-) 2.83 (0.75)	1.91 (0.46)	1.27 (0.90)	3.50 (0.47)	1.66 (0.01)	1.46 (0.70)	3.56 (0.23)
	NEG	(-) 3.94	2.01 (0.78)	2.47 (0.62)	4.64 (0.61)	3.16 (0.92)	(-) 2.46	2.68 (0.46)	0.76 (0.89)	3.83 (0.47)	1.08 (0.02)	1.11 (0.74)	3.95 (0.23)

		(0.03)					(0.78)						
	R	5.24 (0.40)	(-) 1.00 (0.90)	4.70 (0.47)	(-) 3.57 (0.85)	(-) 1.47 (0.86)	3.22 (0.89)	(-) 0.55 (0.84)	(-) 0.22 (0.94)	(-) 0.85 (0.78)	0.08 (0.95)	0.05 (0.98)	(-) 0.35 (0.85)
	ASYM	0.00	0.78	0.16	0.52	0.79	0.58	0.22	0.16	0.08	0.03	0.35	0.01
	LM	0.8	0.84	0.87	0.45	0.55	0.56	0.07	0.12	0.09	0.47	0.34	0.27
	JB	0.68	0.89	0.84	0.82	0.91	0.79	0.79	0.79	0.78	0.58	0	0
	RAM	0.31	0.43	0.45	0.11	0.56	0.12	0.19	0.11	0.09	0.44	0.22	0.71
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S
6	POS	2.67 (0.00)	(-) 3.94 (0.40)	3.90 (0.03)	(-) 3.55 (0.03)	(-) 4.17 (0.21)	(-) 2.22 (0.11)	(-) 4.26 (0.03)	(-) 3.39 (0.51)	(-) 1.47 (0.03)	(-) 0.26 (0.95)	(-) 1.01 (0.89)	2.08 (0.72)
	NEG	4.61 (0.00)	(-) 2.75 (0.64)	3.44 (0.03)	(-) 1.63 (0.03)	(-) 3.86 (0.23)	(-) 2.73 (0.01)	0.91 (0.66)	(-) 2.47 (0.59)	(-) 1.32 (0.07)	1.38 (0.56)	2.03 (0.75)	(-) 0.08 (0.99)
	R	2.58 (0.32)	2.04 (0.29)	3.42 (0.27)	0.33 (0.97)	(-) 3.61 (0.68)	(-) 0.99 (0.85)	0.62 (0.00)	(-) 0.09 (0.02)	0.01 (0.45)	0.06 (0.62)	0.30 (0.11)	(-) 0.04 (0.51)
	ASYM	0.01	0.62	0.04	0.00	0.14	0.00	0.04	0.00	0.00	0.18	0.02	0.00
	LM	0.33	0.26	0.93	0.96	0.58	0.46	0.17	0.09	0.95	0.11	0.11	0.48
	JB	0.32	0.12	0.56	0	0	0	0.55	0.57	0.34	0.71	0.68	0.91
	RAM	0.11	0.8	0.15	0.11	0.65	0.82	0.41	0.39	0.26	0.37	0.36	0.11
	CSMSQ	S	S	S	S	U	S	S	S	S	S	S	S
7	POS	2.96 (0.01)	3.97 (0.24)	(-) 1.36 (0.24)	1.18 (0.00)	(-) 4.65 (0.04)	(-) 1.52 (0.02)	3.34 (0.00)	1.41 (0.37)	(-) 1.40 (0.00)	(-) 3.87 (0.00)	(-) 0.99 (0.70)	(-) 0.76 (0.03)
	NEG	(-) 1.15 (0.54)	2.98 (0.43)	(-) 2.33 (0.03)	0.90 (0.00)	(-) 2.69 (0.29)	(-) 0.91 (0.04)	(-) 0.87 (0.03)	3.11 (0.06)	(-) 1.22 (0.00)	(-) 1.98 (0.00)	(-) 1.16 (0.67)	(-) 1.01 (0.02)
	R	(-) 0.84 (0.08)	(-) 0.26 (0.63)	(-) 1.04 (0.37)	0.29 (0.01)	0.17 (0.64)	0.66 (0.72)	3.12 (0.00)	2.68 (0.00)	2.51 (0.00)	(-) 0.93 (0.49)	0.81 (0.35)	0.67 (0.24)
	ASYM	0.00	0.00	0.02	0.00	0.86	0.05	0.00	0.06	0.00	0.03	0.40	0.04
	LM	0.32	0.46	0.30	0.88	0.72	0.12	0.22	0.33	0.08	0.97	0.46	0.29
	JB	0.99	0.75	0.06	0.98	0.75	0.92	0	0	0.04	0.13	0	0
	RAM	0.81	0.8	0.19	0.34	0.78	0.29	0.06	0.03	0.24	0.69	0.40	0.49
	CSMSQ	S	S	S	S	S	S	U	S	S	S	S	S
8	POS	3.21 (0.17)	(-) 4.19 (0.05)	(-) 3.36 (0.03)	3.43 (0.07)	2.65 (0.55)	1.59 (0.20)	(-) 2.98 (0.04)	(-) 3.91 (0.73)	4.35 (0.04)	2.15 (0.67)	2.82 (0.90)	2.06 (0.74)
	NEG	2.84 (0.04)	(-) 1.10 (0.47)	(-) 3.41 (0.07)	2.85 (0.09)	0.32 (0.91)	2.21 (0.01)	(-) 2.83 (0.05)	0.61 (0.95)	4.55 (0.01)	3.16 (0.37)	5.12 (0.79)	0.47 (0.94)
	R	(-) 0.76 (0.55)	0.77 (0.02)	(-) 1.10 (0.56)	(-) 0.61 (0.51)	(-) 1.56 (0.38)	1.72 (0.48)	5.00 (0.02)	3.98 (0.14)	3.84 (0.08)	0.53 (0.00)	(-) 0.02 (0.96)	(-) 0.04 (0.78)

	ASYM	0.50	0.48	0.30	0.08	0.12	0.00	0.03	0.06	0.00	0.00	0.08	0.00
	LM	0.08	0.05	0.34	0.67	0.61	0.38	0.1	0.07	0.12	0.67	0.51	0.78
	JB	0.51	0.38	0.55	0.93	0.29	0.53	0	0	0	0	0	0
	RAM	0.24	0.39	0.54	0.1	0.22	0.14	0.19	0.58	0.89	0.83	0.74	0.99
	CSMSQ	S	S	S	S	S	S	U	U	S	S	S	S
9	POS	4.43 (0.04)	(-) 4.76 (0.05)	3.17 (0.03)	(-) 0.27 (0.56)	(-) 0.78 (0.80)	0.96 (0.23)	(-) 1.23 (0.01)	(-) 2.41 (0.00)	(-) 2.67 (0.00)	(-) 2.72 (0.00)	3.89 (0.17)	(-) 2.92 (0.00)
	NEG	4.89 (0.01)	(-) 4.08 (0.09)	2.98 (0.05)	0.82 (0.00)	0.86 (0.59)	(-) 1.88 (0.00)	1.09 (0.05)	(-) 1.57 (0.01)	(-) 2.28 (0.00)	(-) 1.61 (0.00)	3.83 (0.19)	(-) 2.80 (0.00)
	R	(-) 4.32 (0.00)	(-) 1.34 (0.32)	(-) 1.99 (0.09)	2.35 (0.00)	1.29 (0.13)	1.49 (0.18)	0.93 (0.00)	1.85 (0.04)	2.93 (0.00)	(-) 0.59 (0.52)	1.42 (0.04)	1.13 (0.09)
	ASYM	0.02	0.28	0.00	0.04	0.08	0.00	0.00	0.00	0.00	0.01	0.10	0.01
	LM	0.19	0.39	0.13	0.39	0.15	0.12	0.91	0.78	0.67	0.13	0.28	0.1
	JB	0	0	0.85	0.67	0.87	0.82	0	0	0	0.09	0.03	0.09
	RAM	0.48	0.9	0.17	0.73	0.79	0.32	0.07	0.44	0.28	0.68	0.60	0.85
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S
10	POS	2.41 (0.07)	(-) 2.64 (0.42)	(-) 0.94 (0.07)	1.49 (0.00)	(-) 2.40 (0.00)	(-) 0.89 (0.00)	(-) 1.43 (0.67)	(-) 2.25 (0.71)	(-) 2.55 (0.00)	1.40 (0.66)	0.57 (0.94)	(-) 2.83 (0.00)
	NEG	2.64 (0.03)	(-) 4.52 (0.16)	0.63 (0.04)	0.56 (0.00)	(-) 2.85 (0.00)	(-) 1.25 (0.00)	(-) 0.77 (0.88)	(-) 1.82 (0.79)	(-) 2.98 (0.00)	0.77 (0.72)	0.99 (0.89)	(-) 3.04 (0.00)
	R	(-) 2.61 (0.09)	(-) 2.53 (0.03)	0.86 (0.02)	(-) 1.14 (0.01)	(-) 0.41 (0.11)	(-) 2.58 (0.00)	(-) 1.53 (0.57)	(-) 1.72 (0.59)	(-) 1.15 (0.78)	0.01 (0.90)	0.01 (0.85)	(-) 0.04 (0.35)
	ASYM	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.11	0.02	0.09	0.06	0.01
	LM	0.62	0.34	0.93	0.87	0.29	0.57	0.12	0.71	0.91	0.76	0.03	0.18
	JB	0.92	0.8	0.65	0.79	0.94	0.97	0.93	0.29	0.12	0.82	0.22	0.74
	RAM	0.68	0.04	0.95	0.63	0.34	0.63	0.52	0.28	0.11	0.47	0.21	0.66
	CSMSQ	U	U	U	S	S	S	S	S	S	S	S	S
11	POS	3.20 (0.00)	4.91 (0.20)	3.29 (0.00)	2.47 (0.02)	(-) 1.08 (0.91)	1.93 (0.15)	1.47 (0.09)	(-) 2.16 (0.60)	(-) 2.48 (0.00)	(-) 1.42 (0.02)	(-) 3.88 (0.49)	(-) 1.27 (0.01)
	NEG	(-) 2.73 (0.00)	(-) 5.09 (0.14)	3.88 (0.00)	1.03 (0.41)	(-) 4.94 (0.52)	2.58 (0.04)	1.82 (0.03)	(-) 4.02 (0.25)	(-) 1.83 (0.00)	(-) 0.48 (0.42)	(-) 3.36 (0.58)	(-) 1.29 (0.04)
	R	(-) 1.44 (0.04)	(-) 1.65 (0.09)	0.74 (0.30)	(-) 0.22 (0.87)	(-) 2.15 (0.29)	0.51 (0.00)	5.06 (0.01)	4.26 (0.12)	4.35 (0.00)	1.04 (0.00)	1.07 (0.49)	1.62 (0.04)
	ASYM	0.00	0.88	0.00	0.00	0.08	0.04	0.01	0.00	0.03	0.04	0.08	0.04
	LM	0.34	0.22	0.83	0.18	0.21	0.82	0.06	0	0.08	0.78	0.27	0.62
	JB	0.64	0.44	0.56	0.57	0.48	0.2	0.05	0.01	0	0.1	0	0.06

	RAM	0.61	0.92	0.82	0.46	0.07	0.27	0.29	0.58	0.09	0.44	0.67	0.92
	CSMSQ	S	S	S	S	S	S	U	U	U	S	S	S
12	POS	4.21 (0.13)	(-) 4.22 (0.11)	4.11 (0.00)	(-) 2.93 (0.00)	0.13 (0.97)	0.46 (0.58)	(-) 1.21 (0.84)	(-) 2.88 (0.67)	(-) 1.20 (0.84)	(-) 2.96 (0.71)	(-) 0.75 (0.96)	(-) 1.24 (0.94)
	NEG	4.47 (0.11)	(-) 4.80 (0.07)	3.17 (0.00)	0.11 (0.76)	4.79 (0.30)	1.65 (0.00)	1.28 (0.91)	(-) 0.31 (0.93)	(-) 3.56 (0.61)	(-) 2.07 (0.67)	1.42 (0.92)	2.40 (0.87)
	R	(-) 3.76 (0.17)	(-) 1.62 (0.01)	1.06 (0.13)	0.01 (0.98)	(-) 0.94 (0.41)	0.58 (0.66)	0.12 (0.71)	0.06 (0.37)	(-) 0.11 (0.58)	0.06 (0.83)	0.09 (0.76)	0.16 (0.58)
	ASYM	0.28	0.20	0.00	0.00	0.08	0.02						
	LM	0.94	0.54	0.15	0.13	0.63	0.29	0.16	0	0.18	0.34	0.21	0.42
	JB	0	0	0.43	0.67	0.43	0.73	0.21	0.05	0	0.61	0.74	0.65
	RAM	0.5	0.19	0.61	0.05	0.66	0.10	0.37	0.21	0.75	0.12	0.22	0.22
	CSMSQ	S	U	S	S	S	S	S	S	S	S	S	S
13	POS	(-) 3.12 (0.05)	3.93 (0.40)	3.67 (0.00)	(-) 3.38 (0.00)	4.71 (0.86)	1.63 (0.00)	3.40 (0.22)	(-) 1.88 (0.82)	(-) 5.64 (0.07)	(-) 2.01 (0.00)	2.48 (0.95)	(-) 4.87 (0.00)
	NEG	2.50 (0.24)	3.82 (0.39)	2.61 (0.00)	1.55 (0.60)	3.74 (0.95)	4.84 (0.00)	3.14 (0.16)	4.38 (0.59)	(-) 3.57 (0.13)	(-) 1.34 (0.00)	2.67 (0.91)	(-) 4.08 (0.04)
	R	1.58 (0.20)	(-) 0.65 (0.70)	(-) 0.86 (0.11)	(-) 1.72 (0.07)	0.47 (0.97)	1.63 (0.00)	(-) 1.01 (0.83)	3.08 (0.06)	3.16 (0.02)	0.11 (0.88)	(-) 1.35 (0.92)	(-) 3.26 (0.00)
	ASYM	0.03	0.71	0.01	0.00	0.77	0.00	0.58	0.06	0.10	0.04	0.53	0.00
	LM	0.88	0.4	0.81	0.92	0.62	0.82	0.12	0.62	0.07	0.2	0.07	0.57
	JB	0.74	0.51	0.92	0.29	0.2	0.8	0.03	0.02	0.5	0.15	0.34	0.35
	RAM	0.48	0.72	0.8	0.45	0.91	0.9	0.72	0.83	0.32	0.19	0.14	0.07
	CSMSQ	S	S	S	S	S	S	U	S	S	S	S	S
14	POS	(-) 4.97 (0.63)	(-) 4.14 (0.90)	2.93 (0.80)	(-) 4.42 (0.34)	1.43 (0.79)	(-) 2.22 (0.69)	(-) 0.83 (0.85)	1.88 (0.36)	(-) 2.35 (0.17)	1.23 (0.00)	4.45 (0.00)	3.52 (0.00)
	NEG	(-) 3.05 (0.03)	3.45 (0.80)	4.88 (0.73)	(-) 2.01 (0.43)	2.68 (0.67)	(-) 2.72 (0.67)	(-) 0.75 (0.89)	(-) 4.32 (0.02)	(-) 2.88 (0.00)	1.33 (0.15)	4.63 (0.00)	3.40 (0.00)
	R	(-) 4.02 (0.00)	(-) 0.25 (0.99)	0.74 (0.97)	0.09 (0.56)	0.11 (0.36)	0.01 (0.90)	1.89 (0.63)	(-) 0.19 (0.00)	2.21 (0.59)	0.02 (0.61)	(-) 0.53 (0.00)	0.03 (0.52)
	ASYM	0.00	0.96	0.51	0.63	0.26	0.96	0.01	0.00	0.00	0.03	0.00	0.00
	LM	0.5	0.46	0.71	0.34	0.77	0.18	0.5	0.11	0.22	0.71	0	0.93
	JB	0	0	0	0	0	0	0	0	0	0	0	0
	RAM	0.1	0.1	0.44	0.75	0.31	0.46	0.22	0.06	0	0.06	0	0.1
	CSMSQ	S	S	S	U	U	U	S	S	S	S	S	S
15	POS	(-) 3.75	(-) 0.23	4.67 (0.00)	3.43 (0.63)	4.46 (0.30)	4.74 (0.03)	(-) 3.31	1.19 (0.00)	1.32 (0.13)	(-) 3.49	(-) 2.68	(-) 0.96

		(0.68)	(0.97)					(0.00)			(0.03)	(0.73)	(0.36)
	NEG	1.84 (0.66)	(-) 2.28 (0.62)	3.35 (0.00)	5.87 (0.24)	5.19 (0.02)	(-) 1.47 (0.52)	1.90 (0.00)	0.92 (0.05)	1.75 (0.01)	2.00 (0.03)	(-) 3.10 (0.70)	1.94 (0.01)
	R	(-) 2.02 (0.55)	(-) 1.34 (0.19)	(-) 3.72 (0.23)	0.70 (0.00)	0.03 (0.73)	(-) 5.79 (0.04)	(-) 0.68 (0.00)	0.28 (0.28)	(-) 2.43 (0.07)	(-) 3.25 (0.06)	(-) 0.15 (0.85)	(-) 2.69 (0.02)
	ASYM	0.42	0.60	0.03	0.44	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LM	0.65	0.68	0.89	0.22	0.25	0.38	0.26	0.24	0.64	0.19	0.67	0.45
	JB	0.47	0.07	0.86	0	0	0	0.55	0.18	0.71	0.25	0.02	0.00
	RAM	0.82	0.55	0.87	0.01	0	0.08	0.52	0.64	0.98	0.22	0.32	0.06
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S
16	POS	(-) 2.51 (0.00)	(-) 0.42 (0.76)	2.96 (0.03)	0.04 (0.98)	(-) 2.80 (0.73)	1.88 (0.22)	4.45 (0.10)	4.89 (0.52)	(-) 3.11 (0.00)	3.60 (0.36)	(-) 2.47 (0.90)	1.84 (0.55)
	NEG	(-) 0.48 (0.48)	3.06 (0.07)	4.54 (0.00)	2.17 (0.35)	(-) 2.67 (0.73)	3.17 (0.04)	4.68 (0.08)	1.78 (0.72)	(-) 3.07 (0.05)	(-) 0.70 (0.71)	1.51 (0.95)	2.85 (0.03)
	R	2.08 (0.00)	1.81 (0.01)	2.94 (0.11)	1.62 (0.55)	0.02 (0.81)	2.19 (0.40)	(-) 3.44 (0.22)	(-) 2.96 (0.20)	(-) 0.04 (0.25)	(-) 0.16 (0.15)	0.10 (0.34)	0.17 (0.31)
	ASYM	0.00	0.00	0.00	0.10	0.93	0.05	0.00	0.00	0.00	0.01	0.00	0.00
	LM	0.99	0.83	0.96	0.56	0.75	0.94	0.69	0.12	0.98	0.12	0.57	0.54
	JB	0	0	0	0.09	0	0	0	0	0.78	0	0	0
	RAM	0.01	0.07	0.26	0.24	0.35	0.13	0.76	0.24	0.94	0.06	0.05	0.06
	CSMSQ	S	S	S	S	S	S	S	S	S	U	S	S
17	POS	3.93 (0.03)	(-) 4.88 (0.16)	(-) 1.86 (0.06)	(-) 4.81 (0.08)	(-) 3.89 (0.65)	4.26 (0.01)	(-) 2.83 (0.30)	5.25 (0.59)	3.01 (0.68)	(-) 5.83 (0.07)	2.97 (0.13)	3.58 (0.03)
	NEG	3.60 (0.00)	(-) 3.30 (0.49)	(-) 1.61 (0.04)	(-) 2.69 (0.12)	(-) 4.47 (0.58)	4.04 (0.02)	(-) 2.09 (0.54)	0.68 (0.94)	2.14 (0.76)	(-) 4.54 (0.05)	2.14 (0.31)	2.73 (0.09)
	R	(-) 4.59 (0.00)	(-) 3.27 (0.08)	(-) 0.38 (0.44)	0.12 (0.15)	0.03 (0.84)	(-) 0.03 (0.78)	5.48 (0.56)	2.76 (0.64)	1.31 (0.87)	4.99 (0.20)	(-) 5.87 (0.11)	(-) 5.81 (0.21)
	ASYM	0.09	0.20	0.61	0.06	0.39	0.31	0.70	0.83	0.76	0.19	0.11	0.59
	LM	0.62	0.05	0.11	0.29	0.24	0.19	0.4	0.31	0.94	0.88	0.62	0.54
	JB	0.61	0.61	0.79	0	0	0	0	0	0	0	0.01	0.02
	RAM	0.63	0.96	0.31	0	0	0	0.56	0.53	0.82	0.49	0	0.01
	CSMSQ	U	U	S	S	S	S	U	S	S	U	S	U
18	POS	3.55 (0.04)	(-) 3.99 (0.58)	0.43 (0.59)	(-) 2.56 (0.04)	(-) 0.98 (0.74)	(-) 2.22 (0.00)	1.28 (0.04)	3.90 (0.00)	1.47 (0.03)	(-) 3.70 (0.00)	3.70 (0.32)	(-) 2.39 (0.01)
	NEG	(-) 2.24 (0.05)	3.22 (0.74)	2.72 (0.00)	0.42 (0.70)	3.73 (0.29)	2.26 (0.03)	(-) 1.17 (0.00)	(-) 1.92 (0.04)	1.26 (0.00)	2.61 (0.02)	4.19 (0.03)	(-) 0.66 (0.41)

	R	0.22 (0.89)	0.50 (0.89)	3.39 (0.02)	2.16 (0.22)	1.09 (0.55)	4.10 (0.00)	0.16 (0.57)	0.81 (0.00)	0.37 (0.00)	(-) 0.43 (0.73)	0.26 (0.69)	(-) 1.26 (0.24)
	ASYM	0.00	0.16	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00
	LM	0.52	0.39	0.29	0.12	0	0.38	0.82	0.61	0.14	0.33	0.33	0.18
	JB	0	0	0.02	0.02	0	0.23	0	0.16	0.9	0.85	0.97	0.66
	RAM	0.48	0.34	0.9	0.88	0.02	0.93	0.55	0.1	0.88	0.12	0.41	0.1
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S
19	POS	(-) 1.78 (0.62)	(-) 3.09 (0.57)	0.29 (0.87)	(-) 3.54 (0.00)	(-) 4.32 (0.51)	2.39 (0.00)	3.44 (0.00)	(-) 3.21 (0.01)	1.78 (0.00)	(-) 1.34 (0.12)	(-) 3.04 (0.84)	3.84 (0.01)
	NEG	2.47 (0.29)	1.24 (0.74)	(-) 2.01 (0.04)	(-) 1.45 (0.16)	1.79 (0.56)	(-) 2.59 (0.00)	(-) 1.85 (0.00)	1.92 (0.00)	3.45 (0.00)	(-)2.67 (0.00)	3.53 (0.73)	1.87 (0.04)
	R	1.35 (0.60)	1.75 (0.31)	0.43 (0.84)	2.09 (0.02)	1.13 (0.17)	(-) 0.20 (0.45)	2.79 (0.00)	1.89 (0.00)	4.94 (0.00)	(-) 0.66 (0.38)	4.12 (0.36)	3.70 (0.14)
	ASYM	0.39	0.09	0.03	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LM	0	0.47	0.16	0.46	0.1	0.34	0.83	0.68	0.19	0.13	0.31	0.33
	JB	0	0	0	0.58	0.46	0.53	0.04	0	0	0.85	0.75	0.71
	RAM	0.09	0.08	0.23	0.07	0.57	0.25	0.72	0.13	0.3	0.96	0.65	0.83
	CSMSQ	S	S	U	S	S	S	S	S	S	S	S	S
20	POS	(-) 1.52 (0.06)	4.84 (0.03)	(-) 0.24 (0.44)	(-) 5.09 (0.01)	(-) 0.62 (0.87)	(-) 4.92 (0.01)	(-) 0.59 (0.04)	3.81 (0.10)	0.65 (0.07)	2.23 (0.07)	3.35 (0.60)	3.28 (0.03)
	NEG	(-) 2.49 (0.05)	4.31 (0.03)	0.94 (0.04)	(-) 4.85 (0.00)	5.85 (0.03)	(-) 3.94 (0.12)	(-) 1.20 (0.00)	(-) 2.61 (0.03)	0.63 (0.00)	2.95 (0.00)	4.14 (0.34)	3.66 (0.04)
	R	0.33 (0.45)	0.56 (0.00)	0.09 (0.94)	(-) 3.15 (0.01)	2.48 (0.11)	0.24 (0.91)	(-) 0.93 (0.00)	0.16 (0.64)	(-) 1.79 (0.00)	0.39 (0.00)	(-) 1.62 (0.49)	(-) 3.10 (0.06)
	ASYM	0.00	0.00	0.00	0.32	0.09	0.45	0.01	0.03	0.00	0.02	0.00	0.00
	LM	0.15	0.2	0.16	0.16	0.12	0.33	0.5	0.99	0.55	0.28	0.91	0.22
	JB	0	0	0.01	0	0	0.06	0.49	0.86	0.80	0.87	0.80	0.40
	RAM	0.17	0.15	0.08	0.06	0.09	0.27	0.61	0.95	0.59	0.71	0.22	0.64
	CSMSQ	S	S	S	U	S	U	S	S	S	S	S	S
21	POS	3.57 (0.05)	1.68 (0.77)	1.10 (0.02)	(-)4.30 (0.00)	2.38 (0.06)	2.07 (0.22)	(-) 3.72 (0.26)	(-) 4.28 (0.66)	(-) 1.53 (0.00)	(-) 1.19 (0.04)	0.26 (0.97)	(-) 3.10 (0.23)
	NEG	4.26 (0.04)	2.69 (0.39)	3.21 (0.00)	(-) 2.18 (0.00)	5.55 (0.01)	3.37 (0.03)	4.04 (0.00)	(-) 2.92 (0.77)	3.58 (0.00)	(-) 1.16 (0.00)	2.50 (0.79)	(-) 1.98 (0.02)
	R	(-) 2.27 (0.01)	(-) 2.23 (0.06)	(-) 0.75 (0.07)	(-) 0.01 (0.97)	1.02 (0.05)	4.68 (0.00)	(-) 0.85 (0.75)	6.70 (0.00)	5.63 (0.00)	3.59 (0.00)	3.02 (0.53)	1.36 (0.14)
	ASYM	0.00	0.61	0.04	0.00	0.63	0.05	0.00	0.00	0.00	0.00	0.00	0.00

	LM	0	0	0.77	0.48	0.78	0.67	0.53	0.42	0.53	0.33	0.49	0.65
	JB	0.7	0	0.77	0	0	0.94	0.62	0.48	0.71	0.97	0.8	0.77
	RAM	0	0	0.43	0.73	0.07	0.56	0.14	0.41	0.24	0.61	0.33	0.72
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S
22	POS	3.30 (0.03)	1.15 (0.03)	1.24 (0.02)	4.68 (0.02)	4.33 (0.02)	1.42 (0.00)	2.74 (0.33)	0.98 (0.95)	1.07 (0.05)	1.17 (0.33)	1.23 (0.83)	0.72 (0.64)
	NEG	0.13 (0.87)	(-) 0.76 (0.17)	(-) 0.42 (0.49)	(-) 0.26 (0.83)	(-) 2.63 (0.06)	0.50 (0.34)	2.25 (0.44)	(-) 2.56 (0.74)	0.39 (0.33)	(-) 0.16 (0.79)	(-) 1.92 (0.68)	(-) 0.16 (0.93)
	R	1.18 (0.53)	3.77 (0.01)	3.74 (0.02)	(-) 0.97 (0.65)	(-) 0.29 (0.68)	(-) 2.01 (0.28)	(-) 2.56 (0.02)	(-) 0.76 (0.79)	(-) 1.09 (0.02)	(-) 0.11 (0.01)	(-) 0.16 (0.03)	(-) 0.06 (0.22)
	ASYM	0.03	0.04	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.01	0.00
	LM	0.57	0.97	0.49	0.14	0.66	0.64	0.92	0.2	0.11	0.54	0.89	0.57
	JB	0	0	0	0.90	0.53	0.88	0	0	0	0.32	0.79	0.39
	RAM	0.34	0.17	0.89	0.12	0.60	0.43	0.41	0	0.18	0.78	0.71	0.58
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S
23	POS	0.09 (0.82)	3.29 (0.00)	1.09 (0.00)	0.71 (0.59)	(-) 3.71 (0.01)	(-) 1.53 (0.08)	(-) 2.17 (0.00)	(-) 4.21 (0.00)	1.78 (0.20)	1.85 (0.02)	(-) 2.46 (0.63)	1.30 (0.02)
	NEG	(-) 1.20 (0.00)	(-) 1.25 (0.29)	0.42 (0.13)	(-) 1.74 (0.00)	5.05 (0.00)	(-) 3.15 (0.00)	1.86 (0.01)	0.33 (0.73)	3.56 (0.00)	(-) 0.53 (0.63)	(-) 1.52 (0.71)	(-) 0.58 (0.49)
	R	(-) 0.54 (0.03)	(-) 0.13 (0.57)	(-) 0.58 (0.11)	2.12 (0.00)	0.90 (0.02)	(-) 0.25 (0.62)	3.83 (0.00)	2.69 (0.00)	4.22 (0.00)	(-) 0.62 (0.41)	(-) 2.43 (0.24)	0.68 (0.51)
	ASYM	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	LM	0.02	0.44	0.19	0.62	0.67	0.53	0.51	0.82	0.67	0.48	0.44	0.34
	JB	0.18	0.36	0.39	0.66	0.56	0.81	0	0	0	0.84	0.09	0.07
	RAM	0.68	0.47	0.86	0.4	0.07	0.73	0.72	0.96	0.87	0.08	0.07	0.28
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S
24	POS	2.58 (0.28)	2.07 (0.76)	(-) 2.22 (0.00)	0.67 (0.00)	3.50 (0.44)	3.94 (0.00)	(-) 2.54 (0.00)	(-) 4.65 (0.02)	(-) 3.35 (0.00)	1.40 (0.04)	(-) 2.46 (0.62)	(-) 3.02 (0.03)
	NEG	(-) 2.17 (0.00)	3.85 (0.58)	(-) 1.31 (0.02)	(-) 4.22 (0.00)	3.25 (0.68)	4.73 (0.00)	(-) 2.06 (0.00)	(-) 3.02 (0.16)	(-) 2.73 (0.00)	1.11 (0.03)	(-) 2.81 (0.56)	(-) 2.89 (0.03)
	R	(-) 2.67 (0.53)	(-) 5.64 (0.00)	(-) 4.14 (0.00)	(-) 2.38 (0.00)	(-) 0.18 (0.95)	1.29 (0.32)	0.59 (0.00)	(-) 0.28 (0.46)	(-) 0.50 (0.00)	4.46 (0.00)	4.05 (0.00)	3.63 (0.00)
	ASYM	0.04	0.88	0.00	0.08	0.85	0.00	0.01	0.00	0.01	0.02	0.00	0.00
	LM	0.17	0.08	0.12	0.22	0.51	0.31	0.53	0.19	0.42	0.35	0.62	0.34
	JB	0.2	0.52	0.22	0.71	0.76	0.69	0	0	0	0.42	0.35	0.46
	RAM	0.08	0.25	0.42	0.24	0.38	0.11	0.46	0.13	0.15	0.43	0.12	0.22
	CSMSQ	S	U	S	S	S	S	S	S	S	S	S	S

25	POS	(-) 2.56 (0.00)	0.19 (0.82)	0.27 (0.65)	0.47 (0.78)	3.91 (0.25)	(-) 0.32 (0.79)	1.60 (0.01)	3.42 (0.02)	(-) 1.71 (0.02)	(-) 1.89 (0.04)	2.54 (0.69)	1.02 (0.21)
	NEG	(-) 0.39 (0.55)	2.74 (0.01)	(-) 1.89 (0.00)	(-) 3.69 (0.00)	1.46 (0.68)	(-) 2.81 (0.05)	(-) 0.43 (0.16)	(-) 2.97 (0.03)	1.59 (0.00)	(-) 0.92 (0.28)	3.72 (0.38)	2.79 (0.03)
	R	(-) 0.88 (0.41)	(-) 1.71 (0.05)	0.58 (0.32)	(-) 0.32 (0.76)	3.80 (0.36)	(-) 0.56 (0.73)	0.53 (0.03)	1.26 (0.00)	(-) 0.10 (0.82)	1.65 (0.31)	0.60 (0.00)	3.28 (0.19)
	ASYM	0.01	0.00	0.00	0.00	0.34	0.01	0.00	0.04	0.01	0.00	0.00	0.00
	LM	0.12	0.64	0.25	0.	0.13	0.81	0.12	0.07	0.21	0.11	0.16	0.08
	JB	0.66	0.41	0.32	0.49	0	0.20	0.74	0.57	0.77	0.04	0	0
	RAM	0.33	0.39	0.56	0.54	0.63	0.22	0.32	0.28	0.33	0.54	0.76	0.82
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S
26	POS	2.40 (0.10)	(-) 2.90 (0.47)	2.01 (0.03)	(-) 0.58 (0.07)	0.67 (0.56)	1.05 (0.00)	(-) 1.09 (0.67)	(-) 2.10 (0.83)	(-) 0.94 (0.48)	(-) 3.18 (0.02)	(-) 4.57 (0.00)	1.13 (0.42)
	NEG	3.04 (0.03)	(-) 2.48 (0.35)	1.49 (0.14)	(-) 0.83 (0.04)	1.07 (0.03)	1.16 (0.00)	(-) 2.78 (0.44)	(-) 3.46 (0.68)	(-) 4.49 (0.00)	4.97 (0.00)	2.07 (0.25)	4.42 (0.00)
	R	(-) 1.61 (0.04)	(-) 0.82 (0.36)	(-) 2.20 (0.00)	(-) 1.52 (0.01)	(-) 0.61 (0.12)	(-) 0.40 (0.17)	2.79 (0.61)	(-) 2.66 (0.78)	(-) 3.15 (0.00)	5.03 (0.00)	4.84 (0.17)	4.27 (0.00)
	ASYM	0.04	0.96	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	LM	0.26	0.15	0.16	0.36	0.2	0.87	0.67	0.22	0.83	0.38	0.08	0.91
	JB	0.51	0.54	0.21	0.83	0.51	0.74	0	0	0.11	0.77	0.76	0.97
	RAM	0.15	0.01	0.66	0.59	0.47	0.13	0.52	0.88	0.28	0.18	0.2	0.14
	CSMSQ	S	S	S	S	S	S	S	S	S	S	S	S

The letters « **S** » and « **U** » denote stable and unstable estimates of the CUSUMSQ test.

For the **Wald statistic** or the F family statistic, the asterisk * signifies the existence of a co integration relationship;

LM: Breusch-Godfrey serial correlation test is used to detect if the time series carry autocorrelation errors if the probability is less than 5%, it is concluded that there is autocorrelation of the residuals in the model;

JB: "Jarque-Bera" test is a hypothesis test that verifies if the data follows a normal distribution (the null hypothesis);

RAMSEY: the null hypothesis is a hypothesis postulating the model is well specified.

The PSS procedure differentiates between five cases depending on the presence of deterministic components in the model: The PSS procedure is used based on cases 2, 3, 4 and 5, respectively.

	I(0) Lower bound	I(1) Upper bound	Confidence Interval
Cas 1: (without constant and without trend)	_	_	_____
Cas 2: (with constant restriction and without	2.98	3.94	95%
Cas 3: (with constant and without trend)	3.40	4.62	95%
Cas 4: (with constant and with trend restriction)	3.69	4.58	95%
Cas 5: (with constant and with trend)	4.31	5.42	95%