Measuring Algeria's real effective exchange rate
A study (2010-2017)

قياس سعر الصرف الفعلي الحقيقي للجزائر دراسة (2010–2017)

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Abstract*:*
Algeria has lost market share despite the weak of the Algerian dinar (DZD). Different Algerian real effective exchange rates ($AREER_{8-13-19}$) measures and types are useful for different purposes. The results for all three $AREER_{8-13-19}$ indexes showed that for the period under review 2010-2017 a real depreciation in the narrow group by 3.02%, in the major group 3.15% and in the broad group 2.33% and in nominal by 21.8% in the narrow group, 22.18% in the major group and 19.66% in the broad group respectively.
Keyword: Effective exchange rates; Effective exchange rates for Algerian dinar;
JEL classification code : XN1, XN2

ملخص:

فقدت الجزائر حصتها في السوق على الرغم من ضعف الدينار الجزائري (DZD). تعد أسعار وأنواع أسعار الصرف الفعلية الحقيقية الجزائرية المختلفة (19-13-8AREER) مفيدة ولأغراض ولأهداف متنوعة. أظهرت النتائج لجميع مؤشرات 19-13-8AREER الثلاثة أنه خلال الفترة قيد الاستعراض 2010–2017، كان هناك انخفاض حقيقي يقدر بـ 3.02٪ في المجموعة الضيقة،3.15٪ في المجموعة الرئيسية و2.33٪ في المجموعة العريضة وبالمقابل هناك انخفاض اسمي يقدرب 21.8٪ في المجموعة الضيقة،22.18٪ في المجموعة الرئيسية و19.66٪ في المجموعة العريضة على التوالي.
الكلمات المفتاحية : أسعار الصرف الفعلية ؛ أسعار الصرف الفعلية للدينار الجزائري؛
تصنيف JEL : XN1، XN2

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1. Introduction :

In times of global economic integration, countries are increasingly influenced by movements in their exchange rates against the currencies of many partner countries. In order to obtain a useful aggregate measure of exchange rate fluctuations, an effective exchange rate combines various bilateral rates into a single indicator. The effective exchange rates (EERs) are an indicator to grip country's international competitiveness in terms of its foreign exchange rates that cannot be understood by examining only individual exchange rates between the country's currency and other currencies (Zanello & Desruelle, 1997). The term effective means that exchange rate changes are not measured against one particular currency, but instead use an average index of a whole basket of currencies, each weighted depending on the issuing countries' respective importance as a trade partner (Hirsch & Higgins, 1970). However, the real effective exchange rate index is still important as an indicator of the external competitiveness of the economy (Turner & Van't dack, 1993).

The concept of the real effective exchange rate (REER) derives originally from the purchasing power parity (PPP) (Hinkle, 1998, p.43). The real exchange rate is evolved from the theoretical model of dependent economy and is based on the ratio of domestic prices of non-tradables to tradables (Dwyer, 1993, p.1). According to Hinkle (1998, p.44) who stated that the real exchange rate for the home country can be defined either in relation to one trading partner or to an average for its main trading partners. In the first case, it is called the real bilateral exchange rate (RBER), and in the second multicountry case, it is called the real effective exchange rate and is calculated as a weighted average. The REER index measures how the nominal exchange rate adjusted for price differences between a country and its trading partners, moves over a period of time (Lafrance, 1998, p.1). The nominal effective exchange rate (NEER) is a weighted average of the changes in the bilateral (nominal) exchange rates of the domestic currency in terms of foreign currencies. The REER, meanwhile, is a weighted average of bilateral exchange rate indexes adjusted for relative price differentials between the home country and foreign countries.

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Moreover, Bahmani-Oskooee (2001), Lal and Lowinger (2002), Stucka (2004), and Guechari (2012) found a significant and favourable effect of a currency depreciation on the trade balance in the long run for Middle Eastern countries (Bahrain, Egypt, Jordan, Morocco, Syria, Tunisia and Turkey), South Asian countries (Bangladesh, India, Nepal, Pakistan and Sri Lanka), Croatia, and Algeria, respectively. Onafowora (2003) found that, in general, a currency depreciation significantly affected the trade balance of Thailand, Malaysia and Indonesia with respect to the USA and Japan in the long run. Hence, Agbola (2004) found that a depreciation had a significant but negative impact on the trade balance of Ghana in the long run. A possible explanation is that the sample data includes periods when domestic prices, exchange rates, exports and imports were heavily controlled by the government, raising the question whether effects of exchange rate changes would be correctly reflected in volumes of exports and imports. Thus, the real effective exchange rate index is still important as an indicator of the external competitiveness of the economy. Therefore, Drareni (2019) found that between 2010-201, although the effective exchange rates of the Algerian dinar against 19 currencies was relatively unstable, Algeria's NEER and REER depreciated unsteadily by 19.66 % and 8.59 %, respectively due to relatively higher inflation and lower productivity in Algeria compared to that in trading partners this resulted in the deterioration in international competitiveness of the Algerian products. While (IMF, 2014) indicated that the real effective exchange rate appeared to be on the strong side, despite recent efforts to offset the real appreciation incurred in 2012. The REER appreciated 8.3 % between April 2011 and June 2013, mainly reflecting higher relative inflation in Algeria. The REER increased sharply in the first half of 2012 as inflation spiked to as high as 11.0 % year on-year in April. It reversed some of these gains in the middle months of 2012 but resumed its appreciating trend toward the end of the year. In 2013, the REER appreciated slightly in the first half of the year before depreciating 6.2 % in recent months, reflecting the decline in inflation as well as a depreciation of the NEER.

The Algerian real effective exchange rate ($AREER_{8-13-19}$) and Algerian nominal effective exchange rate ($ANEER_{8-13-19}$) of the Algerian dinar are a summary measure of the Algerian's value against the currencies of the Algeria's most important trading partners such as narrow group (8 currencies) ,major group (13 currencies) and broad group (19 currencies). The AREER obtained by deflating the nominal rate with appropriate price or cost indices. So, (Bank of Algeria ,2018) show that it is worth recalling that the real effective exchange rate is the reference point for exchange rate policy and remains the relevant indicator for observing exchange rate movements and therefore relative prices. This helps to avoid excessive deviations of the AREER from its equilibrium level, which is detrimental to macroeconomic stability, in the medium term.Thus, these adjustments of the exchange rate of the dinar being limited; this makes it possible to avoid fueling feeding potential inflationary pressures.

This paper is organized as follows: Introduction discusses the methodologies underlying the calculation of effective exchange rates, ending with a summarized description of the methodologies used by some international bodies and central banks; next presents the new nominal effective exchange rate index and three real effective exchange rate indexes; the last presents the conclusion, where the main results obtained are summarized.

2. Methodological features:

In order to construct the set of the effective exchange rates of the Algerian dinar (AEERs), the CBA had to address a number of methodological issues and as stated by (Maciejewski ,1983) these related to 1) the trade basis upon which the weights for the indexes had to be computed choice between goods and services; 2) the selection of the currencies of Algeria's trading partners to be included in the EER indexes; 3) the type of weighting scheme and the method for capturing competition in third markets; 4) Choice of Index Formula and 5) the choice of deflators to derive the real counterparts of the AEERs indexes for measuring Algeria 's international price and cost competitiveness. The study describes the methodology behind the real effective

exchange rates of the Algerian dinar taking economic theory and data constraints into account. In particular, it discusses the weighting method (based on the theoretical foundations outlined by Armington, 1969) and set of deflators used to compile the AREERs.

2.1. Data sources:

The basic source for data on exchange rates, trade (imports and exports) and consumer price index (CPI) for 8-13-19 countries are the international financial statistics (IFS) of the international monetary fund and world development Indicators (WDI) of the World Bank. Data on Algeria's trade with these 8-13-19 countries/regions have been taken from the central bank of Algeria (CBA), Algerian customs (AC) and the national office of statistics (NOS). In general, the selection of countries is based on their importance as trading partners of Algeria and on data availability, particularly in respect of the high quality data on price required for calculating the AREERs.

2.2 Steps of measurements

Several items must be entered in order to calculate the AEERs, which include the following elements:

2.2.1 Trade basis

There are three broad categories of trade flows: manufactured goods; commodities; and services. Traditionally, trade-weighted effective exchange rates have focused on exports and imports manufactured goods and have excluded commodities and services. There are good reasons to exclude commodities trade. Commodities are largely homogeneous and so are priced in world auction markets based on global supply and demand. That means the country of origin or destination is relatively unimportant in determining how price-competitive the product is. Of course, in practice, it is difficult to know where precisely to draw the line between commodities and manufactured goods. The proposed index continues to exclude commodities trade based on standard international trade classifications. The weights are based on bilateral data on trade in manufactured goods, as defined in sections 5 to 8 of the Standard International Trade

Classification (i.e. excluding trade in services, agricultural products, raw material and energy products) for the periods 2010-2017.

2.2.2 Trading partners and weights

According to Loretan（2005）the selected currencies for inclusion in three indexes are the narrow currencies index (NCI), the major currencies index (MCI) and the broad currencies index (BCI) including the other important trading partners (OITP). The AEERs are calculated for three groups of trading partners: AEER-$_8$, AEER-$_{13}$ and AEER-$_{19}$ (Rhomberg, 1976).

✓ The AEER-$_8$: this group includes Italy, France, Spain, Germany, Turkey, China, Brazil and The United States of America. The narrow currency group, which covers a significant proportion of around 65 % of total Algerian trade weighted in the 2010-2017 period.

Chart 1: Regional weights-Narrow currency group
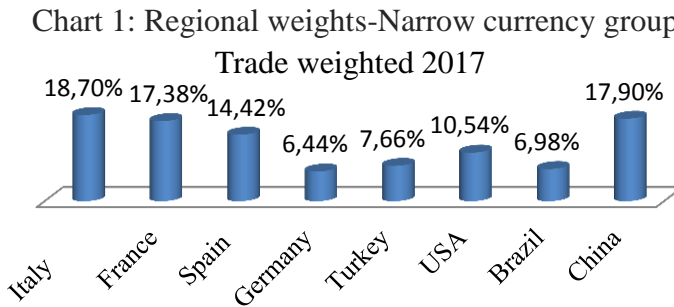
Source: Prepared by author

✓ The AEER-$_{13}$: in addition to the trading partners in the EER-$_8$, this group includes Netherlands, Portugal, Great Britain, Belgium and Canada. The major group, which covers a significant proportion of around 93 % of total Algerian trade weighted in the 2010-2017 period.

Chart 2: Regional weights-Major currency group

Trade weighted 2017
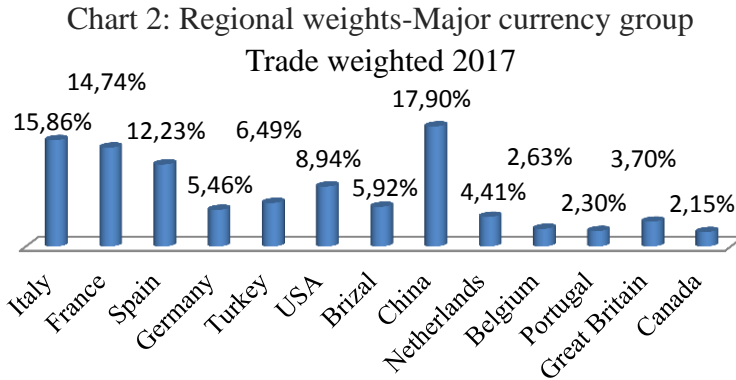
Source: Prepared by author

✓ The AEER-19: in addition to the trading partners in the AEER-8 and AEER-13, the AEER-19 includes Japan, Tunisia, Morocco, Egypt, India and the Russian Federation. The broad group of partner countries covers of around 97 % of total Algerian trade weighted in the 2010-2017 period. In addition to the countries in the narrow group, major group and broad group which includes other countries (OITP).

Chart 3: Regional weights-Broad currency group

Trade weighted 2017
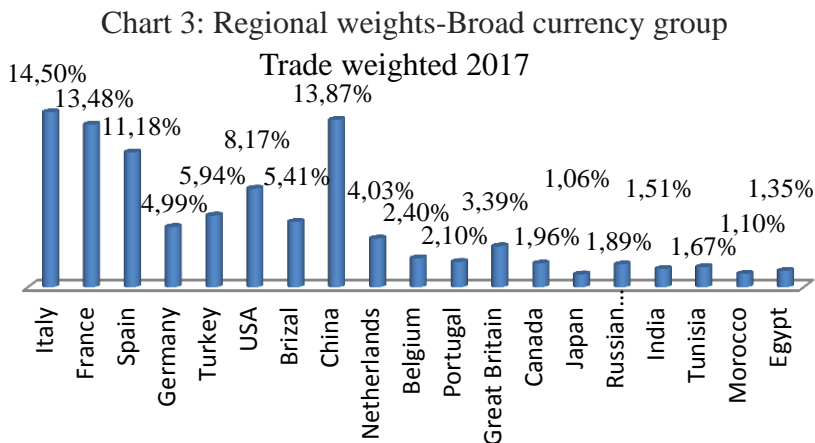
Source: Prepared by author

As shown in the charts 1, 2 and 3, geographical characteristics for Algeria are also reflected in the composition of trade weights in terms of the contribution of import and export weights (total trade). The

weights of the next three most important trading partners (regional weights) are -European area , American area, Asia area and Arab area - in the narrow group are 65%,21%,12% and 0%, in the major group are 64% , 26 % , 11% and 0 % while in the broad group they amount to 64 %, 7% ,5% and 4 % respectively. In terms of regional groupings, the European industrial economies clearly constitute the most important regional group for Algeria's external trade, carrying a weight of around 65 % in the narrow, 69% in the major and 64% in the broad currency group. The second largest region is America (including The United States of America, Brazil and Canada), with some 21%, 20% and 19% respectively, followed by Asia (including China, Japan and India), with around 12%, 10% and 12 %. The Arab economies (including Egypt, Tunisia and Morocco) account for around 0%, 0% and 3%. As shown in the charts 1, 2 and 3 above show how the weights attributed to different regions have varied over time in the narrow, major and broad proposed indexes. The three charts clearly showed a trend increase in the weights attributed to America (including the USA, Canada and Brazil). But this weight drops between 2013 and 2017 in the narrow group, reflecting falls in the import shares of the USA from Algeria. That is related to the sharp slowdown in the rate of growth in the USA and the rise of oil prices in the world in that period. On the other hand, there is a trend increase in the weights attributed to Asian and Arab countries between 2016-2917.

2.2.3 Weighting method

The AEERs of Algerian dinar are calculated using trade weights that combine information on both exports and imports. Import weights and export weights are each trading partner's simple share in total Algeria imports plus exports (total trade). The overall weight of each partner country *j* is obtained as the weighted average of the export and import weights (see table 5 in the appendices).

2.2.4 Deflators

Deflators for the real EERs are consumer price indexes (CPIs), producer price indexes (PPIs), gross domestic product (GDP) deflators

and unit labour costs, both for the total economy (ULCT) and for the manufacturing sector (ULCM). Deflator data are collected from several sources (mainly Eurostat, OECD, ONS, CBA and IMF). For the estimation of the AREER indexes for Algeria, the study used CPI, due to the limitation in the availability of data for other price indexes. According to Edwards (1989, p.24) four alternative price indexes are suggested as possible candidates for estimation the real effective exchange rate. However, as he states, most of them relate to the purchasing power parity (PPP) definition.

2.2.5 Base period and frequencies

The AEERs for the AEER-$_8$, AEER-$_{13}$ and AEER-$_{19}$ are available annually. The base period for all indexes is 2010 (2010= 100).

2.2.6. Exchange rates

The bilateral exchange rates used in the calculation are, in most cases, the CBA's official daily reference rates (if these are not available, indicative rates published by other international organizations are used).

2.2.7 Choice of Index Formula

The practice followed by the staff of bank of Algeria and by that of several other central banks such as (FED , ECB , BOJ (Shimazaki, M. and Solomou S. ,2001) , BANK of ENGLAND , Bank of Canada (Ong, 2006) and Bank of New Zealand (Steenkamp,2014 & Kite ,2008), international organizations (IMF, WB , JPMORGAN and BIS), and private-sector financial institutions are to use exchange rate indexes that are geometrically weighted averages of bilateral exchange rates (Erlandsson & Markowski, 2006).

2.3 The Algerian effective exchange rates calculation

The AEERs of the Algerian dinar are weighted geometric averages of the bilateral exchange rates of the Algerian dinar against the currencies of the Algeria area's main trading partners. A positive change in the index denotes a strengthening of the AEERs of the

Algerian dinar. The weights assigned to each trading partner combine information on imports and exports of manufactured goods between it and Algeria. The Algerian nominal effective exchange rate (ANEER) constitutes a summary measure of the external value of an Algeria's currency against the currencies of its most important trading partners. The Algerian real effective exchange rate (AREER) is the most commonly used indicator of international price and cost competitiveness. The AREER is constructed in such a way that any changes in the index can be decomposed into two effects. An increase in the AREER index represents an appreciation or a loss of competitiveness while the converse is true for a decrease in the index.

2.3.1 The Algerian nominal effective exchange rate

The process begins by first calculating Algerian dinar's nominal effective exchange rate index which reflects the value of the Algerian dinar relative to the value of the currencies of its major trading partners, with reference to a specific base period (Des Vignes & Smith, 2005) and Schmitz et al. (2012), using the geometric mean, the formula for computing the Algerian nominal effective exchange rate can be defined as:

$$\text{ANEER} = \prod_{j}^{n} (Ej)^{Wjt}$$

Where:

ANEER = Algerian nominal effective exchange rate index in a given period (t)

Ej = Price of foreign country (j) currency in terms of the home country (i) currency in period (t) expressed as an index form (base =2010).

Wjt = the appropriate trade weight for each trading partner (j) in period t (weight for country j) note that $\sum_{j=1}^{N} Wjt = 1$

$\prod$ = is the product of the N currencies in the basket

n = the number of countries in the basket 8 currencies, 13 currencies and 19 currencies.

The ANERs of the Algerian dinar are currently calculated against three main groups of trading partners, i.e. the ANER-$_8$ narrow group, the ANER-$_{13}$ major group and the ANER-$_{19}$ broad group. The selected currencies for inclusion in three indexes are the narrow index (NI$_8$ currencies), the major currencies index (MCI$_{13}$ currencies), and the broad index (BI$_{19}$ currencies including the other important trading partners index (OITP$_6$ currencies).

Chart 4: Narrow, Major and Broad Algerian dinar ANEER$_{-8-13-19}$
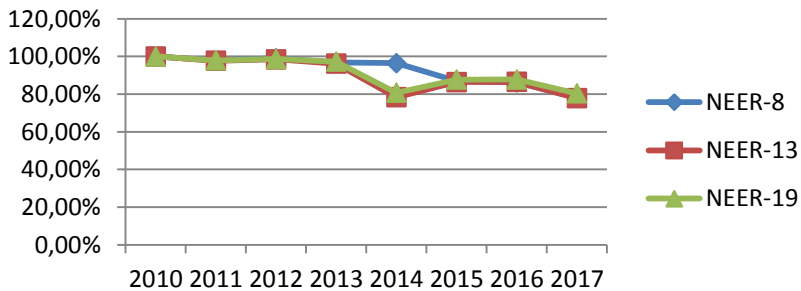
Source: Author's own calculation based on different sources of data such as: central bank of Algeria,   International financial statistics, national office of statistics, World Bank and Algerian customs from Microsoft Excel.

As shown in the chart 4, the ANEER$_8$, the ANEER$_{13}$ and the ANEER$_{19}$ provide useful information about the movement of the Algerian dinar over the time 2010-2017 in different areas with different currencies. It is a measure of the value of the Algerian dinar against a trade-weighted basket of other currencies, relative to a base date 2010 (Euro, Dollar, and GBP). The weights used are designed to measure the relative importance of each of the other countries as a trading partner (Narrow group, major group and broad group (including the other important trading partner's group). During the period 2010-2017, the ANEER$_8$, ANEER$_{13}$ and ANEER$_{19}$ of the Algerian dinar were depreciated by 21.8%, 22.18% and 19.66% respectively and continuing till the end of 2017 because of the slipping policy of the Algerian dinar and also due to the collapse of oil prices and the emergence of a deficit in the balance of payments. This is mainly driven by the movements of Algerian dinar against Euro, USD and GBP. Also, they were appreciated against Turkish Lira (TRY) and Brazilian Real (BRL). As

shown in the chart 4 and chart 5, movements in the nominal effective exchange rate (ANEER $_{8-13-19}$) were reflected in the evolution of the real effective exchange rate (AREER$_{-8-13-19}$), but not with the same magnitude. This showed a general tendency for the value of the Algerian dinar to fall relative to other currencies during this period. This calculation has the advantage that it enables us to assess immediately the extent to which the exchange rate has appreciated against Turkish Lira and Brazilian Real or depreciated against Euro, USD, GBP and other currencies. In this case, we saw that the value of the Algerian dinar relative to the 8-country, 13-country and 19-country mentioned above depreciated between 2010 and 2017, mainly due to the widening of the inflation differential and weak productivity of the industrial sector between Algeria and its main partners.

2.3.2 The Algerian real effective exchange rate

The AREER indexes are computed by deflating a nominal effective exchange rate (ANEER) index by an index of relative prices, which is termed, effective inflation rate (EIR).The EIR measures domestic inflation rates relative to those of the major trading partners. In the study, we use geometric-average real effective exchange rate, due to advantages discussed in the literature review. The AREER released by the central bank of Algeria (CBA), is computed as the weighted geometric average of the prices in Algeria relative to the prices of its principal trade partners in international markets (Hinkle, 2000, p.49). Therefore, we use the following equation for the construction of AREER indexes for Algeria. Mathematically, the index can be written as:

$$\text{AREER} = \prod_{j}^{n} (Ej \quad Pi/Pj)^{Wjt}$$

Where:

AREER = Algerian Real effective exchange rate index in a given period (t)

Ej = Price of foreign country (j) currency in terms of the home country (i) currency in period (t) expressed as an index form (base=2010).

Pi = Index of the cost (or price) indicator of home country i (Algeria).

Pj = Index of the cost (or price) indicator of partner country j (8-13-19-country).

Wjt= the appropriate trade weight for each trading partner (j) in period t (weight for country j) note that $\sum_{j=1}^{N}$ Wjt=1

$\prod$ = denotes the product of the variables.

n = the number of countries in the basket 8 currencies, 13 currencies and 19 currencies.

The AREERs of Algeria are currently calculated against three main groups of trading partners, the narrow AREER$_{-8}$ group, the major AREER$_{-13}$ group and the broad AREER$_{-19}$ group. The selected currencies for inclusion in three indexes are the narrow index (NI_8), the major currencies index (MCI_{13} currencies), and the broad index (BI_{19} currencies including the other important trading partners index ($OITP_6$ currencies).

Chart 5: Narrow, Major and Broad Algerian dinar AREER$_{-8-13-19}$
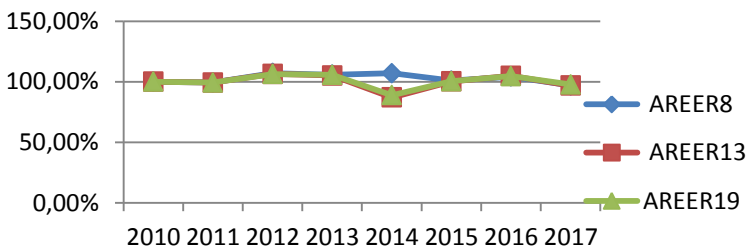
Source: Author 's own calculation based on different sources of data such as: central bank of Algeria, international financial statistics, National office of statistics, World Bank and Algerian customs from Microsoft Excel.

As shown in the chart 5, there were three distinct periods of movements in the AREER$_{-8-13-19}$ by appreciated and depreciated. Over the entire period, the AREER$_{-8-13-19}$ depreciated by 3.02%, 3.15% and 2.33% respectively as the rate of inflation in Algeria was higher than

those of its major trading partners and competitors, except for Brazil, Russian Federation, Turkey, India and Egypt. Thus, the impact of the inflation differential on the AREER$_{-8-13-19}$ outweighed the effect exerted by the depreciation of the nominal effective exchange rate (ANEER$_{-8-13-19}$). From the chart 5, we saw that between 2011 and 2016 the Algerian dinar appreciated in real terms relative to all the other currencies in our sample by 4.9%, 5.54% and 5.28% this is because of the rise in the oil prices. This temporary increase in the AREER$_{-8-13-19}$ was also a result of very expansionary domestic policies reflected in the massive growth of fiscal spending. An increase in government expenditure tends to push the real exchange rate upward as it creates pressure on non-tradables such as services. For example, from 2016 through to 2017, the real effective exchange rate depreciated by 7.27%, 7.97% and 6.95% significantly leading to a substantial profit of competitiveness for the Algerian industry but not the case because of the large entries in the capital in foreign currency and a significant drop in the oil prices. According to the Dutch Disease theory, capital inflows affect real exchange rate through the tradable and non-tradable sectors of the Algerian economy and through that extends to affect the level of international competitiveness of Algeria. In fact, this has not happened because of the poor productivity of the Algerian industrial economy.

3. Results and discussion

3.1 Results

As shown in chart 4 and 5, that shows the results for the three types of AREER and indicates that the narrow, major and broad indexes follow a similar trend but with more exaggerated fluctuations. While the nominal effective exchange rate (ANEER$_{-8-13-19}$) largely depreciated since Algerian inflation was relatively higher. The fluctuations of the narrow AREER$_{-8}$ were strongest with a steep initial depreciation of 0.65 % (2010-2011) and subsequent appreciation of 4.9 % (2011-2016), followed by a 7.27% (2016-2017) depreciation. The movements in the major AREER$_{-13}$ were slightly more pronounced than the narrow AREER$_{-8}$, depreciating slightly in 2011, then appreciating by 5.54% between 2011 and 2016, followed by a moderate depreciation of nearly

the same magnitude 7.97% as the narrow $AREER_{-8}$.Also,the fluctuations of the broad $AREER_{-19}$ were strongest with a steep initial depreciation of 0.66 % (2010-2011) and subsequent appreciation of 5.25 % (2011-2016), followed by a 6.95% (2016-2017) depreciation. However, the observation that fluctuations of the $ANEER_{8-13-19}$ were due to inflation differentials between countries eventually led to the adoption of the Real Effective Exchange rate (AREER) as a more appropriate indicator of international trade competitiveness.Thus, according to the chart 4 and 5, compared with 2016-2017, there was recorded a depreciation of the Algerian dinar in both nominal and real terms. The $AREER_{8-13-19}$ depreciation was mainly determined by the nominal depreciation.This evolution involves the increase of the competitiveness of domestic goods relative to Algeria's trading partners. It should be mentioned that these indicators reflect only the price competitiveness. The chart 5 showed, for example, that the Algerian dinar depreciation against the U.S. dollar determined the decrease of prices of the Algerian products expressed in U.S. dollars. At the same time, prices for Algerian products, also expressed in U.S. dollars, remain at the same level.

3.2 Discussion and Limitation

In recent years, the geographical composition of the Algeria trade has undergone significant change, which is also reflected in the trade weights of the AEERs of the Algerian dinar. In particular, the growing importance of emerging economies. The table 5 in appendices presents the average trade weights of each country included in the narrow $AEER_{-8}$, major $AEER_{-13}$ and broad $AEER_{-19}$ group for all available periods. Advanced economies continue to account for a sizeable share of total Algeria trade such as Italy, France, Spain, USA and China although the importance of the largest advanced economies in the $AEER_{-8}$, $AEER_{-13}$ and $AEER_{-19}$ of Algeria has been declining over time such as the USA ,Canada and Germany. Between 2010 and 2017, the five individual countries with the greatest weights were, on average, the United States, France, Spain, Italy and China which together accounted for almost two-thirds of the $AEER_{-8}$ group, $AEER_{-13}$ group and $AEER_{-19}$ group. With Turkey, Netherlands, Brazil and Great Britain, they also were among Algeria's four largest single trading

partners in the period 2010-2017. Over the entire period (2010-2017), the AREER$_{8-13-19}$ depreciated by 3.02%, 3.15% and 2.33% respectively as the rate of inflation in Algeria was higher than those of its major trading partners and competitors, except for Turkey, Russian Federation, Brazil, Egypt and India. Thus, the impact of the inflation differential on the AREER$_{8-13-19}$ outweighed the effect exerted by the depreciation of Algerian nominal effective exchange rate (ANEER$_{8-13-19}$) by 21.8% , 22.18% and 19.66% respectively.

In theory, the REER contains information useful to estimating the future growth in exports and imports for a country since it expresses the overall premium that consumers in that country pay relative to consumers in the country's trading partners. Movements in REER and NEER indexes would indicate whether REER and NEER have been stable, appreciating or depreciating. In addition, we argue that the change of the REER significantly influences the competitiveness of Algeria on the world market. It is one of the key variables that determine trade balance dynamics and it is the essential indicator of economic development of Algeria. Moreover to those indexes, there are several more that can be used for the constructing the real effective exchange rate (producer price indexes PPI) and unit labour costs (ULC) (Lafrance, 1998, p.4).The CPI is among the most commonly used indexes for the constructing the real effective exchange rate. The main advantage of the CPI over other price indexes is that it is available monthly in most developing countries. However, it has several disadvantages. It includes a broad group of goods and services, and, thus, it is arguable whether it is a good index for the constructing the real effective exchange rate, since it includes non-tradable goods. Therefore, if prices of tradables and non-tradable will diverge over time, the CPI could be very misleading indicator. Additionally, CPIs for different countries are based on the different baskets of goods, and they reflect consumption patterns that can differ from one country to another.These differences limit the usefulness of real effective exchange rate for comparing standards of living.

4. Conclusions and Recommendations

The nominal and real effective exchange rate indexes are constructed using a weighted average of a country's nominal and real bilateral exchange rates against a group of countries. In the absence of a solid consensus on the proper target of exchange rate management, we propose, in particular, the following recommendation is made based on the results obtained in this study so the study recommended the development of a new AREER requires the identification of a set of countries for inclusion in the analysis to construct different other types of AREER such as AREER $_{Euro\ area}$, AREER $_{America\ area}$, AREER $_{Asia\ area}$, AREER $_{Arab\ area}$ and   AREER $_{Africa\ area}$ (Jair Santoya Candice Soutar , 2011; Buldorini, L, S Makrydakis and C Thimann , 2002 and Simon Potter,2018)**.**So the depreciation of the AREER$_{8-13-19}$ has been beneficial to certain industries, these industries still require essential structural reforms to improve productivity and, where the opportunity arises, to broaden their exports base through value added products. Entrepreneurs should look beyond the traditional export markets (Europe, USA, Asia and Arab countries) to grasp business opportunities in Africa. Finally, the study concludes that AREER$_{8-13-19}$ continues to be an important short-term indicator of Algeria's international competitiveness despite its shortcomings. It is very easy to compute given the freely availability of the data on exchange rates and consumer price indexes.

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Appendices: Data and methodology description
Table 1: Data sources

Variables	Data sources
Consumer Price index of Algeria, France, Germany, Italy, Spain, Belgium, Netherlands, Belgium, Portugal, Turkey, Russian Federation, United States of America, Canada, Brazil ,China, Japan, India , Egypt ,Morocco and Tunisia.	World development Indicator (World Bank) and International Financial Statistics (IMF).
Official exchange rates (DZD, GBP,CAD,JPY,CNY,TRY,BLR ,TND,MAD,EGP,RUB,INR)	International financial statistics, World Bank, Central bank of Algeria (various years).
Official exchange rates EUR/USD	European Central Bank and Eurostat.
The 8-13-19 main importers of the Algerian economy	National Office of Statistics Algeria.
The 8/13/19 main exporters of the Algerian economy	National Office of Statistics Algeria.

Source: Prepared bu author.

Table 2: Evolution of the effective exchange rates (ANEER$_{8-13-19}$ and AREER$_{8-13-19}$) indexes over the period (2010-2017)

	2010	2011	2012	2013	2014	2015	2016	2017
The ANEER$_8$	100	97.76	99.01	96.75	96.45	86.90	86.21	78.20
The AREER$_8$	100	99.35	107.12	105.85	107.04	100.90	104.25	96.98
The ANEER$_{13}$	100	97.74	98.46	96.18	78.34	86.38	86,52	77.82
The AREER$_{13}$	100	99.28	106.46	105.15	86.98	100.28	104.82	96.85
The ANEER$_{19}$	100	97.89	98.63	97.20	80.70	87.71	87.74	80.34
The AREER$_{19}$	100	99.34	106.36	105.69	88.93	100.32	104.62	97.67

Source: Author's own calculation based on different data such as: International Financial Statistics, World Bank Central bank of Algeria, National Office of Statistics and Algerian Customs from Microsoft Excel.

Table 3: Data and series construction

Variables	Data construction	Data source
Trade weighted	Author's own calculation	International financial statistics, World Bank, Central bank of Algeria. Various years.
Exchange Rate Indexes Ej	Author's own calculation	International financial statistics, World Bank, Central bank of Algeria. Various years.
Real Bilateral Exchange Rates	Author's own calculation	International financial statistics, World Bank, Central bank of Algeria. Various years.
Weighted ANEER	Author's own calculation	International financial statistics, World Bank, Central bank of Algeria. Various years.
Weighted AREER	Author's own calculation	International financial statistics, World Bank, Central bank of Algeria. Various years.

Source: Prepared bu author.

Table 4: Methodological construction of $ANEER_8$ and $AREER_8$ over the period 2010-2017 Why $AEER_8$? How are the ANEER8 and AREER8 calculated? So there are three questions to answer which currencies? Which weighting system? Which formula? Finally, to obtain $ANEER_8$ and $AREER_8$ (more details see Hooper and Morton (1978), Belongia (1986) and Rosensweig (1986)).

Table 4a: Exchange Rate Indices Ej ($ANEER = \prod_{j}^{n}(Ej)^{Wjt}$)

Country	2010	2011	2012	2013	2014	2015	2016	2017
France	100.0	99.4	100.0	99.4	99.3	97.7	98.0	95.1
Italy	100.0	99.4	100.0	99.3	99.3	97.7	97.6	94.8
Spain	100.0	95.1	100.0	99.3	99.3	97.7	98.2	95.9
Germany	100.0	99.8	100.0	99.8	99.8	99.2	99.2	98.1
Turkey	100.0	100.6	100.7	100.9	101.8	102.0	101.9	103.6
United states of America	100.0	99.3	99.0	99.3	98.1	96.6	95.1	95.4
Brazil	100.0	99.7	100.3	100.7	101.1	101.5	101.6	101.2
China	100.0	99.7	98.5	97.7	97.3	93.6	93.5	91.7
ANEER$_8$	**100.0**	**97.76**	**99.01**	**96.75**	**96.45**	**86.90**	**86.21**	**78.20**

Source: Author's own calculation based on different data such as: Central Bank of Algeria, International Financial Statistics, National Office of Statistics, World Bank and Algerian Customs from Microsoft Excel

$AREER_8$ in 2010= Π [Ej x100] ^{wj} = 1x1x1x1x1x1x1x1= **100.0**
$AREER_8$ in 2011= Π [Ej x100] ^{wj} = 0.994x0.994x0.951x0.998x1.006x0.993x0.997x0.997= **97.76**
$AREER_8$ in 2012= Π [Ej x100] ^{wj} = 1x1x1x1x1.7x0.99x1.03x0.985= **99.01**
$AREER_8$ in 2013= Π [Ej x100] ^{wj} = 0.994x0.993x0.993x0.998x1.009x0.993x1.007x0.977= **96.75**
$AREER_8$ in 2014= Π [Ej x100] ^{wj} = 0.993x0.993x0.993x0.998x1.018x0.981x1.011x0.973=**96.45**
$AREER_8$ in 2015= Π [Ej x100] ^{wj} = 0.977x0.977x0.977x0.992x1.020x0.966x1.015x0.936=**86.90**
$AREER_8$ in 2016= Π [Ej x100] ^{wj} = 0.951x0.948x0.959x0.981x1.036x0.954x1.012x0.917=**86.21**
$AREER_8$ in 2017= Π [Ej x100] ^{wj} = 0.951x0.948x0.959x0.981x1.036x0.954x1.012x0.917=**78.20**
$\prod$ = is the product of the N currencies in the basket (denotes the product of the variables)

Table 4b: Consumer price indexes for main trading partners (Pj) and Algeria (Pi)   ($\prod_{j}^{n}(Pi / Pj)^{Wjt}$)

Country	2010	2011	2012	2013	2014	2015	2016	2017
France	100.0	1.009	1.029	1.033	1.040	1.061	1.063	1.076
Italy	100.0	1.003	1.016	1.018	1.022	1.031	1.046	1.051
Spain	100.0	1.001	1.012	1.019	1.024	1.033	1.036	1.040
Germany	100.0	1.000	1.003	1.004	1.007	1.010	1.014	1.017
Turkey	100.0	0.999	0.998	0.996	0.992	0.989	0.989	0.984
United states of America	100.0	1.003	1.013	1.011	1.011	1.014	1.025	1.025
Brazil	100.0	0.998	1.000	0.999	0.997	0.995	0.993	0.993
China	100.0	0,999	1.005	1.007	1.009	1.016	1.025	1.032
$\prod_{j}^{n}(Pi / Pj)^{Wjt}$	**100.0**	**1,016**	**1.081**	**1.093**	**1.109**	**1.161**	**1,209**	**1.240**

Source : Prepared bu author.

Table 4c: Weighted real bilateral exchange rates ($AREER = (ANEER) * \prod_j^n (Pi / Pj)^{Wjt}$)

Country	2010	2011	2012	2013	2014	2015	2016	2017
ANEER$_8$	100.0	97.76	99.01	96.75	96.45	86.90	86.21	78.20
$\prod_j^n (Pi / Pj)^{Wjt}$	100.0	1.016281907	1.081918351	1.093810119	1.109797508	1.16107135	1.209206054	1.240095
AREER$_8$	100.0	99.35	107.12	105.85	107.04	100.90	104.25	96.98

Source: Prepared bu author
.
AREER$_8$ in 2010= Π [(Pi/Pj) x Ej x100] ^{wj} = 1x1= **100.0**
AREER$_8$ in 2011= Π [(Pi/Pj) x Ej x100] ^{wj} = 0.9776x1.016281907 = **99.35**
AREER$_8$ in 2012= Π [(Pi/Pj) x Ej x100] ^{wj} = 0.9901x1.081918351 = **107.12**
AREER$_8$ in 2013= Π [(Pi/Pj) x Ej x100] ^{wj} = 0.9675x1.093810119 = **105.85**
AREER$_8$ in 2014= Π [(Pi/Pj) x Ej x100] ^{wj} = 0.9645x1.109797508 = **107.04**
AREER$_8$ in 2015= Π [(Pi/Pj) x Ej x100] ^{wj} = 0.8690x1.16107135 = **100.90**
AREER$_8$ in 2016= Π [(Pi/Pj) x Ej x100] ^{wj} = 0.8621x1.209206054 = **104.25**
AREER$_8$ in 2017= Π [(Pi/Pj) x Ej x100] ^{wj} = 0.7820x1.240095654 = **96.98**
$\prod$ = is the product of the N currencies in the basket (denotes the product of the variables)

Table 4d: Decomposition of changes in AREER$_{8\text{-}13\text{-}19}$ and ANEER$_{8\text{-}13\text{-}19}$ indexes

Country	Change in					
	ANEER$_8$	AREER$_8$	ANEER$_{13}$	AREER$_{13}$	ANEER$_{19}$	AREER$_{19}$
2010-2017	-21.8	-3.02	-22.18	-3.15	-19.66	-2.33
2011-2016	-11.55	+4.9	-11.22	+5.54	-10.15	+5.28
2016-2017	-8.01	-7.27	-8.7	-7.97	-7.4	-6.95

Source: Prepared bu author.

Table 5: Shares of Algeria's trading partners (base year = 2010, trade weighted) gives the normalized weights for the 8-13-19 group for over the period 2010-2017, which is based on trade weighted (imports plus exports = total trade).

Country	Trade weighted 2010			Trade weighted 2017		
	8	**13**	**19**	**8**	**13**	**19**
Italy	20,77%	16,92%	15,86%	18,70%	15,86%	14,50%
France	15,89%	12,94%	12,13%	17,38%	14,74%	13,48
Spain	13,84%	11,27%	10,56%	14,42%	12,23%	11,18
Germany	4,36%	3,55%	3,33%	6,44%	5,46%	4,99%
Turkey	6,82%	5,56%	5,21%	7,66%	6,49%	5,94%
The USA	25,86%	21,07%	19,75%	10,54%	8,94%	8,17%
Brazil	5,37%	4,38%	4,10%	6,98%	5,92%	5,41%
China	7,09%	5,78%	5,41%	17,90%	15,18%	13,87%

Netherlands	6,15%	5,76%	4,41%	4,03%
Belgium	3,56%	3,33%	2,63%	2,40%
Portugal	1,74%	1,63%	2,30%	2,10%
Great Britain	2,71%	2,54%	3,70%	3,39%
Canada	4,37%	4,10%	2,15%	1,96%
Japan		2,00%		1,06%
Russian Federation		0,20%		1,89%
India		0,94%		1,51%
Tunisia		1,13%		1,67%
Morocco		1,05%		1,10%
Egypt		0,95%		1,35%
Total	100		100	

Source: Author's own calculation based on different data such as: Central Bank of Algeria, International Financial statistics, National Office of Statistics, World Bank and Algerian Customs from Microsoft Excel

Table 6: Abbreviations

Abrreviations	Meaning
EERs	Effective exchange rates.
NEER	Nominal effective exchange rate.
REER	Real effective exchange rate.
CPI	Consumer price index.
Wpi	Wholesale price index.
ULC	Unit labour costs.
GDP	Gross domestic product.
ANEER	Algerian nominal effective exchange rate.
AREER	Algerian real effective exchange rate.
AEERs	Algerian Effective exchange rate.

Source: Prepared bu author.