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Macroeconomic Factors Influence on Arab Stock Markets: Empirical Evidence from Panel Data Modeling

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Abstract:
The purpose of the present study is to examine the relationship between Saudi Arabia, Egypt, and Morocco stock market Indexes and a set of macroeconomic factors are: inflation rate, unemployment rate, broad money growth, annual growth rate of Gross Domestic Product using annual data from 2002 to 2018. Fixed- and Random-effects models of Panel data method are used to test the relationship and investigates which macroeconomic factors that might affect stock market Indexes in these Arab countries. The results confirm that random effect model is more appropriate (HAUSMAN TEST). Evidence suggests that Broad money growth has a statistically significant effect (positive) on Arab stock indexes for a significance level of 5%; while the other independent variables show no significant effect.
Keywords: Macroeconomic factors, Stock markets, Stock Index, Arab countries, Panel data modeling.
Jel Classification Codes: C33, E44, G15

Introduction:

Since the end of the twentieth century, with the transition of many Arab economies to market economy, numerous studies focused on the role of stock market in the national economy, where the prime function of this market is to provide financial resources for companies or financial institutions. This market is a centripetal force to increase the capital and is a channel of capitalist system to optimally invest in new tools of such as securities (stocks and bonds); Moreover, the stock market plays an important role in financial development and economic growth of emerging

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markets worldwide. To measure the overall activity of this stock market, usually Index is used. It is an indicator that shows the movement of stock prices and tracks the performance of listed companies. Many factors impact stock market Index either positively or negatively. These relationships were studied by researchers. In fact, there are several theories regarding this issue such as the theory of "Efficient Market Hypothesis." This one analyzes the link between the stock prices and the publicly available information, that is, the relationship between macroeconomic variables news and the stock market prices behavior.[1]

This study focuses on the relationship between macroeconomic variables and Arab stock market indexes. We will examine the impact of some macroeconomic variables (like Inflation, Unemployment, Broad money, Gross Domestic Product) on Indexes of stock markets of Saudi Arabia, Egypt, and Morocco for 17 years (2002 – 2018). For this purpose, Fixed- and Random-effects models of Panel data are employed.

The aim of this article is to determine which of the macroeconomic variables that might have a statistically significant effect on Stock Market Index in these three countries.

1. Problem statement:

The main objective of this research paper is to answer the following question:

> Is there a statistically significant effect of Inflation Rate, Unemployment rate, Broad money growth, and Annual Growth Rate of GDP on Saudi, Egyptian and Moroccan stock markets indexes during the period from 2002 to 2018?

1.1. Research paper hypotheses:

In return, in hope to reach adequate answer to the aforementioned question, we will put forward four hypotheses.

During the period from 2002 to 2018, and for a significance level of 5%:

- **H_1**: There is a significant and negative relationship between inflation rate and the stock market Index in Saudi Arabia, Egypt and Morocco.
- **H_2**: There is a significant and negative relationship between unemployment rate and the stock market Index in Saudi Arabia, Egypt and Morocco.
- **H_3**: There is a significant and positive relationship between broad money growth and the stock market Index in Saudi Arabia, Egypt and Morocco.
- **H_4**: There is a significant and positive relationship between annual growth rate of gross domestic product and the stock market Index in Saudi Arabia, Egypt and Morocco.

1.2. Theoretical background:

Numerous studies in the literature have confirmed the relationship between macroeconomic variables and the stock market Index; while, these studies

[1] Fama, E. F. (1991). **Efficient Capital Markets: II,** . The Journal of Finance, Vol. 46, N05, p 1576-1577.

concluded with different results. The interpretation of this relationship has been advanced from some respected economists (such as Nobel laureates like Friedman, Fama, Modigliani, among others). They examined the link between macroeconomic factors (such as Inflation Rate, Unemployment rate, Broad money growth, and annual Growth Rate of Gross Domestic Product) and the stock market (indexes, returns, prices...). Several studies have established that the inflation rate and stock prices are closely related. In this respect, Irving Fisher (1930), Eugene Fama and William Schwert (1977) analyzed this relationship. According to Fisher (1930) -in his hypothesis "generalized Fisher effect"- there is a positive relationship between the stock returns and inflation, He said "equities shares should be used as a hedge against inflation"[1]; while, Fama and Schwert (1977)examined the hypothesis of Fisher and find a negative link between inflation and the stock returns in United States. Fama (1981), in his research paper "Stock Returns, Real Activity, Inflation, and Money"[2], he found a negative relationship between inflation and stock prices. He said "an inverse relationship between expected and unexpected inflation and stock returns." These results of Fama's research are supported by many other researchers like Modigliani and Cohn (1979). Likewise, unemployment rate is a concern for researchers as well as policy-makers. This one is an important variable that affects the economy. In this respect, there is no comprehensive theory about the impact of the unemployment rate on stock market index[3]. Another macroeconomic variable that plays an important role on stock market index is Broad money growth. The economists Friedmanand Schwartz (1963) analyzed the relationship between changes in growth rate of money supply and stock returns. Their results showed that the existence of a positive correlation between these two variables. In contrary, Fama (1981) found an inverse relationship between money supply and stock prices (Lafi AL-Naif, 2018, p. 130).Gross Domestic Product is also one of the important macroeconomic factors that affect stock market. The relationship between GDP growth rate and stock market Index is a direct relationship. Usually the increase in the Gross Domestic Product -that represents economic growth- generates an increase in economic activity, and increases in profits for companies[4]. Generally, it is clear from the previous literature that some macroeconomic variables affect the stock market index either positively or negatively.

Several investigations on the relationship between many macroeconomic variables and the stock markets Indexes in varied countries have also been conducted in recent years. Dr. Robert Gay (2016) in his research paper "Effect of macroeconomic variables on stock market returns for four emerging economies: Brazil, Russia, India, And China", found that "no significant relationship" between

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[1] Cifter, A. (2015). **Stock Returns, Inflation, and Real Activity in Developing Countries: A Markov-Switching Approach**. School of Economics and Administrative Sciences, Istanbul Kemerburgaz University, Turkey Panaeconomicus , Vol. 62, Issue 1 , p55.

[2] Fama, F. E. (1981). **Stock Returns, Real Activity, Inflation, and Money**. American Economic Association, The American Economic Review Vol. 71, No. 4· , p563.

[3] Gonzalo, J., & Taamouti, A. (2017). **The Reaction of Stock Market Returns to Unemployment.** Working papers Economics, Universidad Carlos III de Madrid , p1.

[4] Bessabaa, A. (2015). **The impact of macroeconomic variables on the performance of the Saudi stock market for the period (2005-2013) by using Co-integration test and error correction model (ECM)**. Journal of Economic Sciences Volume 10, Issue 10 , p152-153.

Exchange Rate and Oil Price on the stock markets indexes prices of these emerging economies[1]. While, Prof. Dr. Michaela Hönig and Kaan Celebi (2019) studied the impact of many macroeconomic factors on the German stock market, they found that in the crisis period, major macroeconomic factors had significant impacts on the stock returns; also, the influence especially extends to the post-crisis period.[2]

Overall, in our present study, four variables of macroeconomic (inflation rate, unemployment rate, broad money growth, annual growth rate of Gross Domestic Product) are selected to explore their relationships with stock market Index in three selected Arab countries namely: Saudi Arabia, Egypt, and Morocco.

The following table displays some key definitions of macroeconomic variables that are strongly related to stock market indexes and which are used in this paper:

Table 1: The Research Variables Description

The Variables		Description
The Macroeconomic Variables (Independent Variables)	**Inflation rate (X1)**	Inflation rate: "Inflationas measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used"[3] The term "Inflation"**:** a rise in prices or increase in the money supply? According to Hazlitt Henry "The word inflation originally applied solely to the quantity of money. It meant that the volume of money was inflated, blown up, overextended. It is not mere pedantry to insist that the word should be used only in its original meaning. To use it to mean "a rise in prices" is to deflect attention away from the real cause of inflation and the real cure for it."[4]
	Unemployment rate (X2)	**"**Unemployment refers to the share of the labor force that is without work but available for and seeking employment"[5] "The unemployment rate is the percentage of the total labor force (i.e., those who are either working or actively seeking employment) yet to find work. The unemployment rate measures the extent to which the economy is operating at full capacity"[6] The formula for calculating the unemployment rate is:

[1] Robert D. Gay, J. (2016, May/June /). **Effect of macroeconomic variables on stock market returns for four emerging economies: Brazil, Russia, India, And China**. International Business & Economics Research Journal, Volume 15, Number 3 , pp. 119-125.

[2] Michaela, H., & Kaan, C. (2019, March 29). **The Impact of Macroeconomic Factors on the German Stock Market: Evidence for the Crisis, Pre- and Post-Crisis Periods**. International Journal of Financial Studies , p. 1-13.

[3]World Bank. (2020). Consulté le January 23, 2020, sur site Web World Bank: https:**//www.worldbank.org/**

[4] Hazlitt, H. (1978). **The Inflation Crisis and How to resolve it"** . New York- United States of America: New Rochelle and New York: Arlington House Publishers, p 02.

[5] World Bank. (2020), op. cit.

[6] Bodie, Z., Kane, A., & Marcus, A. J. (2013). **Investments** . New York: Tenth Edition, Published by McGraw-Hill Education, New York, p561.

		(Unemployed people / Total Labor Force) x 100[1]
	Broad money growth (annual) (X3)	**"Broad 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"[2] Money Supply: • (M1) called narrow money: encompasses currency held by the public and demand deposits with banks. • (M2): includes (M1) + time and savings deposits with banks that require prior notice for withdrawal. • (M3): includes (M2) + various money market instruments, such as certificates of deposit issued by banks, bank deposits denominated in foreign currency, and deposits with financial institutions other than banks.
	Annual Growth Rate of Gross Domestic Product (X4)	"Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. 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. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources"[3] A standard definition of (GDP): According to David Andolfatto "GDP is the total value of final goods and services produced in the domestic economy over some given period of time."[4]
The Stock Markets Indexes (Dependent Variable)	**The Stock Markets Indexes : (Y) (TASI) index (EGX 30) index (MASI) index**	TASI index:(TASI) Tadawul All Share Index of Saudi Arabia Stock Exchange is the major stock market index; This index was developed with a base value of 1000 in 1985; it was restructured on June 30, 2008. It tracks the performance listed companies and measures the overall activity of the market.[5] EGX 30 index: (CASE 30 Index –previously-) is a free-float index of the 30 most highly capitalized, liquidity and activity stocks traded on Egyptian exchange. It was developed with a base level of 1000 in January 1st 1998; (EGX 30) is a good barometer for this market.[6] MASI index: (MASI) Moroccan All Shares Index; is a free-float index; it was launched on January 2, 2002 with a base

[1] Greenlaw, S. A., & Shapiro, D. (2018). **Principles of Macroeconomics.** Houston, Texas: 2e Houston: OpenStax.
[2] World Bank. (2020), op. cit.
[3] Op. cit.
[4] Andolfatto, D. (2008). **Macroeconomic Theory and Policy** . Burnaby, British Columbia: (2nd Edition). Simon Fraser University, p 02.
[5] cma. (2020). Consulté le February 6, 2020, sur Saudi Stock Market: **http://www.cma.org.sa**
[6] egx. (2020). Consulté le February 8, 2020, sur Egyptian Stock Market: **http://www.egx.com.eg**

		of 1000; it is the most active share index in the stock exchange(15); it tracks all companies listed performance in the market.[1]

Source: Prepared by researchers

1.3. Empirical evidence:

Table bellow provides a summary of previous empirical evidence of the impact of macroeconomic variables on stock Index. These studies concerns chiefly Arab countries using different tests:

Table 2: a summary of selected empirical studies

Authors (year)	Data (Variables) Independent/ Dependent	Period	Test Used	Results
Khalil Ghazi Hassan; Wafaa Sabah (2019)	**Independent variables:** Consumer Price Index (CPI); Exchange Rate; Money supply (M2); Interest-Rate-Current Account. **Dependent Variable:** Iraq Stock Price Index	2006 To 2015 Monthly Data	(ARDL) (UECM)	A long-run and short-run relationship between a number of macroeconomic variables and Iraq Stock Price Index (co- integration) Long- term relationship and significant impact of (CPI) and (M2) on stock prices index. (Inverse relationship). Interest rate had a significant impact on the stock price index (positive sign). Exchange rate showed no significance impact on the index. The same results in short-run in both significance of the variables and their sign.
Khaled Lafi AL-Naif	**Independent Variables:** Money Supply (M2)	January 2000	Co-integration Analysis; Granger	A significant positive long-run relationship between stock market index and money supply,Unlike the

[1] casablanca-bourse. (2020). Consulté le February 10, 2020, sur Casablanca Stock Market: **http://www.casablanca-bourse.com**

(2018)	Consumer price index Industrial Production Index. **Dependent Variable:** Amman Bourse Index	To November 2016	Causality Test; variance Decomposition	other variables ; Unidirectional short-run relationship between stock Market index and all indicators.
Ibrahim Ahmed Mohamed, Sohail Ahmed (2018)	**Independent Variables:** Industrial Production; Interest Rates; Money Supply; Inflation; GDP; Import Prices; **Dependent Variable:** The Jordanian stock returns	1976 To 2016 Annual Data	(ARDL)	The industrial production has a statistically significant effect on the returns of shares at a significant level of 1%; The effect of the money supply on the stock returns is statistically significant (positive impact), while the impact of import prices was negative and statistically significant on the stock returns
Ali Abdullah; Belhamri Khira (2015)	**Independent Variables:** GDP; Money Supply; Interest Rate; Inflation Rate; **Dependent Variables:** Stock Price Index; Market Value; Volume of Trading; Stock Turnover Rate.	2000 To 2013 Annual Data	Multiple Linear Regression	A causal relationship between the macroeconomic variables and Amman Stock Exchange indicators. The impact GDP on Jordanian STOCK mark performance was direct and significant. The effect of the Inflation Rate on the Trading Volume and the Stock Turnover was significant and positive. The Interest rate and the Money Supply has a negative impact on Dependent Variables
Bessabae Abd-el-Kader (2015)	**independent variables:** Gross Domestic Product (GDP) Money Supply (M3) Interest Rate (INT) Inflation Exchange Rate (EXR)	2005 To 2013	Co-integration Test; Error Correction Model	A significant effect of independent variables on the dependent variable in the long run and the short run. The GDP, Money Supply, and Exchange Rate have positive effects on the General Share Price Index. The Interest Rate and the Inflation have negative effects on the General Share

	Dependent Variables: market Index (General Share Price Index PIND)			Price Index.
Durga Prasad Samontaray; Sultan Nugali; Bokkasam Sasidhar . (2014)	**independent variables:** The Oil WTI The Saudi Exports Price Earnings ratio (PE Ratio) **Dependent Variables:** The Saudi Index (TASI)	December 2003 To December 2013 Monthly Data	Correlation Analysis; Regression Analysis.	Saudi Exports and The PE Ratio were found to be highly correlated with TASI at 1% level of significance; Oil WTI and TASI are significantly correlated at 5% level of significance. (Correlation). The (multiple regression models) is significant at 1% the variable PE Ratio was the most important determinant of TASI followed by Oil WTI and Saudi Exports. All independent variables explain about 93% of variation in the TASI Last Price.
Hassane Mechriki; Aymen El-Chahab (2014)	**independent variables:** (Damascus Stock Ex) Interest Rates Inflation Exchange Rates (Amman Stock Ex) Interest Rate Inflation Money Supply GDP Unemployment Rate Industrial Production Index The Public Budget Deficit **Dependent Variables:** (Damascus Stock Ex) Index (Amman stock Ex) Index	2010 To 2013 Monthly Data	Simple linear Regression	A significant effect for the Public Budget Deficit on the return of Amman Stock market index (a weak positive effect). A significant effect for the Dollar exchange rate in Damascus StockExchange (a weak positive effect). Other variables were all insignificant during the study period

Source: Prepared by researchers

According to this table of previous empirical evidence of the impact of macroeconomic variables on Arab stock index, one can advance that, in empirical evidence, authors may utilize different tests: Co-integration Test; Autoregressive Distributed Lag (ARDL); Multiple Linear Regression; Correlation Analysis, etc.

2. Data and methodology:

In our paper, we use Fixed- and Random-effects models of Panel data to estimate the relationships between the independent variables and the dependent variable; and measuring the statistically significant effect of these macroeconomic variables on three Arab stock markets during the period of study.

The data used in this research paper are taken from macroeconomic indicators and stock indexes homepages of the three countries under study namely: Saudi Arabia, Egypt, and Morocco. The data concern inflation rate, unemployment rate, broad money growth, annual growth rate of grossdomestic product, TASI Index, EGX30 Index, and MASI Index. The data covers the period between 2002 and 2018.

Our research paper investigates the relationship between selected macroeconomic variables and some Arab stock markets indexes i.e. We tried to answer the question: Does the movement of Saudi, Egyptian, and Moroccan stock market indexes is one of the results of the change in selected macroeconomic variables namely: Inflation Rate, Unemployment rate, Broad money growth, and Annual Growth Rate of GDP.

We weren't used Interest Rates, Exchange Rates, and other potential variables because:

- We selected some macroeconomic variables because its data is available.
- Saudi Arabia pegged its currency to a fixed foreign exchange rate "is Dollar" since 1986 (1USD = 3,75 SAR); so, we estimated that the monetary policy may be less effective, especially if the Exchange Rate is fixed (the impact of the Exchange Rate on the stock market index may be less effective). On the other hand, Egypt and Morocco pursue the floating (or flexible) Exchange Rate regime.
- The result of our research paper help to explore if the change (particularly) in Inflation Rate, Unemployment rate, Broad money growth, and Annual Growth Rate of GDP is one of the causes of change in Saudi, Egyptian, and Moroccan stock markets indexes. This of course does not eliminate the possibility that other potential variables may be effect on these stock markets indexes.

Table 3: dependent and independent variables for the three countries

Year	Change in Index %	Inflation Rate %	Unemployment Rate %	Broad money growth (annual %)	Annual Growth Rate of GDP%
	(Y)	(X1)	(X2)	(X3)	(X4)
SAUDI ARABIA					
2002	3,62	0,24	5,27	15,19	-2,81
2003	76,23	0,61	5,56	8,49	11,24
2004	84,93	0,51	5,82	17,25	7,95
2005	103,66	0,47	6,05	13,24	5,57

2006	-52,53	2,2	6,25	20,4	2,78
2007	39,14	4,16	5,73	20,14	1,84
2008	-56,49	9,87	5,08	17,95	6,24
2009	27,46	5,05	5,38	10,81	-2,05
2010	8,15	5,33	5,55	5,17	5,03
2011	-3,07	5,82	5,77	13,26	9,99
2012	5,98	2,86	5,52	16,48	5,41
2013	25,5	3,51	5,57	8,35	2,69
2014	-2,37	2,24	5,72	11,82	3,65
2015	-17,06	1,22	5,59	2,9	4,1
2016	4,32	2,05	5,65	0,54	1,67
2017	0,22	-0,83	5,89	0,15	-0,74
2018	8,31	2,46	5,91	2,7	2,43
EGYPT					
2002	0,57	2,73	10,01	12,63	2,39
2003	134,46	4,5	11,01	21,27	3,19
2004	122,23	11,27	10,32	16,23	4,09
2005	146,29	4,86	11,2	11,48	4,47
2006	10,26	7,64	10,49	15	6,84
2007	51,29	9,31	8,8	19,11	7,08
2008	-56,43	18,31	8,51	10,48	7,15
2009	35,08	11,76	9,08	9,47	4,67
2010	15,03	11,26	8,75	12,41	5,14
2011	-49,28	10,05	11,84	6,66	1,76
2012	50,8	7,11	12,59	12,34	2,22
2013	24,17	9,42	13,15	18,89	2,18
2014	31,61	10,14	13,1	15,76	2,91
2015	-21,52	10,36	13,05	18,6	4,37
2016	76,2	13,8	12,4	39,5	4,34
2017	21,66	29,5	11,77	20,45	4,18
2018	-13,21	14,4	11,43	13,3	5,31
MOROCCO					
2002	-13,48	2,79	11,59	10,31	3,12
2003	24.02	1,16	11,92	7,86	5,96
2004	14.67	1,49	10,83	8,35	4,79
2005	22.49	0,98	11,01	14,05	3,29
2006	71.14	3,28	9,67	18,08	7,57
2007	33.92	2,04	9,56	17,54	3,53
2008	-13,48	3,71	9,57	13,31	5,92
2009	-4,92	0,97	8,96	7	4,24
2010	21.17	0,99	9,09	4,19	3,81
2011	-12,86	0,9	8,91	6,43	5,24
2012	-15,13	1,28	8,99	4,51	3
2013	-2,62	1,88	9,23	3,08	4,53
2014	5.55	0,44	9,7	6,19	2,66
2015	-7,22	1,55	9,46	5,69	4,53
2016	30.46	1,63	9,3	4,73	1,05
2017	6.39	0,75	9,05	5,54	4,23
2018	-8,27	1,91	9,04	4,06	2,99

Source: world-bank database https://www.worldbank.org/

3. Results and discussion:

According to Fixed Effects Model (FEM) findings, one can highlight the following:

- Inflation coefficient (X1) value of -4.667755 explains that every 1-point increase in inflation, it will reduce the value of Arab stock index by 4.667755. This result shows that Inflation Rate influences negatively Arab stock index. This independent variable is one of the most important macroeconomic factors. The significance value calculated for (X1) is lower than 5%. Therefore, the study confirms that there is a statistically significant effect of Inflation rate on Arab stock market Index. The result shows that inflation plays a significant role in determining Arab stock market Index.
- The coefficient of Unemployment (X2) (0.405637) denotes that every unit increase in unemployment rate will increase the value of Arab stock index by 0.405637. Besides, the significance value calculated for (X2) is greater than 5% which is insignificant one. Therefore, the study concludes that there is no statistically significant effect of unemployment rate on Arab stock market Indexes.
- Broad money growth coefficient value (X3) of 2.172067 means that every digit increase for Broad money growth will increase the value of Arab stock index by 2.172067. The significance value calculated for (X3) is lower than 5%. Therefore, the study affirms that there is a statistically significant effect of Broad money growth on Arab stock market Indexes.
- The GDP coefficient (X4) of 2.450113 denotes that every increase of 1 point of the Rate of GDP will increase the value of Arab stock index by 2.450113; while the significance value calculated for (X4) is greater than 5% which means that it is insignificant. Therefore, the study concludes that there is no statistically significant effect of Annual growth rate of gross domestic product on Arab stock market Indexes.
- The constant value (c) is 57.72467 which indicate that if there is no Inflation Rate, Unemployment rate, Broad money growth, Annual Growth Rate of GDP, Arab indices will be equal to 57.72467.

Table 4: estimation findings

Variable	Fixed Effects	Random Effects
Constant	57.72467 (0.294)	23.9108 (0.387)
X1	-4.667755 (0.005)	-2.296213 (0.068)
X2	.405637 (0.944)	2.552137 (0.320)
X3	2.172067 (0.035)	2.582129 (0.008)
X4	2.450113 (0.308)	1.857343 (0.440)
R^2	0.9764	0.2413

Nb.obs	51	51
NB. Groups	03	03

Source: fixed- and random-effects models findings

From the table above, by using Random Effects Model, the main findings are as follows:

- Inflation coefficient value of -2.296213 explains that every 1-point increase in inflation will reduce the value of Arab stock index by -2.296213. The significance value calculated for (X1) is greater than 5%; so it is insignificant. Therefore, we conclude that there is no statistically significant effect of Inflation rate on Arab stock market Indexes.
- Unemployment coefficient is 2.552137 meaning that every unit increase in unemployment rate will increase the value of Arab stock index by 2.552137; however, the significance value calculated for (X2) is greater than 5% which means that it is insignificant. Therefore, we can conclude that there is no statistically significant effect of unemployment rate on Arab stock market Indexes.
- Broad money growth coefficient value of 2.582129 denotes that every digit increase in Broad money growth will increase the value of Arab stock index by 2.582129. The significance value calculated for (X3) is lower than 5%; therefore, we can say that there is a statistically significant effect of Broad money growth on Arab stock market Indexes.
- The gross domestic product coefficient of 1.857343 means that every increase of 1 point of the Rate of GDP will increase the value of Arab stock index by 1.857343, but the significance value calculated for (X4) is greater than 5% which means that is insignificant. Therefore, we report that there is no statistically significant effect of Annual growth rate of gross domestic product on Arab stock market Indexes.

Based on above discussion, and for selecting the appropriate model between Fixed- and Random-effects models, Hausman test is used. The null and alternative hypotheses are as follows[1]:

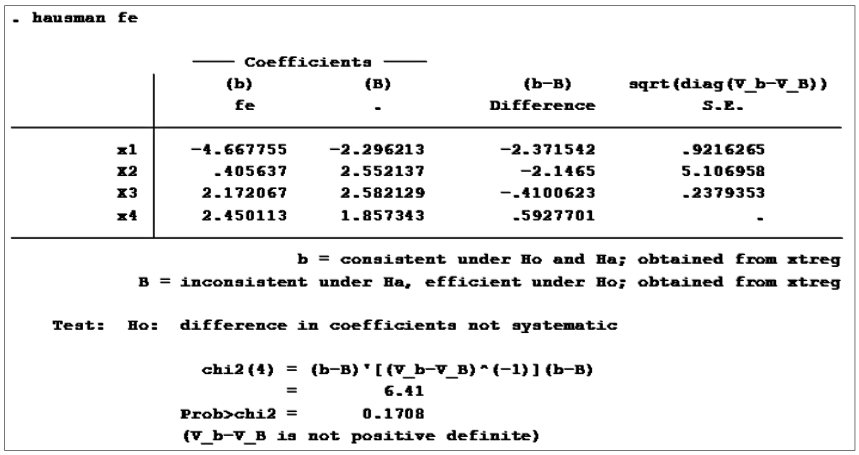
H_0: The appropriate model is random effects.

H_1: The appropriate model is fixed effects.

The results of Hausman Test are shown in Figure (1). The probability is 0.1708 (more than 5%). The null hypothesis cannot be rejected for level of significance 5%; therefore, we choose the random effects model (REM).

[1] Algamal, Z. Y. (2012). **Selecting Model in Fixed and Random Panel Data Models**. Iraqi Journal of Statistical Sciences Volume: 12 Issue: 21 ,p 275.

Figure 1: Hausman Test Results



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. hausman fe

                 ---- Coefficients ----
                 (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                  fe           .          Difference          S.E.
------------------------------------------------------------------------------
          x1   -4.667755    -2.296213      -2.371542        .9216265
          x2     .405637     2.552137        -2.1465        5.106958
          x3    2.172067     2.582129       -.4100623        .2379353
          x4    2.450113     1.857343        .5927701               .
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =          6.41
                Prob>chi2 =        0.1708
                (V_b-V_B is not positive definite)
```

Source: Hausman Test

According to the results, our research paper only accepted the third hypothesis (**H_3**), which assumes that there is a significant and positive relationship between Broad money growth and the stock market Index in Saudi Arabia, Egypt and Morocco; so, every 1-point increase in Broad money growth, it will increase the value of these Arab stock markets indexes by 2.582129; while, the study rejected the rest of hypotheses. On the other hand, one can conclude that the three Arab stock markets under study are not efficient in the Semi-Strong form (This form of efficiency is the second version for the economist EUGENE FAMA in his theory namely "The Efficient Market Hypothesis EMH", it assumes that all publicly available information must be fully reflected already on stock prices). So, if the Saudi, Egyptian and Moroccan stock markets are efficient in the Semi-Strong form, we guess that any change in every macroeconomic variable under study will lead to change in the stock markets indexes. (Several studies testing the relationship between macroeconomic variables and stock markets indexes that supported the semi-strong efficient market hypothesis confirmed the impact of news about some major economic factors like inflation, money supply, gross domestic product, etc on the stock market index).

Conclusion:

The present paper aimed to investigate whether the macroeconomic variables under study affect the Arab stock Indexes or not. To do so, we have taken into consideration the annual data of three selected Arab countries which are: Saudi Arabia, Egypt and Morocco for 17 years (from 2002 to 2018). We analyzed this data by using Fixed- and Random-effects models of Panel data. In these two models, we have taken four independent variables which are: Inflation rate, Unemployment rate, Broad money growth, and Annual Growth rate of Gross Domestic Product.

We found positive and negative relationships between the independent variables and the dependent variable. Both models indicate that some macroeconomic

variables have a statistically significant effect on the Arab stock markets indices, while others have not. Furthermore, Hausman Test showed the random effects model (REM) is more appropriate for our study. According to random effects model,the results show that Broad money growth has a statistically significant effect (positive) on Arab stock Indexes, while the other independent variables (Inflation rate, Unemployment rate, and Annual Growth rate of Gross Domestic Product) show no significant effect on Arab stock Indexes.

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