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MACROECONOMIC DETERMINANTS OF INFLATION IN MIDDLE EAST AND NORTH AFRICAN COUNTRIES

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ABSTRACT

The purpose of this research is to measure the effect of leading macroeconomic variables of the Middle East and North African (MENA) countries, as well as the nature of the relationship between the factors and inflation. Hence, studying the factors that affect Inflation is notably vital in the process of setting policies in order to regulate inflation rates to protect economies. This research will display the kind of nature in the relationship between the growth of the six macroeconomic factors (broad money, current account balance, annual gross domestic product, gross national expenditure, imports of goods and services, and real interest rate) and the consumer price index growth in some of the Middle East and North African countries such as Egypt, Bahrain, Jordan, Morocco, Kuwait, Oman, Tunisia and Saudi Arabia. The established period of the study is 30 years from 1985 to 2015. All related data will be obtained through the World Development Indicators (WDI). The results of this research displays the macroeconomic factors chosen do indeed have mostly a significant impact on Inflation within the scope of this research. Therefore, it would be important to consider these macroeconomic factors to predict, or study, or regulate inflation and deflation in the economies of the selected countries.

INTRODUCTION

Inflation is one of the most important indicators of performance for all countries as deflation or inflation indicates the costs of conducting business as well as the costs of borrowing money, bonds yields both from government and corporate, and fundamentally determining all the other costs in any country which affects the economic growth of the country which can have its own impact globally as well [1, 2]. Inflation impacts all the costs in the economy

such as living costs, business costs, the cost of borrowing money, both government bonds, and corporate bonds yields, which reflect on the overall economy of the country, it also will be affected nationally and globally [3, 4]. Therefore regulating inflation is a job of high importance to stabilize economies.

Obiamaka and Omankhanlen [5] concluded that the relationship between the two factors which are inflation and foreign direct investment are more likely negative than positive, the study also showed that inflation might have a positive influence on the foreign direct investment giving that it does not override a certain threshold. The reason why inflation rate did not override a certain threshold is because it was minimal in United Arab of Emirates through the past five years of the study, examine the time period from 1980 to 2013, inflation did not fluctuate in a negative way till that time when their financial crisis hit at 2007 and it affected most of the world economy as well, having inflation rate as minimal was also the reason why it did not have a negative relationship with foreign direct investment.

Qenaie [6] research paper, the data analysis limited the time period from1991 to 2014 to spot the light on the causes of inflation across oil exporting countries, Inflation is examined by using the consumer price index, also it is linked with few factors which are, demand that covers the public and government expenditure, then comes the supply factor which covers the rest of the world oil price, third comes the money factors which covers the growth and interests, lastly is the external factors which are the exchange rate. The major causes of inflation across oil exporting countries are the increase in oil price, decrease in money growth, and increase in the exchange rate and decrease in population growth [6, 7].

According to Joseph Crowley [8] study, Inflation kept performing a certain pattern in all the Middle East countries, North Africa, and Central Asia from the time period of 1996 till 2009, when entering the 2000 it became to fail that certain pattern in performing inflation fluctuation. The study examines many factors across different section among the Middle East economy, to view the fluctuation on inflation in the past years, and determine what the primary elements are. As it stated, the oil price does not majorly benefit the study in demonstrating the fluctuation pattern of inflation in those years among the Middle East countries, the pattern is demonstrated by viewing the past pattern of inflation fluctuation as well as the analysis of monetary and exchange policies and commodity prices.

Masood Ahmad [9], he believed that there are two main areas when it comes to inflation, they’re headline and core inflation. The headline inflation examine the total consumer price index is faring. The index affects the cost of purchasing extending from food, clothing and rent. The headline number could be affected by seasonal elements such as food prices and it could also show ranges in changes in individual items like food prices and energy prices. The core inflation focuses on providing a point of view in highlighting the inflation trends by taking out some goods or products which are prone to short-term price shocks.

Inflation is the rate at which the general level of prices for goods and services is rising and, consequently, the purchasing power of the currency is falling. Central banks are responsible for making efforts to limit inflation rates from rising while steering away from deflation as well in order to maintain a stable economy in any country [10]. Hence, one of the factors that are very important to investigating is the macroeconomic factors that are variables in this equation that can be contributing inflation and deflation in economies. This study will help in indicating the factors effects on Inflation.

METHODOLOGY

This research used quantifying method to measure the effect of selected macroeconomic factors on inflation for the Middle East and North African (MENA) countries namely, Egypt, Bahrain, Jordan, Morocco, Kuwait, Oman, Tunisia and Saudi Arabia. The obtained data is from World Development Indicators (WDI), covered period between 1985 and 2005. The method employed in this research is an ordinary least square method (OLS) which empirically calculates a multiple linear regression to predict the dependent variable (DV) chosen here which is consumer price index growth (logCPI) based on certain independent variables' (IV) growth which are multiple macroeconomic factors that includes broad money (M3), current account balance, annual gross domestic product (GDP), gross national expenditure (GNE), imports of goods and services, and real interest rate. The model of the study:

logCPI = logM3 + logCA + logGDP + logGNE + logIMP + logRIR

where, M3=Broad Money, CA=Current Account, GDP=Gross Domestic Product, GNE=Gross National Product, IMP=Imports of Goods and Services and RIR=Real Interest rate.

The same macroeconomic indicators for all the countries are used with the exception of KSA due to unavailability of a certain variable. To increase the accuracy of the results, the number of terms used to conduct the OLS also increased.

Each selected variable effects CPI growth in terms of a positive or a negative effect, based on the nature of each country's economy, for example in any country when economy is sustainable along with regulated inflation rate, business grow in growing economies demanding employees which lowers unemployment rates which rise GDP as well, but in case it was raising rapidly the federal reserve may raise interest rates to control inflation. The ordinary least square method is also measuring the significance of each IV effect on the DV, an output summary (regression) displays the R. square explaining how much are the variables are responsible for logCPI in each country. Then it shows log CPI increasing or decreasing by the value of the coefficient of each variable for each unit of measure. Then the OLS displays the IV's that were significant predictors of logCPI based on their P-Values.

Correlation (r) and significance level (p).

P-value < 0.10 => Relationship is statistically significant (strong)

P-value > 0.10 => Relationship is statistically insignificant (weak)

Descriptive statistics excel calculator is used in order to measure the standard deviation of all the selected variables, which uses a square root of the average squared deviation from the mean formula, it is basically a measure of the variability in a data, the closer the number is to 0 the lower the standard deviation is which indicates that most of the measurements of the variables are very close to the average, in another word, no deviation. While a high standard deviation indicates that measurements of the variables are spread out from the mean. While a high standard deviation indicates that measurements of the variables are spread out from the mean. Standard deviation is one tool to calculate historical or realized volatility, and volatility here is referring to a variable tendency to move. A high standard deviation (SD) = High volatility.
A correlation matrix formula is used to display each variable correlation coefficient (r) to test the strength of the relationship between all the variables, high correlation indicates that the two variables are highly associated with each other (Table 1).

Table 1 Linear relationship of correlation

Correlation (r)	linear relationship	Sign
-1	Perfect Downhill	negative
-0.7	Strong Downhill	negative
-0.5	Moderate Downhill	negative
-0.3	Weak Downhill	negative
0	No Linear Relationship	-
0.3	Weak Uphill	positive
0.5	Moderate Uphill	positive
0.7	Strong Uphill	positive
1	Perfect Uphill	positive

Result And Discussion

The dependent variable is CPI growth, while the explanatory variables include broad money growth, current account balance growth, GDP annual growth, growth for gross national expenditure, imports of goods and services growth, and real interest rate growth. For each variable, growth values are obtained in order to quantify the relationship in percentage terms.

OLS estimation for The Arab Republic of Egypt

In order to estimate the major determinants of Inflation for Egypt, the following model is estimated:

$$\log CPI = -2.43\log M3 - 2.28\log CA - 1.65\log GDP - 1.88\log GNE - 0.18\log IMP - 0.37\log RIR$$

Employing OLS estimation p-values reveals that broad money growth and gross national expenditure growth and annual GDP growth are less than 0.1 which means they are statistically significant, implying that these macroeconomic indicators strongly influence inflation growth in Egypt. The signs point to the nature of the relationship between the factor and inflation, whether they have a negative correlation or positive correlation. The estimation results indicate that a 1 percentage point increase in broad money leads to 2.43 percentage point decrease in CPI growth. And a 1 percentage point increase in current account growth leads to 2.28 percentage point decrease in CPI growth. And a 1 percentage point increase in annual GDP growth leads to 1.65 percentage point decrease in CPI growth. As well as a 1 percentage point increase in gross national expenditure growth leads to 1.88 percentage point decrease in CPI growth. And a 1 percentage point increase in Imports leads to 0.18 percentage point decrease in CPI growth. Similarly, a 1 percentage point increase in Real interest rate leads to 0.37 percentage point increase in CPI growth. The P-value is shown in Table 2.

Table 2. The t Stat and P-value for Egypt

	t Stat	**P-value**
Intercept	4.672879932	9.54E-05
Broad money (growth)	-2.432095569	0.022842343
Current account balance (growth)	-2.287085909	0.031305913
GDP growth (annual %)	-1.658173902	0.110297218
Gross national expenditure (growth)	-1.884717589	0.071634542
Imports of goods and services (growth)	0.180171942	0.858530262
Real interest rate (growth)	0.377968768	0.708776148

The R-square in Table 3 shows that 39 percent of the variations in CPI growth is explained by broad money growth, the current account balance growth, annual GDP growth, the growth of gross national expenditure, imports of goods and services growth, and growth in the real interest rate. Table 4 indicates the volatility of each of the variables for Egypt based on their SD.

Table 3. Regression Statistics for Egypt

Multiple R	0.631960854
R Square	0.399374521
Adjusted R Square	0.249218151
Standard Error	5.474291521
Observations	31

Table 4 Volatility of each of the variables for Egypt

Standard deviation (SD)	**Mean (M)**
CPI = 6.317875142	M = 10.35874717
M3 = 4.853733761	M = -0.418967209
CA = 1104.374919	M = -233.7800129
GDP = 1.653678887	M = 4.254062269
GNE = 2.355404623	M = -0.081139999
IMP = 13.64675233	M = -0.470086041
RIR = 412.2796437	M = 53.37233069

OLS estimation for the Kingdom of Bahrain

In order to estimate the major determinants of Inflation for Bahrain, the following model is estimated:

$$\log CPI = -0.02\log M3 - 0.03\log CA + 0.81\log GDP + 0.33\log GNE - 0.53\log IMP + 0.71\log RIR$$

Employing OLS estimation p-values reveals that all the variables that have been used are higher than 0.10 which means they are statistically insignificant, implying that these macroeconomic indicators are not strongly influencing inflation growth in Bahrain. The signs point to the nature of the relationship between the factor and inflation, whether they have a negative correlation or positive correlation. The estimation results indicate that a 1 percentage point increase in broad money leads to 0.02 percentage point decrease in CPI growth. And a 1 percentage point increase in current account growth leads to 0.03 percentage point decrease in CPI growth. As well as a 1 percentage point increase in GDP growth leads to 0.81 percentage point increase in CPI growth. It also indicates that a 1 percentage point increase in Gross national expenditure growth leads to 0.33 percentage point increase in CPI growth, and a 1 percentage point increase in Imports leads to 0.53 percentage point decrease in CPI growth. Similarly, a 1 percentage point increase in Real interest rate leads to 0.71 percentage point increase in CPI growth. The P-value is shown in Table 5.

Table 5. The t Stat and P-value for Kingdom of Bahrain

	t Stat	**P-value**
Intercept	0.960953964	0.346157598
Broad money (growth)	-0.020858331	0.983531114
Current account balance (growth)	-0.037764122	0.970188122
GDP growth (annual %)	0.813747394	0.423790074
Gross national expenditure (growth)	0.339868177	0.736912307
Imports of goods and	-0.533988029	0.598261642

services (growth)		
Real interest rate (growth)	0.713188596	0.482606797

The R-square in Table 6 shows that 0.07 percent of the variations in CPI growth is explained by broad money growth, the current account balance growth, annual GDP growth, the growth of gross national expenditure, imports of goods and services growth, and growth in the real interest rate. Table 7 indicates the volatility of each of the variables for Bahrain based on their SD.

Table 6 Regression Statistics for Kingdom of Bahrain

Multiple R	0.266915833
R Square	0.071244062
Adjusted R Square	-0.160944922
Standard Error	1.791651576
Observations	31

Table 7. Volatility of each of the variables for Kingdom of Bahrain

Standard deviation (SD)	**Mean (M)**
CPI = 1.662829604	M = 1.080958491
M3 = 9.667157162	M = 1.198586147
CA = 591.242435	M = -52.43779537
GDP = 3.427975884	M = 4.740561143
GNE = 20.3956723	M = -3.415376976
IMP = 19.33509555	M = -5.170664099
RIR = 596.3595972	M = 127.7558448

OLS estimation for The Hashemite Kingdom of Jordan

In order to estimate the major determinants of Inflation for Jordan, the following model is estimated:

$$\log CPI = -3.34\log M3 - 0.57\log CA - 4.29\log GDP - 0.24\log GNE + 1.89\log IMP - 3.59\log RIR$$

Employing OLS estimation p-values reveals that broad money, GDP, Imports, and Real interest rate are less than 0.1 which means they are statistically significant, implying that these macroeconomic indicators strongly influence inflation growth in Jordan. The signs point to the nature of the relationship between the factor and inflation, whether they have a negative correlation or positive correlation. The estimation results indicate that a 1 percentage point increase in broad money leads to 3.34 percentage point decrease in CPI growth. And a 1 percentage point increase in current account growth leads to 0.57 percentage point decrease in CPI growth. As well as a 1 percentage point increase in GDP growth leads to 4.29 percentage point decrease in CPI growth. It also indicates that a 1 percentage point increase in gross national expenditure leads to 0.24 percentage point decrease in CPI growth and a 1 percentage point increase in Imports lead to 1.89 percentage point increase in

CPI growth. Lastly, a 1 percentage point increase in real interest rate leads to 3.59 percentage point decrease in CPI growth. The P-value is shown in Table 8.

Table 8. The t Stat and P-value for Jordan

	t Stat	**P-value**
Intercept	7.505582687	9.57783E-08
Broad money (growth)	-3.343271547	0.002709604
Current account balance (growth)	-0.574546833	0.57094461
GDP growth (annual %)	-4.292682857	0.000250923
Gross national expenditure (growth)	-0.245434127	0.808206928
Imports of goods and services (growth)	1.899771319	0.069544441
Real interest rate (growth)	-3.593424268	0.001461308

The R-square in Table 9 shows that 0.67 percent of the variations in CPI growth is explained by broad money growth, the current account balance growth, annual GDP growth, the growth of gross national expenditure, imports of goods and services growth, and growth in the real interest rate. Jordan based on their SD. Table 10 indicates the volatility of each of the variables for The Jordan based on their SD.

Table 9. Regression Statistics for Jordan

Multiple R	0.822708159
R Square	0.676848715
Adjusted R Square	0.596060894
Standard Error	3.497615894
Observations	31

Table 10. Volatility of each of the variables for Jordan

Standard deviation (SD)	**Mean (M)**
CPI = 5.503185646	M = 4.583229637
M3 = 7.495595899	M = 1.168799374
CA = 1155.701011	M = -158.9135883
GDP = 4.799465937	M = 4.13344319
GNE = 4.70934203	M = -0.252224714
IMP = 11.3165482	M = -0.120058446
RIR = 126.4499763	M = -24.16342428

OLS estimation for The State of Kuwait

In order to estimate the major determinants of Inflation for Kuwait, the following model is estimated:

$$\log CPI = -1.49\log M3 - 0.04\log CA - 1.14\log GDP - 2.13\log GNE + 2.36\log IMP - 0.25\log RIR$$

Employing OLS estimation p-values reveals that GDP, gross national expenditure, and Imports are less than 0.1 which means they are statistically significant, implying that these macroeconomic indicators strongly influence inflation growth in Kuwait. The signs point to the nature of the relationship between the factor and inflation, whether they have a negative correlation or positive correlation. The estimation results indicate that a 1 percentage point increase in broad money leads to 1.49 percentage point decrease in CPI growth. And a 1 percentage point increase in current account growth leads to 0.04 percentage point decrease in CPI growth. As well as a 1 percentage point decrease in GDP growth leads to 1.14 percentage point decrease in CPI growth. It also indicated that a 1 percentage point increase in gross national expenditure leads to 2.13 percentage point decrease in CPI growth, and a 1 percentage point increase in Imports leads to 2.36 percentage point increase in CPI growth. Lastly, a 1 percentage point increase in real interest rate leads to 0.25 percentage point decrease in CPI growth. The P-value is shown in Table 11.

Table 11 The t Stat and P-value for Kuwait

	t Stat	**P-value**
Intercept	5.594446335	9.31E-06
Broad money (growth)	-1.491343826	0.148899277
Current account balance (growth)	-0.04239823	0.966532006
GDP growth (annual %)	-1.14368136	0.264035535
Gross national expenditure (growth)	-2.137460857	0.04295222
Imports of goods and services (growth)	2.364432951	0.026488273
Real interest rate (growth)	-0.252608632	0.802721635

The R-square in Table 12 shows that 0.38 percent of the variations in CPI growth is explained by broad money growth, the current account balance growth, annual GDP growth, the growth of gross national expenditure, imports of goods and services growth, and growth in the real interest rate. Kuwait based on their SD as shown in Table 13.

Table 12 Regression Statistics for Kuwait

Multiple R	0.620940088
R Square	0.385566592
Adjusted R Square	0.23195824
Standard Error	2.415148366
Observations	31

Table 13 Volatility of each of the variables for Kuwait

Standard deviation (SD)	**Mean (M)**
CPI = 2.755823494	M = 3.00962142
M3 = 25.48351001	M = -3.566994157
CA = 248.1106387	M = -51.73368172
GDP = 8.812658942	M = 4.80787667
GNE = 28.2037582	M = -2.313630441
IMP = 33.40534844	M = -1.039365235
RIR = 337.4655758	M = -65.92839341

OLS estimation for The Kingdom of Morocco

In order to estimate the major determinants of Inflation for Morocco, the following model is estimated:

logCPI = 0.12logM3 + 0.00logCA + 0.131logGDP + 0.07logGNE + 0.07logIMP + 0.00logRIR

Employing OLS estimation p-values reveals that gross national expenditure and Imports are less than 0.1 which means they are statistically significant, implying that these macroeconomic indicators strongly influence inflation growth in Morocco. The signs point to the nature of the relationship between the factor and inflation, whether they have a negative correlation or positive correlation. The estimation results indicate that a 1 percentage point increase in broad money leads to 0.12 percentage point increase in CPI growth. And a 1 percentage point increase in current account growth leads to 0.00 percentage point increase in CPI growth. As well as a 1 percentage point increase in GDP growth leads to 0.13 percentage point increase in CPI growth. It also indicated that a 1 percentage point increase in gross national expenditure leads to 0.07 percentage point increase in CPI growth and a 1 percentage point increase in Imports leads to 0.07 percentage point increase in CPI growth. Lastly, a 1 percentage point increase in real interest rate leads to 0.00 percentage point increase in CPI growth. The P-value is shown in Table 14.

Table 14 The t Stat and P-value for Morocco

	t Stat	**P-value**
Intercept	3.109095117	0.004781973
Broad money (growth)	0.358758497	0.722912545
Current account	0.986082897	0.333929959

balance (growth)		
GDP growth (annual %)	-0.562830521	0.578770654
Gross national expenditure (growth)	1.942723053	0.063870999
Imports of goods and services (growth)	-1.860232719	0.075150993
Real interest rate (growth)	-1.10869306	0.278549592

The R-square in Table 15 shows that 0.16 percent of the variations in CPI growth is explained by broad money growth, the current account balance growth, annual GDP growth, the growth of gross national expenditure, imports of goods and services growth, and growth in the real interest rate. Morocco based on their SD as shown in Table 16.

Table 15 Regression Statistics for Morocco

Multiple R	0.407920358
R Square	0.166399018
Adjusted R Square	-0.042001227
Standard Error	2.35662122
Observations	31

Table 16 Volatility of each of the variables for Morocco

Standard deviation (SD)	**Mean (M)**
CPI = 2.30863709	M = 2.823670621
M3 = 4.782363259	M = 3.830171881
CA = 573.1955623	M = 63.97251319
GDP = 3.987919157	M = 4.292597649
GNE = 18.0990522	M = -3.087166481
IMP = 20.25261271	M = -1.795822093
RIR = 101.7397896	M = 8.011365106

OLS estimation for The Sultanate of Oman

In order to estimate the major determinants of Inflation for Oman, the following model is estimated:

$$\log CPI = -0.23\log M3 - 0.68\log CA + 0.57\log GDP - 1.08\log GNE + 1.82\log IMP + 3.64\log RIR$$

Employing OLS estimation p-values reveals that imports and real interest rate are less than 0.1 which means they are statistically significant, implying that these macroeconomic indicators strongly influence inflation growth in Oman. The signs point to the nature of the relationship between the factor and inflation, whether they have a negative correlation or positive correlation. The estimation results indicate that a 1 percentage point increase in broad money leads to 0.23 percentage point decrease in CPI growth. And a 1 percentage

point increase in current account growth leads to 0.68 percentage point decrease in CPI growth. As well as a 1 percentage point increase in GDP growth leads to 0.57 percentage point increase in CPI growth. It also indicated that a 1 percentage point increase in gross national expenditure leads to 1.08 percentage point decrease in CPI growth, and a 1 percentage point increase in Imports leads to 1.82 percentage point increase in CPI growth. Lastly a 1 percentage point increase in real interest rate leads to 3.64 percentage point increase in CPI growth. The P-value is shown in Table 17.

Table 17 The t Stat and P-value for Oman

	t Stat	**P-value**
Intercept	1.3701744	0.183314492
Broad money (growth)	-0.238804141	0.813284845
Current account balance (growth)	-0.684555256	0.500182512
GDP growth (annual %)	0.571898983	0.572708578
Gross national expenditure (growth)	-1.082518676	0.289778961
Imports of goods and services (growth)	1.824748163	0.080512665
Real interest rate (growth)	3.649251759	0.00127164

The R-square in Table 18 shows that 0.43 percent of the variations in CPI growth is explained by broad money growth, the current account balance growth, annual GDP growth, the growth of gross national expenditure, imports of goods and services growth, and growth in the real interest rate. Oman based on their SD as shown in Table 19.

Table 18 Regression Statistics for Oman

Multiple R	0.662334358
R Square	0.438686802
Adjusted R Square	0.298358502
Standard Error	2.163012884
Observations	31

Table 19. Volatility of each of the variables for Oman

Standard deviation (SD)	**Mean (M)**
CPI = 2.582268949	M = 1.270827166
M3 = 11.96490726	M = 3.009080967
CA = 2539.174926	M = 443.7827473
GDP = 3.817973526	M = 4.073960802
GNE = 22.74571088	M = 78.73794273
IMP = 30.20898654	M = -4.033953604

RIR = 478.6566473	M = 93.18359356

OLS estimation for The Republic of Tunisia

In order to estimate the major determinants of Inflation for Tunisia, the following model is estimated:

$$\log CPI = -1.86\log M3 - 1.32\log CA - 0.82\log GDP - 0.25\log GNE + 0.32\log IMP - 1.50\log RIR$$

Employing OLS estimation p-values reveals that broad money is less than 0.1 which means they are statistically significant, implying that these macroeconomic indicators strongly influence inflation growth in Tunisia. The signs point to the nature of the relationship between the factor and inflation, whether they have a negative correlation or positive correlation. The estimation results indicate that a 1 percentage point increase in broad money leads to 1.86 percentage point decrease in CPI growth. And a 1 percentage point increase in current account growth leads to 1.32 percentage point decrease in CPI growth. As well as a 1 percentage point increase in GDP growth leads to 0.82 percentage point decrease in CPI growth. It also indicated that a 1 percentage point increase in gross national expenditure leads to 0.25 percentage point decrease in CPI growth and a 1 percentage point increase in Imports lead to 0.32 percentage point increase in CPI growth. Lastly, a 1 percentage point increase in real interest rate leads to 1.50 percentage point decrease in CPI growth. The P-value is shown in Table 20.

Table 20 The t Stat and P-value for Tunisia

	t Stat	**P-value**
Intercept	6.907031376	3.83295E-07
Broad money (growth)	-1.869629794	0.073784063
Current account balance (growth)	-1.320751989	0.199040304
GDP growth (annual %)	-0.822348504	0.41897422
Gross national expenditure (growth)	-0.256123625	0.800037983
Imports of goods and services (growth)	0.320119026	0.751648439
Real interest rate (growth)	-1.501869603	0.146174684

The R-square in Table 21 shows that 0.30 percent of the variations in CPI growth is explained by broad money growth, the current account balance growth, annual GDP growth, the growth of gross national expenditure, imports of goods and services growth, and growth in the real interest rate. Tunisia based on their SD as shown in Figure 22.

Table 21. Regression Statistics for Tunisia

Multiple R	0.550163669
R Square	0.302680063
Adjusted R Square	0.128350079
Standard Error	1.801662971
Observations	31

Table 22. Volatility of each of the variables for Tunisia

Standard deviation (SD)	**Mean (M)**
CPI = 1.929756467	M = 4.487425125
M3 = 3.590871522	M = 1.425929844
CA = 105.6048687	M = -15.39219939
GDP = 2.534593498	M = 3.782010307
GNE = 18.10388888	M = -3.058606852
IMP = 19.78939847	M = -1.662465112
RIR = 54.16970515	M = -14.54888796

OLS estimation for The Kingdom of Saudi Arabia

In order to estimate the major determinants of Inflation for Saudi Arabia, the following model is estimated:

$$\log CPI = -2.69\log M3 + 0.43\log CA + 2.36\log GDP + 2.80\log GNE - 1.03\log IMP$$

Employing OLS estimation p-values reveals that broad money and GDP and gross national expenditure are less than 0.1 which means they are statistically significant, implying that these macroeconomic indicators strongly influence inflation growth in Saudi Arabia. The signs point to the nature of the relationship between the factor and inflation, whether they have a negative correlation or positive correlation. The estimation results indicate that a 1 percentage point increase in broad money leads to 2.64 percentage point increase in CPI growth. And a 1 percentage point increase in current account growth leads to 0.43 percentage point increase in CPI growth. As well as a 1 percentage point increase in GDP growth leads to 2.32 percentage point increase in CPI growth. It also indicated that a 1 percentage point increase in gross national expenditure leads to 2.75 percentage point increase in CPI growth, and a 1 percentage point increase in Imports leads to 1.01 percentage point decrease in CPI growth. The P-value is shown in Table 23.

Table 23. The t Stat and P-value for Saudi Arabia

	t Stat	P-value
Intercept	1.835218451	0.078398786
Broad money (growth)	-2.695844714	0.012376678

Current account balance (growth)	0.439194257	0.664293569
GDP growth (annual %)	2.366297423	0.026026426
Gross national expenditure (growth)	2.804441009	0.009609077
Imports of goods and services (growth)	-1.03835064	0.30904598

The R-square in Table 24 shows that 0.38 percent of the variations in CPI growth is explained by broad money growth, the current account balance growth, annual GDP growth, the growth of gross national expenditure, and imports of goods and services growth. KSA based on their SD as shown in Table 25.

Table 24 Regression Statistics for Saudi Arabia

Multiple R	0.621663583
R Square	0.38646561
Adjusted R Square	0.263758732
Standard Error	2.337932922
Observations	31

Table 25. Volatility of each of the variables for Saudi Arabia

Standard deviation (SD)	**Mean (M)**
CPI = 2.724720556	M = 1.724124598
M3 = 11.39885315	M = 2.67593842
CA = 1052.530164	M = -64.29552735
GDP = 3.854348905	M = 3.752228773
GNE = 8.703190752	M = 0.299609697
IMP = 9.8272202	M = 0.655904914

This study identifies the six variables impacts on the CPI of the selected MENA Countries also the significant of the variables. And both the impact and significance are shown in Table 26 highlighting some of the findings in this research, which are the significance (sig) or (not sig), and whether the variable had a positive Impact (+) or negative impact (-). The significance of the variables is differing from a country to another. Since each country performs differently the significance of each variable would be dependent on how it plays its role in the country, so as shown in the table it varies greatly.

CONCLUSION

The macroeconomic variables in this study show the impact on CPI growth in the selected economies from MENA countries. This research did not include the most recent years and has been limited to a number of MENA countries and certain variables which in some cases correlated highly with each-other

but was not changed due to the lack of availability in data for other and for certain variables and years. The obtained results conclude that the variables have an impact on Inflation. Therefore, it would be important to consider these factors to predict or study or regulate inflation and deflation in the economy of MENA countries.

Table 26. Impact and significance between the factors for each country

Factors	Bahrain	Jordan	Morocco	Kuwait	Oman	Tunisia	KSA	Egypt
M3	Not Sig (-)	Sig (-)	Not Sig (+)	Not Sig (-)	Not Sig (-)	Sig (-)	Sig (-)	Sig (-)
CA	Not Sig (-)	Not Sig (-)	Not Sig (+)	Not Sig (-)	Not Sig (-)	Not Sig (-)	Not Sig (+)	Sig (-)
GDP	Not Sig (+)	Sig (-)	Not Sig (+)	Not Sig (-)	Not Sig (-)	Not Sig (-)	Sig (+)	Not Sig (-)
GNE	Not Sig (+)	Not Sig (-)	Sig (+)	Sig (-)	Not Sig (-)	Not Sig (-)	Sig (+)	Sig (-)
IMP	Not Sig (-)	Sig (+)	Sig (+)	Sig (+)	Sig (+)	Not Sig (-)	Not Sig (-)	Not Sig (-)
RIR	Not Sig (+)	Sig (-)	Not Sig (+)	Not Sig (-)	Sig (+)	Not Sig (-)	-	Not Sig (-)

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