

## Effects of Exchange Rate on Unemployment in Morocco Economy

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### ABSTRACT

**Objective:** This paper investigates the effects of real effective exchange rates and other macroeconomic variables on unemployment in Morocco during the period from 1991 to 201.

**Methods:** We applied the ARDL model to Moroccan data to examine how the exchange rate explains the largest proportion of variation in unemployment.

**Results:** Both the depreciation of the Moroccan dirham and the rise in inflation lead to higher unemployment rates in Morocco in the long run. Conversely, money growth and GDP have negative relationships with unemployment over the long term, highlighting the crucial role these variables play in reducing unemployment rates.

**Conclusions:** The study recommends that Morocco design an exchange rate policy and trade reform programs to maintain the strong real value of the Moroccan dirham. Moroccan authorities should also focus on controlling inflation and adopting policies that promote money growth, encouraging investment, and generating higher GDP growth to reduce unemployment rates in the economy.

**Keywords:** Unemployment, Effective Exchange Rate, Inflation, Money Growth, GDP Growth.

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## 1. Introduction

Analyzing the causes of unemployment to reduce its rates is a crucial objective for any economy due to the economic and social implications of unemployment on individuals of the community, especially for those economies suffering from persistently high unemployment rates. The increasing rate of unemployment around the world has become an issue of major concern for both policymakers and scholars in the developing economies; this is attributable to the importance of unemployment as a key outcome of the labor market and an indicator of the state of the economy in general (Folawewo and Adeboje, 2017; Gur, 2015; Kooros, 2008). Many factors affect the unemployment rate identified in the literature: inflation, free trade, population, exchange rate, economic and money growth, interest rate, education, foreign direct investment, technology, debt, population growth, and other factors. While these factors may arise for different reasons in each economy, there common factors among developing economies such as GDP, inflation, money growth, and one of the most important factors in today's open economies is the real value of the exchange rate of the domestic currency that affects the state of trade and investment, and thereby the rates of unemployment (Shaaria et al., 2013).

By the end of the Bretton Woods system in the early 70s together with the increase of market integration and trade openness over the years, small developing economies faced a large swing in the exchange rates of their domestic currency which then increased unemployment rates. Exchange rate depreciation hampers output and increases unemployment rates in open economies, especially for small developing countries relying on imported goods. High variability and depreciation in exchange rate causes uncertainty in future earning, consequently, reduces investment in physical capital and increasing unemployment (Shaaria et al., 2013). Besides, a major concern for small developing

economies is to maintain the real value of its currency regardless of the exchange rate system that they adopt due to the instability and weak fundamentals of these countries and fragility facing economic shocks. However, it is believed that adopting a fixed exchange rate policy by small open economies can reduce instability of the domestic economy in terms of prices, inflation and encourage investment, believing that pegged regimes can only achieve sustainable growth and employment.

As a small open economy, Morocco has maintained a fixed exchange rate of the local currency anchored to a basket of currencies of major trading partners. These amounts to the monetary authorities may fix the weights of the trading basket to avoid any loss of competitiveness and offset the inflation differential between Morocco and its partners. By increasing the integration of the Moroccan economy into the World economy particularly in Europe, the objective of the exchange rate policy was to keep inflation under control to preserve the external competitiveness of the Moroccan economy. But since the collapse of the Bretton Woods system, the Moroccan dirham has been devalued several times to cope with its depreciated value together with the Euro and US dollar; in the 80s, the real value of the Moroccan dirham was depreciated by about eighty-four percent (Belhadj, 2009; Bouzahzah and Bachar, 2014; Haoudi and Rabhi, 2017). The monetary authority of Morocco succeeded in capping inflation rates over the years by around two percent which helped prices and trading with its partners but was unable to reduce high unemployment rates with its exchange rate policy. Recently, Morocco moved toward greater exchange rate flexibility by updating the currency basket and widening the band of the Moroccan dirham exchange rate around the Euro and US dollar, thus allowing greater variability of the dirham which raises the concern of potential capital outflows that could occur with greater exchange rate flexibility. But the merit of this flexibility in exchange rate policy aims at strengthening the ability of the Moroccan economy to adjust to external shocks

while remaining consistent with the country's strategy to position itself as a trade and financial hub, at the same time avoiding free float or anchoring to a single currency (Alby, 2017; Haoudi and Rabhi, 2017)

A major concern of the Moroccan economy is the high unemployment rate that is persistent above 10% for more than two decades particularly for young skilled people living in urban areas – as high as 26% of total unemployment. In the early 90s, skilled and university graduates of unemployment were qualified as a public problem deserving government attention due to the weak labor regulation in the private sector and the absence of general social protection measures (Badimon, 2013); the majority of new jobs are problematic in low-productivity, low-skilled areas and many are in the informal sector, where ninety percent of the jobs created since the 2000s went to individuals without higher education. To keep unemployment rates under control and prevent social instability, the Moroccan government attempted to achieve an economic growth rate of 6% through a program of economic reform and liberalization, including private-sector development to diversify the economy; however, reforms efforts have lagged where GDP growth rate averaged around 3.8% in the past ten years but in 2016 was as low as 1.22%, the reforms are obviously complex and cannot be modeled in detail (Marouani and Robalino, 2012; Haoudi and Rabhi, 2017). The persistently high unemployment rates present an important challenge for social welfare as it hampers the efficiency of resource allocation not only to youth people but also to the broader economy (Pereira Da Silva, Thomas 2017).

This paper will investigate the effects of real effective exchange rate and other selected macroeconomic variables such as inflation, economic and money growth on unemployment in Morocco for the period of 1991 to 2016. The objective is to highlight the critical macroeconomic variables that the Morocco authority needs to maintain to reduce unemployment rates in the

domestic economy. The remaining sections of this paper shall be structured as follows: section two reviews the empirical and theoretical relationships related to unemployment. Section three discusses the methodology used for investigating the study problem, as well as define the variables and discuss further the theoretical relationship between the dependent variable and each of the explanatory variables to be tested in the econometric model. Section four reports and analyses the empirical results. Section five provides a conclusion of the results and analysis.

## 2. Literature Review

Nyahokwe (2013) investigated the effects of macroeconomic variables on unemployment in South Africa using quarterly data for the period 2000 to 2010. The empirical results using VAR and GARCH models suggest that there is a long-run relationship of the real exchange rate, exports, real interest rate, and the gross domestic product with unemployment; the most interesting result emerged from the analysis supported by previous work is that the real exchange rate explains the largest proportion of the variation in the unemployment rate. The econometric results show that an increase in the real exchange rate has adverse effects on employment because weak currency generates real exchange rate variability usually causing increased uncertainty that would reduce the potentials for investment in physical capital and accordingly increase unemployment rates in the domestic economy.

Chimnani et al. (2016) studied the effects of exchange rate on unemployment rates in ten Asian countries using an unbalanced panel annual dataset for the period from 1995 to 2005 and applying the OLS econometric technique; the study found that exchange rate has a positive impact on the unemployment rate, implying the fact that Asian countries have more reliance on imported goods as compared to exported goods. The implication of this study is that if Asian countries maintain their

exchange rate then they can control the unemployment level. All variables show significant effects on unemployment where exchange rate, net exports, and real interest rate show a positive impact on unemployment, labor productivity and GDP have an inverse relationship with unemployment.

The main purpose of Benazić and Rami, (2016) article is to determine the impact of monetary policy variables on unemployment in Croatia by using the bounds testing ARDL approach for cointegration for the period from 1998 to 2014 using quarterly data for the series on consumer price, money, and real effective exchange rate. The results indicate that money is insignificant in the short- and long-run implying that changes in the quantity of money have no effect on unemployment. Consumer prices are found to have a positive relationship with unemployment in the long run; an increase in consumer prices in the long-run increases unemployment, mainly because rising prices will decrease aggregate demand for products and services while in the short-run an increase in prices lead to a decrease in unemployment, however, in the short-term prices are found to be statistically insignificant. The relationship between unemployment and the real effective exchange rate is significant and positive in the short- and long-run, indicating that exchange rate depreciation causes a rise in unemployment.

Kaur and Zaharudin (2016) investigated the effects of macroeconomic variables on unemployment in Malaysia using quarterly data from 2006 to 2015. The result of the OLS estimator shows that money growth significantly affects unemployment in Malaysia; inconsistent with the monetarist view an increase in money supply led to an increase in income and investment spending that will increase employment and decrease unemployment. The result of inflation effects on unemployment is positive but insignificant. GDP growth, overnight interbank rate, and oil price were found to be statistically significant and negatively related to unemployment.

Ogbeide et al. (2016) investigated the determinants of unemployment in Nigeria using the data from 1981 to 2013. The results of ECM and OLS estimators show that GDP, FDI, trade openness, and exchange rate depreciation have a significant effect on reducing unemployment in Nigeria, while an increase in industrial capacity reduces the demand for labor and thereby increases unemployment also government capital spending found to worsen the unemployment level in Nigeria. Inflation had mixed outcomes and was insignificant in both estimators.

Aurangzeb and Asif (2013) investigated the effects of inflation, gross domestic product (GDP), exchange rate, and population growth rate on unemployment for India, China, and Pakistan for the period 1980 to 2009. The results show that all the variables have a significant positive impact on the rate of unemployment for Pakistan. GDP showed a significant positive impact on unemployment; this result is in contradiction to the theory related to the inverse relationship between economic growth and unemployment. One of the reasons is that although growth plays a vital role to overcome the problem of unemployment and poverty, alone it is not adequate, poverty is one of the major reasons for the positive relationship among these variables; another reason for the positive relation is that the foreign investment is not being utilized in a productive way in Pakistan or underutilized for the purpose it is intended for. The result of India and China show the negative impact of growth on the unemployment rate of both countries; it means that when an economy grows, employment opportunities are boosted and eventually unemployment rate falls; this complies with the theory of inverse relationship, and it also means that in most cases the utilization of the resources in these countries is better than that of Pakistan. For Pakistan and India, inflation showed a positive relation with unemployment which means that when the rate of inflation increases, unemployment increases as well, but a negative relationship exists

between unemployment and inflation for China, which supports the Philip curve. The population also showed a positive impact on the unemployment rate; it explains that when the population grows unemployment rate increases too. Logically and theoretically, it supports the results, because with the rising population although the factors of production keep increasing, but that the increase is not in proportion to the production and utilization of the resources.

The effect of the exchange rate on unemployment is positive and significant in all three countries, indicating that domestic currency depreciation increases unemployment rates in Pakistan, India, and China. With the increase of globalization and trade openness between countries around the world the movement of exchange rate plays a vital role in the domestic economies of countries which have a direct effect on the employment level in a country. The inflow and outflow of foreign currency affect investment and the value of the domestic currency in turn influence the rate of growth in an economy and consequently the rate of unemployment, where an increase of foreign currency inflow moves the economy toward growth and consequently the rate of unemployment declines (Aurangzeb and Asif, 2013).

Bakhshi and Ebrahimi (2016) estimated the effect of the real exchange rate, gross domestic product, exports, and imports on unemployment rates in Iran by applying Pesaran et al. econometric estimation to test the short- and long-runs effects using annual data series for the period from 1981 to 2012. The results of the study demonstrated that in both short- and long-runs, the gross domestic product had a positive and significant effect on unemployment; exchange rate had a negative and significant effect on unemployment, where there was no significant relationship between unemployment and other variables of the study, namely, exports and imports.

Shaaria et al. (2013) studied the impact of exchange rate and oil prices on unemployment in Malaysia using monthly for the period 2009 to 2011 by applying the

VAR-based cointegration technique and the VECM model. The VECM results show that the error correction coefficient is negative and statistically significant confirming a long-run relationship between the variables in the VECM model. The coefficient of the exchange rate is positive and is statistically significant indicating that the exchange rate influences unemployment rates in Malaysia in the short run, however, the coefficient of oil prices is insignificant meaning that oil price does not influence unemployment while exchange rate depreciation cause higher unemployment.

Gur (2015) examined the factors of unemployment in the recently attention-grabbing BRIC countries, namely, Brazil, Russia, India, and China. The study covers the period 2001-2012 using panel data analysis. According to the results, GDP growth, trade volume, total investment, and industrial production growth have an impact on reducing unemployment. The most important cause of increasing unemployment in the BRIC countries is inflation followed by population growth. Folawewo and Adeboje (2017) also found that inflation exerts a positive impact on unemployment in the Economic Community of West African States (ECOWAS), thereby showing that the Phillips curve hypothesis does not hold in the ECOWAS region.

Berument et al. (2009) used a quarterly VAR model to address how changes in various macroeconomic indicators affect overall unemployment and unemployment in different sectors of economic activity in Turkey for the period 1988-2004. These macroeconomic indicators are real GDP (as a measure of income), price, the exchange rate, the interbank interest rate, and money. Interbank interest rate and exchange rate shocks have statistically significant and positive effects only on the manufacturing sector at the initial level but statistically insignificant effects on unemployment among other sectors of the Turkish economy (i.e. agriculture, construction, and wholesale-retail trade sectors). In addition, money shock causes a decline in unemployment

of all sectors of economic activity in the first period except in the activities of agriculture, which is positive and marginally significant in the initial period. Furthermore, whereas an income shock decreases unemployment in all the sectors of economic activity in the short run, a price shock statistically has positive effects on unemployment in all the sectors in the long run. This suggests that income policies in Turkey are more effective than the interbank interest rate and exchange rate policies in tempering unemployment. Income policies that also incorporate structural reforms should be emphasized to fight unemployment in various sectors of economic activity. However, price shocks might be capturing inefficiency; it is assumed that the government sector in Turkey is less efficient than the private sector noting that the largest source of price shock is the government sector. Thus, government-sector pricing could negatively affect the economy and increase unemployment. This clearly suggests that structural reforms in which privatization is important might increase efficiency and decrease unemployment. The study found that there is an initial effect of exchange rate movement on unemployment in Turkey in the manufacturing sector, but not an effective tool to fight unemployment in the long-run all sectors, whereas price shocks affect unemployment in all sectors over the long run.

Atya (2015) investigated the effect of the exchange rate, economic growth, labor productivity, and openness on unemployment in Egypt using ARDL, Fully Modified OLS, and Dynamics OLS econometric methods. The results found that depreciation of real exchange rate leads to a decrease the unemployment in the Egyptian economy because the depreciation of the real exchange rate will increase exports and gross domestic product. There is a negative and significant relationship between economic growth and unemployment. For labor productivity, the results reveal that the effect of labor productivity on unemployment is positive and significant. For economic openness, the results indicate the insignificant effect of

economic openness on unemployment.

Chang and Shen (2011) tested the effects of exchange rate uncertainty – measured by exchange rate volatility – on unemployment in Taiwan, Singapore, and South Korea. The GARCH results indicate that the increase of exchange rate uncertainty generates a large positive impact on unemployment initially, but the impact gradually falls in Singapore; in Taiwan, the exchange rate shock on unemployment is relatively smaller than that in Singapore and will die out eventually. However, the effect that the lagged unemployment has an obvious and positive impact on future unemployment is demonstrated in South Korea and Taiwan. Therefore, the solution to solve the current unemployment problem in South Korea and Taiwan is to adopt policies that create more job opportunities in order to reduce unemployment in the future.

Providing that economic growth is one of the key determinants for creating new jobs and reducing unemployment rates in an economy, several studies involved focusing on the relationship between economic growth and unemployment as defined by Okun's law; where Okun's law concept proposes that an increase of the unemployment rate for one percentage point is related with two percentage point decrease of the real GDP (Lozanoska and Dzambaska, 2014). Khan (2013) findings indicate that a rise of 1% point of unemployment is associated with a decline of 0.36% point of GDP growth in Pakistan. The regression testing by Kokotović (2016) found that economic growth in the six EU member-states (i.e. Greece, Croatia, Spain, Germany, Denmark, and the Czech Republic) is far stronger in decreasing total unemployment rate than youth unemployment rate. Given the persistent and increasing rate of unemployment in the Economic Community of West African States (ECOWAS), the empirical result by Folawewo and Adeboje (2017) shows that GDP growth has a negative relationship with unemployment, but the coefficient of GDP is not significant, which indicates low employment elasticity of growth in the ECOWAS region.

Lozanoska and Dzambaska (2014) findings on the Republic of Macedonia show that a rise of 1% point of unemployment is associated with a decline of roughly 1.6% points of GDP growth; the regression shows that only 17.2% of the changes in the GDP can be explained with the changes in the unemployment, in which can be concluded that the Okun's concept is not totally prominent for the Macedonian economy. Given the structure and level of unemployment is one of the most pressing problems of the MENA region where the labor market has some difficulties in both supply and demand, and economic growth rates is not enough to reduce unemployment rates in the region; empirically, Bilgin and Kilicarslan (2008) found that there is a high correlation between growth and unemployment rates. The regression result shows that as growth rates decrease in the MENA region, unemployment rates increase. The model predicts that GDP growth rates in the MENA region need to increase by much higher than the average historical growth rate of 3.5% in order to reduce unemployment rates by half in 2015.

### **3. Data, Variables and Methodology**

#### **3.1 Data**

This section shall discuss the methodology steps to test the effects of macroeconomic variables on unemployment using annual observations for the period 1991 to 2016. The source of time series data is extracted from the websites of the databases of the World Bank (WB). The first part of this section will start by defining each variable and reinforcing the theoretical relationship identified in the literature review between the dependent variable and each of the explanatory variables.

##### **3.1.1 The dependent variable 'Unemployment'**

Unemployment is one of the important problems discussed in macroeconomic analysis, because of its economic and social implications on individuals, families, and society. In a broad definition, unemployed people are those with the desire and ability to generate income and they are looking for work but cannot find it, and this situation is called unemployment; in the

International Labour Organisation (ILO) there are three basic elements in the definition of unemployment which should be satisfied simultaneously: those "without work", "currently available for work" and "seeking work" (ILO, 2004).

Unemployment (UN) is expressed in percentage as the number of unemployed people of the total labor force in an economy. A high rate of unemployment is an indicator for lower production, investment, and consumption in the economy which increases the expenditure burden on the economy that may reduce the demand for domestic currency. The high unemployment rate is a major problem in many developing countries which can affect the growth and social conditions of a country; the problems caused by unemployment are more tangible in countries that have a younger population, especially in countries that have not basically predicted the issues related to social and economic structures with necessary and timely investments (Bakhshi and Ebrahimi, 2016).

##### **3.1.2 Explanatory variables**

The literature review on Morocco in the introduction section identified that GDP, inflation, money growth, and exchange rate as major concerned variables for Morocco's economy. These variables are also identified in the literature review affecting unemployment in developing economies. The econometric model will involve testing the effect of GDP, inflation, money growth, and exchange rate on unemployment in the Morocco economy.

The real effective exchange rate (REER) is a measure of international competitiveness that measures the real value of the domestic currency by calculating the real exchange rate (RER) with each of the major trading partners of Morocco and summing the resulted RERs; the REER measured as the index (2010=100). A fixed ER system is meant to peg a domestic currency to foreign currencies such as the US dollar or Euro or both; therefore, fixed or pegged exchange rate systems are used

interchangeably to reflect the same definition of ER policy. The real value of the domestic currency is calculated to identify overvaluation or undervaluation relative to the nominal exchange rate (NER); an overvaluation indicates that the domestic currency is depreciating, while undervaluation indicates that the domestic currency is appreciating relative to the anchor fixed NER. In other words, when the REER index increases this means that more units of the domestic currency (e.g., Moroccan dirham) are needed to exchange one unit of the foreign currency, in this case, the Moroccan dirham is depreciating when the REER increases. Similarly, when the REER index decreases this means that fewer units of the domestic currency (e.g. Moroccan dirham) are needed to exchange one unit of the foreign currency, in this case, the Moroccan dirham is appreciating when the REER decreases. The relationship between the REER and unemployment is expected to be positive, that is higher REER (i.e. depreciation in domestic currency) will increase the unemployment rate.

Developing countries rely strongly on foreign exchange earnings for international trading that making the exchange rate one of the important variables in the economic system of small open economies affecting investment and employment. Depreciation in exchange rate generates risk-averse investors' behaviour toward less investment as a result causes reduction in employment rate (Bakhshi and Ebrahimi, 2016). Employment has been declining in many countries in the recent decades due to the increase in trade openness between countries, especially for developing countries where the highest proportion of their international trade relies on imported goods; firms that have more reliance on imported inputs, have their competitiveness and employment negatively affected by depreciation of the domestic currency. There is some evidence that countries with a higher degree of trade openness are affected more by exchange rate depreciation in terms of employment (Chimnani et al., 2014), this is due to increased capital outflows during

unstable periods in developing economies which cause exchange rate depreciation (Benazić and Rami, 2016).

Inflation (INFL) is the change in price level taken as inflation; it is the annual percentage change in a consumer price index. Phillips Curve hypothesis states that there is an inverse relationship between inflation and unemployment; an increase in prices and wages leads to lower unemployment rates in the short run. However, Milton Friedman criticized the short-run Philips Curve hypothesis, that is the inverse relationship between inflation and unemployment disappears in response to sustained inflation (Hetzel, 2007; Friedman, 1968). The non-linear behavior between the changes in money wages or changes in price level and unemployment generates a trade-off due to market frictions and lags asymmetry, but in the long run these frictions disappear and the trade-off between inflation and unemployment no longer holds (Faliski and Smith, 1973). However, Friedman later in his paper published in 1976 (Inflation and unemployment) talked about the positively sloped Phillips's curve opposing to the short-run negatively sloped Phillips's curve; Friedman stated that in the third stage higher inflation has often accompanied by higher, not lower unemployment, especially for periods of several years of length. A simple statistical Phillips curve for such periods seems to be positively sloped, not vertical, and the apparent positive relationship between unemployment and inflation has been a source of great concern to government policymakers (Friedman, 1976). An increase in consumer prices will increase unemployment in the long run mainly because rising prices will decrease aggregate demand for goods and services (Benazić and Rami, 2016). Therefore, the long-run relationship between inflation and unemployment is expected to be positive, that is higher inflation will increase the unemployment rate.

Broad money (MONEY) is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign



currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper. Money growth is the annual percentage change of broad money. Monetary policy is one of the means to regulate and protect the performance of the economy; where money growth is an instrument of monetary policy that plays an important role in promoting economic activities and thereby an increase in money supply will reduce unemployment (Kaur and Zaharudin, 2016). Money growth in an economy is a good vehicle to promote investment and drive output in turn creates new job opportunities and reduces unemployment rates. Therefore, the relationship between money growth and unemployment is expected to be negative, that is higher money growth will decrease unemployment rate.

Gross Domestic Product (GDP) is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. GDP growth is the annual percentage change of GDP. The relationship between GDP and unemployment is defined by Okun's law, where an increase of the unemployment rate by one percentage point is related to two percentage points decrease of GDP (Lozanoska and Dzambaska, 2014). Okun's law helps policymakers to create new job ideas for the purpose of improving the living standards of a country, the connection between GDP growth and unemployment plays a fundamental role in initiating the policymakers to generate new economic approaches to perk up the growth of GDP (Khan, 2013). Therefore, the relationship between GDP and unemployment is expected to be negative, that is higher GDP will decrease the unemployment rate.

### 3.2 Methodology

The estimation of the long-run time-series relationships shall use the Autoregressive Distributed Lag (ARDL) model; where the ARDL estimation method has the advantage of measuring the long-run and short-run

relationships in a small sample, regardless of whether the degree of cointegration is at level or at first difference of the time series, included in the model designed for estimating. The time series testing procedures shall follow stationary tests, bounds cointegration tests, and diagnostic tests for the errors and stability of parameters of the estimated model. To stabilise the variance, all variables are expressed in logarithms.

The ARDL econometric estimator shall take the following form:

$$LUN_t = \alpha + \sum_{i=1}^m \beta_{1,i} LUN_{t-i} + \sum_{i=0}^n \beta_{2,i} LREER_{t-i} + \sum_{i=0}^o \beta_{3,i} LINFL_{t-i} + \sum_{i=0}^p \beta_{4,i} LMONEY_{t-i} + \sum_{i=0}^q \beta_{5,i} LGDP_{t-i} + U_t \quad (3.1)$$

where

LUN: is Unemployment

LREER: is Real Effective Exchange Rate

LINFL: is Inflation

LMONEY: is Money Growth

LGDP: is Gross Domestic Product (GDP)

Source of time series data is the World Bank (WB) website.

Pesaran and Shin (1999) showed that cointegrating systems can be estimated by ARDL models with the advantage that the series variables in the cointegrating relationship can be either integrated at level or first difference, I(0) or I(1) respectively, without the need to pre-specify which are I(0) or I(1). The ARDL estimator transforms the tested model into a long-run representation in order to show the long-run response of the dependent variable to the change of the explanatory variables. The cointegrating regression form of ARDL is obtained by transforming the original equation into differences and substituting the long-run coefficients from equation; this is called the Unrestricted Error Correction Model (UECM) and shall produce short-run and long-run coefficients of explanatory variables and the Error Correction Term (ECT) of the dependent variable.

The UECM representation of the ARDL approach

shall be given by differencing equation 3.1 to express lags of the short-run and long-run parameters of dynamic regressors. The UECM explores the short-run adjustments with long-run equilibrium of the variables in the model, as follows:

$$\begin{aligned} \Delta LUN_t = & \alpha + \sum_{i=1}^m \alpha_{1,i} \Delta LUN_{t-i} + \sum_{i=0}^n \alpha_{2,i} \Delta LREER_{t-i} \\ & + \sum_{i=0}^o \alpha_{3,i} \Delta LINFL_{t-i} + \sum_{i=0}^p \alpha_{4,i} \Delta LMONEY_{t-i} \\ & + \sum_{i=0}^q \alpha_{5,i} \Delta LGDP_{t-i} + \gamma_1 LUN_{t-1} + \gamma_2 LREER_{t-1} \\ & + \gamma_3 LINFL_{t-1} + \gamma_4 LMONEY_{t-1} + \gamma_5 LGDP_{t-1} \\ & + U_t \quad (3.2) \end{aligned}$$

The ECT is the long-run coefficient of the dependent variable at first lag and explains the speed of adjustment from the short-run to the long-run; it should be negative and significant.

Finally, ARDL generates the long-run coefficients or long-run multipliers effects of each explanatory variable on unemployment. The long-run multiplier is calculated by dividing the long-run coefficient, at first lag of each of the independent variables over the ECT coefficient. The long-run multiplier measures the permanent effects in the change of explanatory variable on dependent variable, so that the difference between the old and new equilibrium values of the dependent variable can be interpreted as the long-run effect of the independent variable on the dependent variable, in other words, if a sudden change in the explanatory variable, from steady state, by one unit affecting the dependent variable which starts to change eventually, this effect will be settling down in the long-run to a new equilibrium value (Koop, 2006).

#### 4. Empirical Results and Analysis

The analysis of the estimated results shall involve discussions, and synthesis of the ARDL results with the literature review presented and investigated in the field of this study.

##### 4.1 Stationary Tests

The stationary tests of variables are unit root tests to identify whether the time series are stochastic or whether there are temporal dynamics in the series. A stochastic series is the one that have unit root implying that the mean and variance is not constant, and the series increases in time indefinitely, the series is then denoted as non-stationary series. If the mean, variance and covariances of the series are constant over time then the series is said to be stationary at the level I(0); in economic view, the shocks effects are temporary and will be absorbed over time in a stationary series. Differencing series can make the series stationary and denoted as integrated series at first difference I(1) or at second difference I(2), (Thomas, 1997; Greene, 2012; Ghiorghie et al., 2014).

Famous test for stationarity of a time series is the Augmented Dickey Fuller (ADF) unit root test. Testing stationarity of variables is to ensure that all variables are stationary at I(0) or I(1) as a condition to apply ARDL estimator, that is none of the variables are stationary at I(2). The ADF unit root results are in Tables 4.1 and 4.2 showing that unemployment and inflation are stationary at the level I(0), whereas real effective exchange rate, money growth, and GDP growth are stationary at the first difference I(1).

**Table 4.1. ADF unit root test for variables that are significant at level with constant**

| Variable           | t-statistic | ADF critical value | p-value  | Order of integration |
|--------------------|-------------|--------------------|----------|----------------------|
| Unemployment (LUN) | -4.3354     | -3.808546          | 0.0033*  | I(0)                 |
| Inflation (LINFL)  | -3.706714   | -2.986225          | 0.0104** | I(0)                 |

\* Significance at 1%; \*\* Significance at 5%

**Table 4.2. ADF unit root tests for variables that are significant at first difference with constant**

| Variable                             | t-statistic | ADF critical value | p-value | Order of integration |
|--------------------------------------|-------------|--------------------|---------|----------------------|
| Real effective exchange rate (LREER) | -1.393103   | -2.986225 (5%)     | 0.5693  | I(0)                 |
| Real effective exchange rate (LREER) | -3.747852   | -3.737853          | 0.0098* | I(1)                 |
| Money growth (LMONEY)                | -2.860156   | -2.986225 (5%)     | 0.0645  | I(0)                 |
| Money growth (LMONEY)                | -6.908187   | -3.737853          | 0.0000* | I(1)                 |
| GDP growth (LGDP)                    | -0.523539   | -2.986225 (5%)     | 0.8706  | I(0)                 |
| GDP growth (LGDP)                    | -4.012600   | -3.737853          | 0.0053* | I(1)                 |

\* Significance at 1%; \*\* Significance at 5%

#### 4.2 Bounds Cointegration test and ARDL results

To check for the long-run cointegration relationship between the variables in the model, a bounds cointegration test is applied, which relies on comparing F-statistic with the upper critical bounds (UCB) and lower critical bounds (LCB) values obtained from Pesaran et al. (2001) critical table. The calculated F-statistic (i.e., 6.287041) of bounds test for unemployment in relationship to explanatory variables is higher than the critical value (i.e., 5.06) of the UCB at 1% level of significance. We reject the null hypothesis of no long-run relationship; confirming that there is a long-run cointegration relationship between variables of the tested model. The cointegration result indicates that there is a long-run relationship between unemployment and real effective exchange rate, inflation, money growth, and GDP, and then we can estimate the ARDL with appropriate lags following Akaike Info Criterion (AIC).

The cointegrating and long-run form of ARDL results are shown in Table 4.3. Appendix-1 shows the EViews calculations of long-run coefficients or long-run multipliers that are shown in Table 4.3. All independent variables in the tested model have significance effects on unemployment in the long run. The results indicate that there is a long-run effect of real effective exchange rate, inflation, money growth, and GDP with the expected sign as discussed in the literature. The REER and inflation have positive relationship with unemployment in the long-run, whereas money growth and GDP have negative relationship with unemployment in the long-run.

Table 4.3 indicates a positive and significant relationship between real effective exchange rate (REER) and unemployment in the short run. In the long run, the results show a positive and significant effect of the REER on unemployment at 5% significance; that is if the REER permanently increases by 1%, the equilibrium value of unemployment will increase by 1.59%. This result of ARDL regression implies that a depreciation in Moroccan dirham by one-point leads to increase in unemployment rate by 1.59 points. That is maintaining a strong real value of Moroccan dirham is an important factor to reduce unemployment in the future in Morocco's economy; a strong value of dirham will motivate trade and investment leading to higher output in the economy and reduce unemployment.

Inflation has a negative relationship with unemployment in the short-run in the first- and second lags, indicating Phillips Curve hypothesis hold in the short-run; that is an increase in inflation reduces unemployment in the short-run. However, inflation shows positive effects on unemployment on the long-run at 1% significance, in line with Friedman long-run hypothesis that the relation between inflation and unemployment is positive in the long-run (Hetzel, 2007; Friedman 1977). An increase in consumer prices will increase unemployment in the long run mainly because rising prices will decrease aggregate demand for goods and services (Benazić and Rami, 2016). In the long run, the regression results show that a 1% increase in inflation rate will increase unemployment rate by 0.32% in the Moroccan economy.

The relationship between money growth and unemployment is negative positive in the short-run at the first- and second-lags, however this relationship shifts to a negative relationship at 1% significance in the long-run in line with the theoretical relation between money growth and unemployment; that is if money growth increases by 1%, the equilibrium value of unemployment will decrease by 0.41% in the long-run, implying important role of money growth to stimulate investment and increase output in Moroccan economy to reduce unemployment.

The relationship between GDP and unemployment in

the short run is positive at the first lag but shifts to a negative relationship in the second lag. In the long run, the relationship between GDP and unemployment continues to be negative in line with Ukon's theory that an economic growth reduces unemployment rates in Moroccan economy (Folawewo and Adeboje, 2017). This result should reinforce the role of GDP in promoting employment opportunities in Morocco, and that Moroccan government should adopt reform programs to accelerate the GDP growth rates in Morocco.

**Table 4.3. ARDL (3, 2, 3, 3, 3) Cointegrating and Long-Run Form**

| Variable   | Coefficient | Standard Error        | T-Ratio  | Prob.     |
|--|-------------|-----------------------|----------|-----------|
| <b>Short Run Coefficients (Cointegrating Form)</b>                                   |             |                       |          |           |
| D(LUN(-1))   | -0.48906    | 0.09558               | -5.11681 | 0.0069*   |
| D(LUN(-2))   | -0.21455    | 0.083618              | -2.56582 | 0.0623*** |
| D(LREER)   | 1.806791    | 0.418268              | 4.319694 | 0.0125**  |
| D(LREER(-1))   | 2.407486    | 0.563474              | 4.27258  | 0.0129**  |
| D(LINFL)   | 0.09126     | 0.026078              | 3.499475 | 0.0249**  |
| D(LINFL(-1))   | -0.08404    | 0.019132              | -4.39265 | 0.0118**  |
| D(LINFL(-2))   | -0.15057    | 0.018885              | -7.97329 | 0.0013*   |
| D(LMONEY)  | -0.06105    | 0.013437              | -4.54311 | 0.0105**  |
| D(LMONEY(-1))  | 0.137188    | 0.02297               | 5.972402 | 0.0039*   |
| D(LMONEY(-2))  | 0.139702    | 0.029554              | 4.727063 | 0.0091*   |
| D(LGDP)  | 0.46095     | 0.124472              | 3.703243 | 0.0208**  |
| D(LGDP(-1))  | 1.184548    | 0.14751               | 8.030267 | 0.0013*   |
| D(LGDP(-2))  | -0.49207    | 0.096703              | -5.08849 | 0.007*    |
| ECT(-1)  | -0.98645    | 0.112049              | -8.8037  | 0.0009*   |
| <b>Long Run Multiplier Coefficients</b>  |             |                       |          |           |
| LREER  | 1.596436    | 0.48921               | 3.263294 | 0.031**   |
| LINFL  | 0.323306    | 0.040398              | 8.002951 | 0.0013*   |
| LMONEY   | -0.40996    | 0.035684              | -11.4887 | 0.0003*   |
| LGDP   | -0.23912    | 0.057518              | -4.15734 | 0.0142**  |
| C  | 1.645666    | 3.502557              | 0.469847 | 0.6629    |
| Cointeq = LUN - (1.5964*LREER + 0.3233*LINFL -0.4100 *LMONEY -0.2391*LGDP + 1.6457 ) |             |                       |          |           |
| <b>Regression Diagnostic</b>   |             |                       |          |           |
| R-Square   | 0.992694    | Adjusted R-Square     | 0.959819 |           |
| F-statistic  | 30.19582    | p-value (F-statistic) | 0.00231  |           |

\* Significance at 1%; \*\* Significance at 5%; \*\*\* Significance at 10%

Model selection method: Akaike info criterion (AIC)

The long-run results of the ARDL estimator are in line with the literature results discussed in this research paper, where the exchange rate has the most variability effect on unemployment in Morocco's economy relative to other variables in the tested model. The Moroccan authority needs to be careful in adopting an exchange rate policy and trading reforms in order to ensure the stability of the real value of the Moroccan dirham currency; an appreciation in the Moroccan dirham will reduce unemployment rates whereas a depreciated dirham will discourage investment and thereby hamper output and lead to higher unemployment. The regression results also show positive and significant effects of inflation on unemployment in the long run, therefore keeping inflation under control will control prices and maintain the employment level. Whereas the result of money growth on unemployment is significantly negative indicating the importance of money supply policy in reducing unemployment in Morocco, that is adopting consistent policies that promote higher money growth in order to encourage investment and drive output have positive effects in creating new job opportunities and reduce unemployment in Morocco's economy. Additionally, the result of GDP on unemployment is significantly negative indicating that stimulating investment and productivity to pursue sustainable long-term economic growth are key drivers for generating higher employment opportunities in the Morocco in the future.

The regression diagnostic of ARDL in Table 4.3 indicates the significance of the model where the value of F-statistic is significant at 1%; therefore, we reject the null hypothesis indicating that all coefficients slope of independent variables in the regression are different from zero. The R-square is 99.2% and the adjusted R-square indicates that explanatory variables explain 95.9% of the variance in the dependent variable, in other words, the tested model confirms that at least one of the explanatory variables have significant effects unemployment.

The error correction term (ECT(-1)) is the long-run coefficient at first-lag of the dependent variable that represents cointegrating for the long-run adjustment process of the estimated model from the short-run to the long-run. The ECT(-1) coefficient in Table 4.3 has the correct sign and statistically significant at 1% implying the system is getting adjusted toward long-run equilibrium at a moderate speed of convergence to the long-run equilibrium ( $ECT(-1) = -0.98645$ ); which implies that the results support the existence of a long-run between the variables..

The diagnostic tests in Table 4.4 accept the null hypotheses which validate that the error terms of the model are free of heteroscedasticity (i.e., no disturbance variance in the residuals), have no serial correlation, and are normally distributed. All these tests support the stationarity of the model and the reliability of its results.

**Table 4.4. Diagnostic Tests**

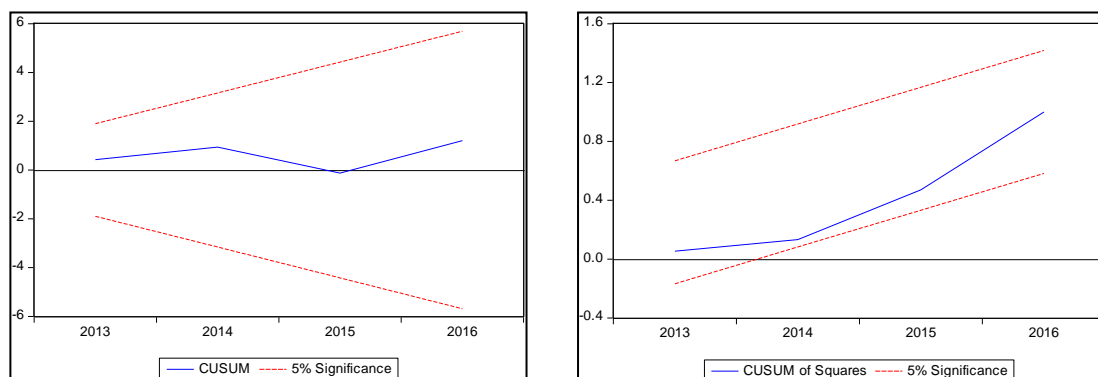
| Test   | Estimated value | P-value  |
|--|-----------------|----------|
| Jarque-Bera Normality test                     | 0.205870        | 0.902186 |
| Breusch-Godfrey Serial Correlation LM Test     | 2.381902        | 0.2957   |
| Heteroskedasticity Test: Breusch-Pagan-Godfrey | 1.203485        | 0.4771   |
| Heteroskedasticity Test: ARCH                  | 1.832278        | 0.1809   |
| Heteroskedasticity Test: White                 | 0.798381        | 0.6753   |

The stability of coefficients was tested using the cumulative sum of recursive residuals (CUSUM) and cumulative squares of recursive residuals (CUSUMQ). The

CUSUM test is suitable to detect the systematic changes in the regression coefficients, whereas the CUSUMQ test is utilised in situations where departure from the constancy of

the regression coefficients is random and sudden (Ogbeide et al., 2016). The results are presented in Figure 4.1; the results fail to reject the null hypothesis at 5% level of significance, because the plots of the CUSUM and

CUSUMQ tests fall within the critical limits. Therefore, it can be realised that the selected ARDL model is stable, and the stability of coefficients indicates that the estimated model is free from structural breaks.



**Figure 4.1: CUSUM and CUSUM of Squares stability tests**

## 5. Conclusion

Unemployment problem is of high concern to nations around the world due to its economic implication and social instability that affect the individuals and the society as a whole. The country of Morocco suffers from high and persistent unemployment rates for several years even with the reform programmes to induce investment and development in the private sector, the reform efforts were unable to reduce unemployment rates in Morocco. This article examined the dynamic impact of the real effective exchange rate on unemployment in Morocco by using time-series data for the period 1991 to 2016, along with inflation, money growth, and GDP. The estimates of the ARDL regression indicate that there is a significant effect of the real effective exchange rate on unemployment in the short- and long-runs, implying that depreciation in domestic currency will increase the level of unemployment in Morocco, supporting the literature, that the effect of exchange rate on unemployment increases in today's open economies.

Additionally, the outcome from the ARDL regression indicates significant effect of inflation, money growth, and

GDP with the expected relationship discussed in the literature. An increase in inflation generates higher unemployment in the Moroccan economy in the long-run, in line with Friedman hypothesis that the relationship between inflation and unemployment is positive in the long-run. Money growth and GDP growth have reducing effect on unemployment in the long run indicating the important roles of both variables in reducing unemployment rates in Morocco.

The study recommends that the authority of Morocco needs to be careful in adopting an exchange rate policy and trading reforms with their major partners to ensure stability of the real value of Moroccan dirham. Besides, inflation needs to be under control to avoid more unemployment in the future, for example, a benchmark of inflation for Morocco has not to be higher than the inflation of its major trading partners. Authority of Morocco also needs to adopt policies that promote higher money growth and GDP growth rates to encourage investment and productivity in the near future to create new job opportunities and reduce unemployment rates in the Moroccan economy.

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## أثر سعر الصرف على معدل البطالة في اقتصاد المغرب

علي أحمد الأمين<sup>1</sup>، بشير خليفة الزعبي<sup>2</sup>

### ملخص

نظراً للاستمرار في ارتفاع معدلات البطالة في دولة المغرب، تبحث الدراسة في الآثار الاقتصادية لسعر الصرف الحقيقي الفعال، إضافة إلى متغيرات اقتصادية كلية أخرى على معدل البطالة في المغرب في المدة الزمنية 1991 إلى 2016. وتظهر نتائج تطبيق الاقتصاد القياسي لنموذج ARDL أن سعر الصرف يفسر النسبة الأكبر من التباين في البطالة؛ إذ يؤدي انخفاض قيمة الدرهم المغربي وزيادة التضخم إلى ارتفاع معدلات البطالة في المغرب على المدى الطويل، وإنَّ نمو النقد والنواتج المحلي الإجمالي لهما علاقات عكسية مع البطالة على المدى الطويل مما يشير إلى الأدوار المهمة للمتغيرين كلاهما في خفض معدلات البطالة، وتوصي الدراسة بضرورة أن يصمم المغرب سياسة سعر الصرف وبرامج إصلاح التجارة للحفاظ على قيمة حقيقية قوية للدرهم المغربي. وتحتاج السلطة المغربية إلى إبقاء التضخم تحت السيطرة، واعتماد سياسات تعزز نمواً نقدياً أعلى لتشجيع الاستثمار وتوليد نمو أعلى للناتج المحلي الإجمالي في المستقبل لتقليل معدلات البطالة في الاقتصاد المغربي.

**الكلمات الدالة:** معدل البطالة، سعر الصرف، معدل التضخم، نمو النقود، نمو الناتج المحلي.

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