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The impact of Inflation and Unemployment on Economic Growth in Jordan: An ARDL Bounds Testing Approach

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ABSTRACT

This paper examines the effect of inflation (INFR) and unemployment rate (UNR) on economic growth which is measured by Gross Domestic Product (RGDP) in percent on in Jordan for the period 1976-2016. To achieve this objective unit root, Augmented Dickey Fuller test was used. Subsequently, the Autoregressive distributed Lag (ARDL) bounds testing approach and Error Correction Model (ECM-ARDL) model are applied to examine the both long-run and short-run causality issues between the variables under consideration. The empirical results of the study revealed, the results of the unit root test indicate that Real Gross Domestic Product growth (RGDPG), unemployment and inflation are tested at first difference then the problem of unit root has disappeared and hence they have become stationary at first difference. The bounds tests suggest that the variables of interest are bound together in the long-run when RGDPG is the dependent variable. Also, there is a long run relationship amongst the variables when INFR is the dependent variable. The results indicate also that there is no significant Granger causality from INFR to UNR and from RGDPG to UNR and from RGDPG to INFR and from INFR to RGDPG as well the short run. The results of this study can be used by all respected authorities in Jordan, especially authorities of economic and social institutions, so that they could attempt to reduce and control unemployment and inflation to achieve economic growth.

Keywords: *Unemployment, Economic Growth, Inflation, ARDL, Vector Error Correction Model,* Granger causality test

INTRODUCTION

Overtime, economists have tried to establish the relationship between inflation and unemployment; however, these two variables are linked together economically. The relationship that exist between them are inversely correlated; therefore, when unemployment is high, inflation is low and otherwise.[1]

In any economy, inflation and unemployment are always on the "front burner"; all economies will always intend to keep them both on a low rate mostly on a single-digit rate because this will tend to bring about stability in the macroeconomic policies of the country. This stability is pivotal to effectively achieve growth and development in the economy and also the attainment of its set out goals and objectives of its economic policies [2]

Unemployment has been categorized as one of the serious impediments to social welfare. Apart from representing a colossal waste of a country's manpower resources, it generates welfare loss in terms of lower output, thereby leading to lower income and wellbeing. The need

to avert the negative effects of unemployment has made the tackling of unemployment problem to feature very prominently in the development objectives of many developing countries.

Unemployment and inflation are two intricately linked economic concepts. Over the years there have been several economists and policy-makers trying to interpret the relationship between the concepts of inflation and unemployment.

unemployment and Inflation both vary from economy to economy. [3]. Some economies have found high inflations related to higher unemployment. Some economies have found high inflation moderately related to unemployment and others high inflation with low unemployment. [4]. Similarly, some countries are in the situation where the economy is in moderate to low inflation and moderate to lower unemployment and others are moderate to low inflation but moderate to high unemployment. Therefore, inflation exists in different economies differently [5]. Therefore, inflation in economy exists everywhere and it would be a proper research objective for investigation. The impact of inflation on unemployment would also be critically investigated in the current study. As research student of higher studies, the identification of these two variables will provide something insights into the economic problems with a critical look on the issues of inflation and unemployment and their relationship. The research study would be contributive

Jordan economy has been witnessing a chronic unemployment in the labor market since the eighties of the 20 century due the excess supply of labor resulting from the substantial outcome of the educational system and the inflow of guest workers. Unemployment and inflation has been an issue of concern, most especially in developing country like Jordan, to policymakers and researchers alike. This is because unemployment and inflation are one of the key macroeconomics indicator and determinant of economic growth and development which is the priority of any economy

The Jordanian economy had made a considerable efforts aiming at reducing unemployment including attracting foreign direct investment, encouraging the private sector to increase its employment, and encouraging migration of workers to the neighboring countries in particular oil producing countries. Despite all the government strategies, Jordan economy is still experiencing an increase in unemployment rate has stable at around 12 per cent during the period of 2010-2014. In fact, the unemployment rate for Jordanians has been slightly reduced from 12 to 11.7 in 2013 and 11.9 in the first quarter of 2014. Up to the second quarter of 2014, the Jordanian labor market appears remarkably resilient considering the high pressure from the influx of Syrian refugees to the country since 2011 to the governorates of Mafraq, Irbid, and Amman. For most key indicators on the labor market, impacts, which can be related to the influx of Syrian refugees, must be characterized as modest as up to the second quarter of 2014. However, this is not to say that the large influx of Syrians into the Jordanian labor market has been, or will be, unproblematic in any sense, and in some areas, there are signs of impacts that needs to be dealt with to avoid escalation of problems in the near future. [6].Beside that digging into the reasons causing unemployment revealed that there are several reasons such as guest workers, the lack of job openings, the mismatch of the educational system outcomes and labor market needs, and to some extent the cultural prospects are among the mean reasons behind unemployment.

The paper has contributed to the body of existing literature and filled some gaps that were not discuss, and is significance to economic decision-makers, as it will assist us with the basic knowledge and skills needed to tackle the pressing issue of unemployment and inflation in

Jordan However, a good deal of research work has been carried out on unemployment and inflation worldwide, but not much has been carried out using the Jordanian economy and within the scope of our analysis.

The structure of the paper is as follows: Section [2] briefly reviews the literature. Section [3] presents data and methodology. Empirical results are discussed in section [4]. Concluding remarks are given in the final section.[5].

LITERATURE REVIEW

The literature reveals many studies on the relationship among unemployment; inflation, economic growth, trade openness, real GDP per capita, and Urban Population as share of total population for different countries for different time periods. This part is designed to review the past studies which demonstrate the relationship among unemployment; inflation, economic growth, trade openness, real GDP per capita, and Urban Population as share of total population. It is given as below:

(Mohsenia and Jouzaryan, 2016)[7] investigated the relationship between inflation, unemployment and economic growth in Iran for the period 1996-2012. The results of the study revealed, both in short and long-run, a negative effect of inflation and unemployment on economic growth. They concluded that policy makers could attempt to control inflation and reduce unemployment in order to achieve sustainable economic growth.

(Mehrnoosh M and Feizolah J,2016)[8] examined the role of inflation and unemployment on economic growth in Iran from 1996 to 2012. The effect of inflation and unemployment on economic growth in two short-term and long-term phases was investigated and examined using Autoregressive Distributed Lag (ARDL) The finding showed the significant and negative effect of inflation and unemployment on economic growth in long term, which indicated that inflation and unemployment decreased economic

(Yelwa et al ,2015)[9] examined the relationship between inflation, unemployment and economic growth in Nigeria the period 1987-2012. findings derived that both unemployment and inflation have a negative impact on economic growth. They conclude that Nigerian government should improve macroeconomic policy instruments in order to achieve a stable economic environment that will increase its domestic output.

(Aminu and Manu ,2014) [10] carried out research on analysis of unemployed resources and inflation in Nigeria from 1986 to 2010 using OLS technique and found that both unemployed human resources, rate of natural resource production (i.e rate of tapped resources), total inflation have positive impact on rate economic growth in Nigeria.

(Shahid M ,2014) [11], study the effect of inflation and unemployment on economic growth in Pakistan via the ARDL model approach found that a long run relationship between the variables existed.

(Umar and Razaullah,2013) [12] found the impact of GDP and inflation on unemployment rate in Pakistan. They are using the time series data since 2000 to 2010 and run regression through SPSS. The results indicate that the F-test value is very low and below the value of 4.00. R square has limited variation i.e 0.70% and 22.8% from the inflation to Gross Domestic Product and unemployment. They found that inflation have negative for Gross Domestic Product and have negative correlation with unemployment.

(Stephen,2012) [13] investigates the impact of unemployment on economic growth for a case of Nigeria for the period from 1980 - 2008. He used Cobb - Douglas production function to develop his model and estimates his results by using simple OLS method. He has found the unemployment changes significantly and inversely to the economic growth in Nigeria.

(Vandemoortele,1991) [14]; (Oladeji,1994) [15], (Umo,1996) [16], and (Rama,1998) [17] investigated the impact of unemployment on economic growth for the African economies and for Nigerian economy in specifically. They found that as growth rate of unemployment increases, it curtails economic growth and hence they found trade off between unemployment and economic growth. . Besides the brief review of literature; in the following part.

(Muhammad U. and Raza U.2013) [18] have analyzed the impact of GDP and inflation on unemploy-ment rate of Pakistan Economy in (2000-2010) and their study concluded that inflation has a role which influential but for GDP and unemployment with insignificant levels in the macroeconomics factors of Pakistani economy.

(Mahmoud A. J. 2013) [19] has analyzed impact of inflation and unemployment on Jordanian GDP from (2000-2010) and the empirical results of this study indicate that there is a negative relation between unemployment and GDP, and there is a positive relation between Inflation and GDP. In the other way this study found that there is strong negative significant relation between Unemployment and GDP in Jordan, and there is a strong positive significant relation between Inflation and GDP in Jordan, this can be explained by the reflection of the inflation in GDP.

(Ayesha W. 2013) [20] empirically analyzes the impact of inflation and economic growth on unemployment by using time series evidence from (1973 - 2010) in Pakistan. This study used Augmented (Dickey Fuller ,1981) [21] test to test unit root problem and in order to find out the long run relationship among unemployment, inflation, economic growth, trade openness and urban population he applied [22] Maximum Likelihood Approach. This study concludes that inflation significantly increases unemployment in the long term; economic growth has a significant adverse impact on unemployment in the long run and in the short run respectively, and the impact of trade openness on unemployment is positively and insignificant in the long run but this impact becomes significant in the short run.

A Study was carried by (Asoluka et.al,2011) [23] has examined the unemployment and Nigerian economic growth for the period 1985-2009. The study recommends that the agricultural sector as a medium of reducing unemployment in Nigeria should be harnessed and advises that Government and all relevant stakeholders continue in their quest towards reducing unemployment, as well as give their support in ensuring that the agricultural sector is not downtrodden but embraced in this task.

(Silvapulle et al.2004) [24] used the other way of examining the relationship between unemployment and economic growth. They explored the impact of cyclical output on cyclical unemployment for a case of U.S. by applying dynamic model for post – war period dataset. They found two conclusions from their study; the first conclusion made by them was that the positive impact of cyclical output on unemployment differs from the negative impact of cyclical output on unemployment in the short run, the second conclusion made by them was that their dataset supports this their proposition that the negative impact of cyclical output on cyclical unemployment is more significant than that of the positive impact of cyclical output on cyclical unemployment.*(*Cutler and Katz,1991)[25]examined and proved that inflation and employment level are negatively correlated to each other. The influencing impact levels are

also proved to be positive and significant in relation to each other. Therefore, there are other factors that affect the unemployment level, but inflation is one of the most influencing factors for the growth of unemployment level at the national level. The inflation levels from walking to running from high to higher inflation promotes step wise, in case, there are no or slow responsive initiatives. Therefore, if inflation exists with control mechanism then controlled phenomenon towards the unemployment level would be recorded.

In summary, the above literature reviews show that inflation is vary form economy to economy but most of the studies indicate that there is a positive relationship between inflation and economic growth. On the other hand, the above literature reviews showed that there is a negative relationship between unemployment and economic growth. Therefore, the impact of inflation and economic growth on unemployment is still ambiguous despite the truly enormous amount of research that has been undertaken on inflation, unemployment and economic growth there remain serious methodological issues. We could not find any study that related to Jordan, therefore, further studies are required in this field.

The above literature reviews show that inflation is vary form economy to economy but most of the studies indicate that there is a positive relationship between inflation and economic growth. On the other hand, the above literature reviews showed that there is a negative relationship between unemployment and economic growth. Based on the results of recent empirical studies on the relationship between the economic growth, inflation rate and unemployment rate and to ensure an adequate examination of the Jordan evidence, our study will have to answer four salient questions regarding the impact of inflation and unemployment on economic growth in Jordan for the period 1976-2016. Which are:

- Does an association exist between unemployment and Inflation in Jordan? If so, is it positively or negatively related to unemployment rate?
- Does an association exist between unemployment and RGDPG in Jordan? If so, is it positively or negatively related to unemployment rate?
- Does an association exist between inflation and RGDPG in Jordan? If so, is it positively or negatively related to unemployment rate
- Is the impact of the inflation and unemployment on RGDPG direct or indirect?

The direction of association between unemployment rate, inflation rate and GDP for Jordan may consist of four possible alternatives. These are:

- No association.
- unemployment rate affects RGDPG.
- Inflation rate affects RGDPG and vise-versa.

CONCEPTUAL MODEL

Annual time series data on GDP, Inflation and unemployment, which cover the 1977-2016 period, have been used in this study. All data has been obtained from different sources, including, different volumes of the International Financial Statistics (IFS) Yearbook, published by the International Monetary Fund (IMF,2016)[26], and World Development Indicators (WDI,2014)[27] edition published online by the World Bank have been used to supplement the local data and Index Mundi web (2013)[28],

The purpose of this paper is to study the variables of GDP and inflation which are affecting on unemployment in Jordan. The methodological approach of the study includes the following steps

The first step is to check the stationarity properties of the series to define their integration order. For this reason, we apply the [29]; [21],as well as the (Elliott, R. and Stock test (DF-GLS) ,1996) [30].

The next step is to examine the long-run relationship between the variables using the analysis of Auto-Regressive Distributed Lag (ARDL), developed by Pesaran et al. (2001)[31].The third is to estimate the short-run and long-run relationship between the variables.Finally, the vector error correction model (VECM) is used to find the causality relations.

Methodology

ARDL bounding test approach has better statistical properties than (Engle-Granger technique,1987) [32] is used for two variables. On the other hand, Johansen Cointegration (1988) [33] is used for more than two variables. So, Johansen Cointegration has advantage on [32]. (Johansen and Juselius,1990) [22] extended VAR model. However, it is only suitable with certain conditions like it deals with large sample size and pre-conditions for the cointegrated VAR is that all variables should be integrated of same order i.e. I(1). ARDL technique does not only overcome these issues but it has also several other advantages. ARDL is more suitable than Johansen and Juselius cointegration in case of small sample size (Pesaran HM, Shin Y.1999) [34]. also it can be used whether variables are purely I(0), purely I(1) or the mixture of both I(0) and I(1)[35]. it captures appropriate number of lags in data generating process particularly in general to specific process as is reported by Laurence son and Chai (2003)[36]. the ECM can be obtained from bound testing approach through simple OLS transformation. ECM shows short run to long run adjustment mechanism without the loss of long run information [34]. However, ARDL approach makes the model dynamic. Although ARDL can be used whether all variables are stationary at level i.e. I(0) or I(1) or the mixture of both (Pesaran HM, Shin Y. 2001[31], [34]. But we cannot use ARDL if any of the variable under investigation is stationary at second difference i.e. I(2) as bound testing approach is based on I(0), I(1) or mixture of these two sets we check the unit root property of each variable to confirm that any of the variable should not be stationary at second difference. For this we use [22], and [37] tests. All these tests confirm that none of the variable is stationary at second difference I(2). and denoted as RGDPG,UNR and INFR.To estimate the impact of independent variables on dependent variable in Jordan may be expressed as:

$$〖RGDPG〗_t= \alpha + 〖\beta_1 INFR〗_t+ 〖\beta_2 UNR〗_t + Ɛ1 \quad (1)$$

Where RGGDP is the Real Gross Domestic Product growth in precent(economic growth),UNR is the rate of unemployment,; INFR is the rate of inflation and ε is error term.

We use the two-step procedure from the Engle and Granger (1987)[33] model to examine the causal relationship among real UNR, INFR and RGDPG. In the first step, we explore the long-run relationships between the variables. In the second step, we employ error-correction based on Granger causality model to test causal relationship among variables in the model.

Before running the causality test the variables must be tested for stationarity. For this purpose, in this current study we use the conventional ADF tests, Dickey-Fuller generalized least square (DF-GLS) de-trending test proposed by Elliot et al. (1996)[30].

The ARDL bounds test is based on the assumption that the variables are I(0) or I(1). So, before applying this test, we determine the order of integration of all variables using the unit root tests. The objective is to ensure that the variables are not I(2) so as to avoid spurious results. In the presence of variables integrated of order two, we cannot interpret the values of F statistics

provided by (Pesaran et al.,2001) [31].

ARDL Bounds Tests For Cointegration

To analyze the long-run and short-run interactions among the variables under study (RGDPG, UNR, INFR and), we apply the autoregressive distributed lag (ARDL) cointegration technique. The ARDL cointegration approach was developed by [34]and [31]. It has three advantages in comparison with other previous and traditional cointegration methods. The first one is that the ARDL does not need that all the variables under study must be integrated of the same order and it can be applied when the underlying variables are integrated of order one, order zero or fractionally integrated. The second advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes. The last and third advantage is that by applying the ARDL technique we obtain unbiased estimates of the long-run model [38]. The ARDL model for the linear functional specification of long-run relationship among gross domestic product (RGDPG), UNR and INFR may follows as:

$$RGDPG_t = \alpha 3 + \sum_i^n \beta_7 DUNR_{t-1} + \sum_i^n \beta_8 DINFR_{t-1} + \sum_i^n \beta_9 DRGDPG_{t-1} + \delta 7\ UNR_{t-1} + \delta 8 INFR_{t-1} + \delta 9 RGDPG_{t-1} + \varepsilon_{1t} \ldots\ldots\ldots\ldots (2)$$

$$INFR_t = \alpha 2 + \sum_i^n \beta_4 DUNR_{t-1} + \sum_i^n \beta_5 DI\square FR_{t-1} + \sum_i^n \beta_6 DRGDPG_{t-1} + \delta 4\ UNR_{t-1} + \delta 5 INFR_{t-1} + \delta 6 RGDPG_{t-1} + \varepsilon_{1t} \ldots\ldots\ldots\ldots (3)$$

$$DUNR_t = \alpha_1 + \sum_i^n \beta_1 DUNR_{t-1} + \sum_i^n \beta_2 DINFR_{t-1} + \sum_i^n \beta_3 DRGDPG_{t-1} + \delta 1\ UNR_{t-1} + \delta 2 I\square FR_{t-1} + \delta 3 RGDPG_{t-1} + \varepsilon_{1t} \ldots\ldots\ldots\ldots (4)$$

Where ε and D are the white noise term and the first difference operator respectively,

The bounds test is mainly based on the joint F-statistic which its asymptotic distribution is non-standard under the null hypothesis of no cointegration. The first step in the ARDL bounds approach is to estimate the four equations (2, 3 and 4) by ordinary least squares (OLS). The estimation of the hree equations tests for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables, i.e.,

Null Hypotheses: There is no long-run relationship) against the alternative hypothesis that not all of this coefficient are equal to zero.
Alternative Hypotheses: There is a long-run relationship.

An appropriate lag selection based on a criterion such as Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). According to 34], the SBC is generally used in preference to other criteria because it tends to define more parsimonious specifications. Two sets of critical values (*CVs*) that are reported by [31] provide *CV* bounds for all classifications of the repressors into purely I(1), purely I(0) or mutually cointegrated. If the calculated *F*-statisticslies above the upper level of the band, the null is rejected, indicating cointegration. If the calculated *F*-statistics is below the upper *CV*, we cannot reject the null hypothesis of no cointegration. Finally, if it lies between the bounds, a conclusive inference cannot be made without knowing the order of integration of the underlying regressors. Recently, the set of critical values for the limited data (30 observations to 80 observations) were developed originally by Narayan (2005) [39]. If there is an evidence of long-run relationships (cointegration) between the variables, the second step is to estimate the following long-run and short-run models that are represented in Equations (5) and (6):

$$RGDPG_t=\alpha_{1+}\sum_i^n \beta_1 RGDPG_{t-1}+\sum_i^{n1} \beta_2\, INFR_{t-1}+\sum_i^{n2} \beta_3\, UNR_{t-1}+\varepsilon_{1t} \quad \text{-------} \quad (5)$$

$$DRGDPG_t=\alpha_1 \sum_i^n \beta_1 RDGDPG_{t-1}+\sum_i^{n1} \beta_2\, DINF\square_{t-1}+\sum_i^{n2} \beta_3\, DUNR_{t-1}+\delta ECT_{t-1}+ \varepsilon_{2t} \quad \text{----} \quad .(6)$$

Where δ is the coefficient of error correction term ECT_{t-1}. It shows how quickly variables converge to equilibrium and it should have a statistically significant Coefficient with a negative sign.

The orders of the ARDL (n, n1, n2) model in the four variables are selected by using AIC. Equation (5) is estimated using the following ARDL (1,2,0) specification. The results obtained by normalizing on GDP.

EMPIRICAL RESULTS

Unit roots tests

At the first, the variable used in this analysis is tested for the unit roots The test is applied to both the original series and to the first differences. Further, the models with and without trend are tried. The study will use Augmented Dickey and Fuller test (ADF) that it is purposed to eliminate error term correlations. The model has three styles shown below.

The first shape is equation 1: $\Delta Y_t = b_1 + Zy_{t-1} + a_i + e_t$ (intercept only)

The first shape is equation 2: $\Delta Y_t = b_1 + b2t + Zy_{t-1} + a_i + e_t$ (Trend and intercept)

The first shape is equation 3**:** $\Delta Y_t = Zy_{t-1} + a_i + e_t$ (No Trend No intercept)

The results are reported in table 1 which indicates the presence of unit roots in the original series in Augmented Dickey Fuller (ADF) test statistics. The results further suggest that taking first differences remove these roots implying that these variables are first differenced stationary. Thus, none of the series are (2), and they can be used in the ARDL bounds test method.

Table 2: Unit Root Tests with ADF

Decision	ADF Level			First difference			DECISION
Variables	With intercept	With Trend and intercept	With None	With intercept	With Trend and intercept	With None	
UUR	-1.216795 (0.6575) I (0)	-2.205299 (0.4735) *I (0)*	0-0.951658 (0.2987) I(0)	-5.208484 *(0.0001)* *I (0)*	-5.135769 (0.0009) I(1)	-5.206247 (0.0000) I(1)	I(1)Stationary
INFR	-5.884866 ((0.0000) I(1)	-6.084307 (0.0001) I(1)	-1.728284 (0.0795) I(1)	-11.68043 (0.0000) I(1)	-11.52384 (0.0000) I(1)	-11.83590 (0.0000) I(1)	I(1)Stationary
RGDPG	-3.671786 (0.0085) I(1)	-3.726533 (0.0322) I(1)	-2.550788I (0.0121) (1)	-6.704590 (0.0000) I(1)	-6.791103 (0.0000) I(1)	-6.720703 (0.0000) I(1)	I(1) stationary

Source: Authors' calculation using EViews 9.

After the unit root test, the maximum lag length of the model is found by using Vector

Autoregressive (VAR) lag order selection criteria. The results are presented into (Table 2) and it has confirmed that the maximum lag length of the model is '1' and it is selected based on the minimum value of each criterion and based on that the maximum number of 'lag 1' was selected. The estimated results for lag length criteria are given in the below (table 2).

Table 2: VAR Lag Order Selection Criteria

Endogenous variables: UNR INFR RGDPG						
Exogenous variables: C						
Sample: 1977 2016						
Included observations: 37						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-584.7122	NA	1.26e+10	31.76823	31.89884	31.81428
1	-453.0435	234.8686*	16624663*	25.13748*	25.65994*	25.32168*
2	-446.9532	9.876126	19677313	25.29477	26.20907	25.61710
3	-445.2614	2.469049	30023353	25.68981	26.99596	26.15029

** indicates lag order selected by the criterion*
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Authors' calculation using EViews 9.

ARDL Bounds tests for Cointegration

We choose a maximum lag order of 1 for the conditional ARDL vector error correction model by using the Akaike information criteria (AIC). The order of distributed lag on the dependent variables were selected by the Akaike information Criterion (AIC), selects an ARDL for model (2) they are ARDL (1,2,0) and for model (3) they are ARDL (1,0,0), and for model (4) they are ARDL (1,0,0), where the number represents the lags for each of the variables in the three models. The long-run coefficients of the variables under investigations are shown in the following table.

The calculated F-statistics are reported in Table 3 when each variable is considered as a dependent variable (normalized) in the ARDL-OLS regressions.

Table 3: Results from bound tests

Dependant variable	AIC lags	F-statistic	Decision
RGDPG *(UNR, INFR, RGDPG)*	1	5.054933	Cointegration
INFR *(UNR, INFR, RGDPG)*	1	11.67409	Cointegration
UNEMR *(UNR, INFR, RGDPG)*	1	1.038374	No Cointegration
Lower-bound critical value at 1%		3.79	
Upper-bound critical value at 1%		4.85	

Lower and Upper-bound critical values are taken from Pesaran et al. (2001), Table CI(ii) Case II.

Source: Authors' calculation using EViews 9.

From these results, there is a long run relationship amongst the variables when R*GDPG* is the dependent variable because its F-statistic (5.05) is higher than the upper-bound critical value (4.85) at the 1% level. Also, there is a long run relationship amongst the variables when *INFR* is the dependent variable because its F-statistic (11.67) is higher than the upper-bound critical value (4.85) at the 1% level. This implies that the null hypothesis of no co integration among

the variables in equation (2 and 3) is rejected. However, for the other equations (4) the null hypothesis of no cointegration is accepted as reported in Table 3.

Table 4: long-run and short-run models

ARDL Cointegrating And Long Run Form
Dependent Variable: RGDPG
Selected Model: ARDL(1, 2, 0)
Date: 06/18/18 Time: 21:50
Sample: 1977 2016
Included observations: 38

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFR)	-0.133432	0.243711	-0.547502	0.5878
D(INFR(-1))	-0.459151	0.246102	-1.865690	0.0713
D(UNR)	-0.073091	0.363747	-0.200938	0.8420
CointEq(-1)	-0.530517	0.147864	-3.587879	0.0011

Cointeq = RGDPG - (0.2251*INFR -0.1378*UNEMPR + 5.6988)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	0.225066	0.771601	0.291687	0.7724
UNR	-0.137773	0.694877	-0.198269	0.8441
C	5.698766	9.852556	0.578405	0.5670

Source: Source: Authors' calculation using EViews 9.

From the table above the, ECM (-1) = -0.530517 is negative and P-value=0.001 Less than 0.05, meaning that there is a SR association ship. The coefficients of ECM terms present the speed of adjustment in the long-run due to a shock. The coefficients of ECM terms imply that 53.0% of the disequilibria in RGDPG of the previous year's shock adjust back to the long run equilibrium in the current year. When INFR as a dependent variable results show that the coefficient of ECM (-1) is significant at 1% level which indicate that the speed of adjustment in the long run imply that 99.4% of the disequilibria in INFR of the previous year's shock adjust back to the long run equilibrium in the current year (Table A1and A2 Appendix).When UNR is consider as a dependent variable the results show that the coefficient of ECM (-1) is negative but not significant which indicate that the speed of adjustment for short run to reach long run is not significant in equation (Table A3 and A4 Appendix).To interpret the long run coefficient in the second part in table 2 is.

$$RGDPG = 0.2251*INFR - 0.1378*UNR + 5.6988$$

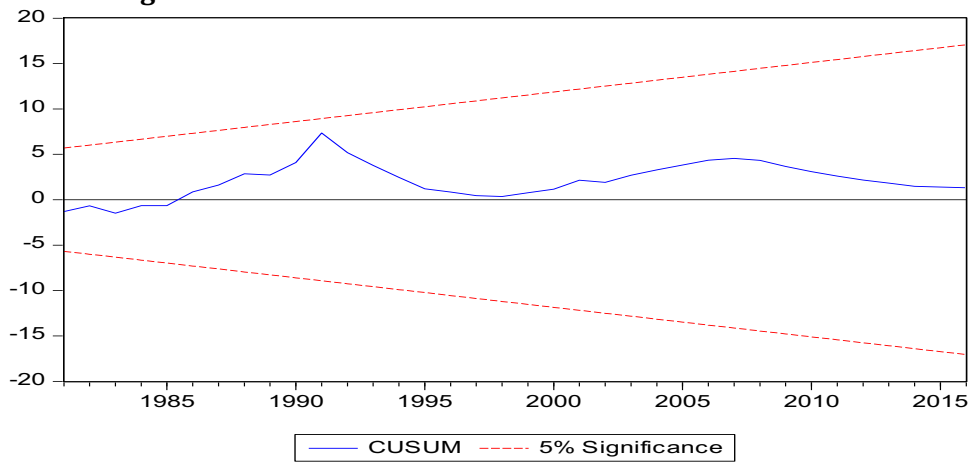
Here we can take each variable individually and test the significance as: First I talk about INFR. where p-value = 0.67 > 0.05, meaning that INFR positive coefficient and statistically not significant to explain the dependent variable RGDPG, meaning that if INFR rate increase by 1% this will lead RGDPG to increase by the value of the coefficient 0.225 units keeping UNR is constant., meaning that we cannot reject H_0 rather accept H_0 and reject alternative H_1 as hypothesized by H0. The second Variable is UNR where p-value > 0.05, meaning that UNR negative coefficient and statistically not significant to explain the dependent variable RGDPG. meaning that if UNR increase by 1% this will lead RGDPG to decrease by the value of the coefficient 0.137 units keeping INFR is constant., meaning that we have the evidence to accept H_0 and reject the H_2 as hypothesized by H_0. the above (table 4) shows that, the equation

consists of a trend value at (5.6988).

Stability Test

To test the stability of parameters, Cumulative sum (CUSUM) tests have been employed to investigate the stability of long and short run parameters. Pesaran et al. (2001)[32] suggest that the stability of long and the short run estimate be verified using the CUSUM tests. Figures 1 provide the plots for CUSUM. This is between the critical bounds at the 5 percent level, this asserts the stability of short run and long run parameters.

Figure 1: Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bonds at 5% significance level

Source: Source: Authors' calculation using EViews 9.

Diagnostic Tests

Statistical diagnostic tests are applied to examine model specification and functional forms. As shown in Table 6, The empirical evidence shows that no serial correlation, and the model is free from heteroskedasticity and ARCH affect, the residual term is normally distributed, ,.

Table 6: Diagnostic Tests

Model (2) ARDL (1,0,0)			
Null Hypotheses	Statistics	sig	Decision
There is no serial correlation in the residual	$\chi 2 = 0.365089$	0.5457	fail to reject H_0
There is no autoregressive conditional heteroscedasticity	$\chi 2 = 3.490833$	0.3220	fail to reject H_0
Normal distribution	JB=4.8690	0.0876	fail to reject H0
Heteroskedasticity Test: ARCH	$\chi 2 = 1.37$	0.9991	fail to reject H_0

Source: Source: Authors' calculation using EViews 9.

CONCLUSIONS AND POLICY IMPLICATIONS

This paper examines the effect of inflation and unemployment on economic growth in Jordan for the period (1977-2016) using multivariate time series techniques such as Augmented Dicky Fuller test, Lag length criteria, and Granger causality test.

The results of the Augmented Dicky Fuller unit root test illustrate that all series are non-stationary at their levels but after they converted into their first difference then all became as stationary. For getting optimal lag length of this model, vector autoregressive lag model was used based on FPE, HQIC and SBIC criteria. These criteria suggested that optimal lag length as (1) and it was used in this study.

The effects of inflation and unemployment on economic growth was also examined in Jordan economy, which revealed the INF positive coefficient and statistically not significant to explain the dependent variable RGDPG, meaning that if INFR rate increase by 1% this will lead RGDPG to increase by the value of the coefficient 0.225 units keeping UNR is constant.

INF and UNR negative and statistically significant on RGDPG on short-term, since ECM (-1) = -0.530517 is negative and significant at 0.05 level of significance, meaning that there is a SR association ship. The coefficients of ECM terms present the speed of adjustment in the long-run due to a shock. The coefficients of ECM terms imply that 26.53.0% of the disequilibria in RGDPG of the previous year's shock adjust back to the long run equilibrium in the current year. When INFR as a dependent variable results show that the coefficient of ECM (-1) is significant at 1% level which indicate that the speed of adjustment in the long run imply that 99.4% of the disequilibria in INFR of the previous year's shock adjust back to the long run equilibrium in the current year When UNR is consider as a dependent variable the results show that the coefficient of ECM (-1) is negative but not significant which indicate that the speed of adjustment for short run to reach long run is not significant in equation.

As long term INFR and UNR with respectively 0.2251 and -0.1378, meaning that INFR positive coefficient and statistically not significant to explain the dependent variable RGDPG. The second variable is UNR with negative coefficient and statistically not significant to explain the dependent variable . meaning that if UNR increase by 1% this will lead RGDPG to idecrease by the value of the coefficient -0.1378,

Further, the stability of long and the short run estimate be verified using the CUSUM tests and the model is stable. Finally, As a result, authorities should pay more attention to importance of inflation and unemployment in economic growth. Furthermore, the empirical evidence shows that no serial correlation, and the model is free from heteroskedasticity and ARCH affect, the residuals term are normally distributed

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APPENDIX A

Table A!:ARDL Cointegrating And Long Run Form

Table A!:ARDL Cointegrating And Long Run Form
Dependent Variable: INFR
Selected Model: ARDL(1, 0, 0)
Date: 06/18/18 Time: 21:52
Sample: 1977 2016
Included observations: 39

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UNEMPR)	0.129332	0.249189	0.519011	0.6070
D(RGDPG)	-0.069815	0.101447	-0.688199	0.4959
CointEq(-1)	-0.994994	0.170710	-5.828558	0.0000

Cointeq = INFR - (0.1300*UNEMPR -0.0702*RGDPG + 2.2582)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMPR	0.129982	0.249388	0.521206	0.6055
RGDPG	-0.070167	0.100670	-0.696995	0.4904
C	2.258163	3.596339	0.627906	0.5341

Table A2: ARDL Bounds Test

Table A2: ARDL Bounds Test		
Date: 06/18/18 Time: 21:52		
Sample: 1978 2016		
Included observations: 39		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	11.67409	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Table A3: ARDL Cointegrating And Long Run Form

Table A3: ARDL Cointegrating And Long Run Form				
Dependent Variable: UNR				
Selected Model: ARDL(1, 0, 0)				
Date: 06/18/18 Time: 21:55				
Sample: 1977 2016				
Included observations: 39				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDPG)	0.019413	0.027597	0.703434	0.4864
D(INFR)	0.010461	0.046449	0.225210	0.8231
CointEq(-1)	-0.085594	0.068521	-1.249176	0.2199
Cointeq = UNEMPR - (0.2268*RGDPG + 0.1222*INFR + 11.4949)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDPG	0.226798	0.357889	0.633710	0.5304
INFR	0.122214	0.543689	0.224786	0.8235
C	11.494902	3.856837	2.980396	0.0052

Table A4: ARDL Bounds Test

Table A4: ARDL Bounds Test		
Date: 06/18/18 Time: 21:56		
Sample: 1978 2016		
Included observations: 39		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	1.038374	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36