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THE EFFECT OF INTEREST RATE, INFLATION RATE, GDP, ON REAL ECONOMIC GROWTH RATE IN JORDAN

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ABSTRACT

The main objective of this study is to investigate the effect of interest rate, inflation rate, and GDP on real economic growth in Jordan over the period 2000-2010. Unit root test (Augmented Dickey-Fuller test) has been exploited to check the integration order of the variables. Acointegration analysis with four variables (economic growth, interest rate, GDP, and inflation level) is employed. Study adopted Johansen test. Findings indicated that both trace test and max eigenvalue static showed that the four equations have significant existent 1% or 5%. It means that all variables have long term equilibrium relationship. Study adopted the same four variables to discuss Granger Causality relationship; findings indicated that inflation causes interest rate. On the other hand all other variables are independent with each other. Regressionwas conducted to test growth rate with interest rate which showed that current interest rate has an influence power on growth rate. Also, regression used to test growth rate with inflation rate; it showed that inflation rate has influence power on growth rate. Finally regression used to test GDP, interest rate, and inflation rate together; results have shown that current GDP and one lag GDP have influence power to growth rate.

Keywords: Inflation, Economic Growth, Interest Rate, GDP

JEL Classification: E31, 040, E43, E01

INTRODUCTION

Economic growth of any country reflects its capacity to increase production of goods and services. The simplest definition of economic growth can be stated as the increase in the Gross Domestic Product (GDP) of that country. Nominal GDP is usually adjusted for inflation factor to reflect real GDP. Interest rate is one of the macroeconomic growth factors; it's up and down volatility is

closely related with inflation rates. Its high or low rates also impact the economic boom (high GDP) and extending to influence economic growth rate. In business fields, it is very important to accurately predict interest rate trends. Many previous studies have assumed that the time series data is stationary and they ignored that non stationary could exist in the variables. This study is a contribution to the existing literature on real growth applied to Jordan's economy; it will examine the effect of interest rate, inflation, and Real GDP on the real growth rate of Jordan's economic. Study is concerned to analyze:

- The relationship between Interest rate and inflation rate,
- The relationship between GDP and economic growth rate.
- The Effect of Interest rate, Inflation rate, and R. GDP, on Real Economic Growth Rate.

Research Problem

Measuring real economic growth of a country aims to assess whether growth can cope with the growing demands of the society including the population and prosperity growth rates; and how to maintain and confine the depletion rate of its national natural resources.

This study is designed to investigate the effect of the basic economic factors such as interest rate, inflation rate, and GDP on Jordan's real economic growth by answering the following questions:

1-Is the effect of inflation on real economic growth rate significant?

2- Is the effect of interest rate on real economic growth rate significant?

3-Is the effect of R.GDP on real economic growth rate significant?

LITERATURE REVIEW

Previous Studies

Estrella and Hardouvelis (1991). Tested data over the period 1955 to 1988, they found out that the spread between the yield on the ten year Treasury bond and the three-month Treasury bill is a useful predictor of both cumulative economic growth up to four years in the future and marginal economic growth rates up to seven quarters in the future. They also found that the spread contains information for future economic growth. Spread was not a very good predictor of economic activity over the period 1985 to 1995. Haubrich and Dombrovsky (1996): they tested for yield spread over the period 1961:1 to 1995:3, they found that the yield spread is a relatively accurate predictor of four-quarter economic growth; but this predictive content has changed over time. Berument (1999): Researcher indicated inflation rate influenced three month Treasury bill rate by using conditional variance of inflation rate to represent risk index. The results showed inflation rate had positive influence to three month Treasury bill rate. Sweidan (2004): Researcher aimed to check whether inflation and economic growth have a structural break point effect. He found that there is a positive structural effect at inflation rate of 2%, while at higher rates effect turned to be negative; so he

recommended that Central Bank of Jordan should pay attention to the inflation phenomenon while conducting new monetary policies. Engen and Hubbard (2004): Researchers have determined that an increase in federal government debt equivalent to one percent of GDP, all else equal, would be expected to increase the long-term real rate of interest by about three basis points. Giovanni and Shambaugh (2007): This paper explored the connection between interest rates in major industrial countries and annual real output growth in other countries. The results show that high foreign interest rates have a contractionary effect on annual real GDP growth in the domestic economy, but that this effect is centered on countries with fixed exchange rates. The paper then examines the potential channels through which major-country interest rates affect other economies. The effect of foreign interest rates on domestic interest rates is the most likely channel when compared with other possibilities, such as a trade effect. Tridico (2007): Researcher explained economic growth is a complex issue which needs positive interaction of several socio-economic and institutional factors. His analysis suggested that countries can grow with their own "style of capitalism" and economic model, and the determinants of economic growth seem to be the ability of each country to associate appropriate governance and institutions with education level, export activity and non-income dimensions of human development (life expectancy growth and infant mortality reduction). In fact, countries which experienced an increase in non-income dimensions of human development during 1970-2000 as a consequence of appropriate institutions, have sustained economic growth. (Hasanov, 2010): The study examined possibility of threshold effect of inflation on economic growth in Azerbaijani economy over the period of 2000-2009. Estimated threshold model indicated that there is a non-linear relationship between economic growth and inflation in the Azerbaijani economy and threshold level of inflation for GDP growth is 13 percent. Below threshold level inflation has statistically significant positive effect on GDP growth, but this positive relationship becomes negative one when inflation exceeds 13 percent. Nisha and Nishat (2011) found that economic activities can be created by flow of reserves to the most productive investments, as investors usually decide to invest in certain selected companies. Shahmoradi and Baghbanyan (2011) concentrated on the determining factors of foreign direct investment inflows in developing countries, study was conducted for the period 1990-2007. Obamuyi and Olorunfemi (2011) examined the implications of financial reform and interest rate behavior on the economic growth in Nigeria. Study results revealed that financial reform and interest rates have significant impact on economic growth in Nigeria; also, results implied that the interest rate behavior is important for economic growth.

Test Hypotheses

Ho-1: There is no significant effect of interest rate on economic growth.

Ho-2: There is no significant effect of inflation on economic growth.

Ho-3: There is no significant effect of GDP on economic growth.

METHODOLOGY

Data

Data was collected from Central Bank Files: Nominal Interest rates, Inflation rates,CPI(consumer price index) and GDP rates for the period 2000- 2010.

Tests

Researchers used unit root test to distinguish ifdata have stationary ACF or PACF figure diagnosis. It is too arbitrary to use figure diagnosis to judge variable's stationary. 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.

A. no intercept and no time trend items: $\Delta y_t = \delta y_{t-1} + \sum_{t=1}^{p} \alpha_t \Delta y_{t-1} + \varepsilon_t$

B. intercept and no time trend item: $\Delta y_t = \alpha + \delta y_{t-1} + \sum_{t=1}^{p} \alpha_t \Delta y_{t-1} + \varepsilon_t$

C. intercept and time trend item: $\Delta y_t = \alpha + \gamma t + \delta y_{t-1} + \sum_{t=1}^{p} \alpha_t \Delta y_{t-1} + \varepsilon_t$

The study used unit root process allowing for intercept and time trend to determine whether there is a unit root in the data series. Tochoose the lag length;study adopted Augmented Dickey and Fuller tests (ADF); the model is shown below:

$SBC(p) = N \log(SSR) + p \log N$, Whereas p is volume of parameter, N is sample size, and SSR is sum of square residual.

Co integration Test

The study adopted Johansen multivariate maximum likelihood method using this co integration process to test the variables with existed long term equilibrium relationship. First step used first difference in the vector autoregressive model, the formulasare shown below:

$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + ... + A_n Y_{t-n} + \varepsilon_t$, Whereas Y_t is lag length n $(p \times 1)$ vector endogenous

$\Delta Y_t = \sum_{j=1}^{n=1} \pi_j \Delta Y_{t-j} + \pi Y_{t-n} + \varepsilon_t$, whereas π_j is a short term adjusting coefficient to describe short-term relationship, π is long term shock vector that includes long term information hint in the regression to test those variables' whether existence long term equilibrium relationship or not. Meanwhile rank of π decides the number of co integrated vector. It has three kinds of styles:

a. $rank(\pi) = n$ then π is full rank. It means all of variables are stationary series in the regression (Y_t)

b. $rank(\pi) = 0$, then π is null rank. It means variables do not have co integrated relationship.

c. $0 < rank(\pi) = r < n$, then some of variables exist r co integrated vector. Johansen approach has used rank of π to distinguish the number of co integrated vector. To examine the vector rank that tests how many non-zero characteristic roots existed in the vector. It could use below two statistic processes co integration.

a. Trace test:

$$H_0 : rank(\pi) \le r(\text{at most r integrated vector})$$
$$H_1 : rank(\pi) > r(\text{at least r+1 integrated vector})$$

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1-\hat{\lambda}_i)$$

T is sample size, $\hat{\lambda}_i$ is estimated of characteristic root. If test rejects H_0 that means variables exist at least r+1 long term co integrated relationship.

b. Maximum cointegration value test:

$$H_0 : rank(\pi) \le r(\text{at most r integrated vector})$$
$$H_1 : rank(\pi) > r(\text{at least r+1 integrated vector})$$

$$\lambda_{\max}(r, r+1) = -T \ln(1-\hat{\lambda}_{r+1})$$

If test accept H_0 that means variables have r co integrated vector. The method is starting test from variables do not have any co integrative relationship which is r=0. Then test has added the number of co integrative item till can't reject H_0 that means variables have r co integrated vector.

Granger Causality Test

Many models assume different hypotheses to discuss variables' relationship; but they could not make sure variables' cause and effect relationship. However, Granger (1969). was the first person who defined lead and lag relations based on the role of predictability; He used twin factors of VAR to find variables' causal relationship. This test assumed two series X_t and Y_t that define those messages set.

$$X_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} X_{t-1} + \sum_{i=1}^{k} \alpha_{2i} Y_{t-1} + \varepsilon_{1t}$$

$$Y_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} X_{t-1} + \sum_{i=1}^{k} \beta_{2i} Y_{t-1} + \varepsilon_{2t}$$

To test four coefficients find out variables' relationship.

a. $\alpha_{2i} \neq 0 \; and \; \alpha_{1i} = 0$: It means Y lead X or X lag Y.

b. $\beta_{1i} \neq 0 \; and \; \beta_{2i} = 0$: It means X lead Y or Y lag X.

c. $\alpha_{2i} = 0 \; and \; \beta_{1i} = 0$: It means both of variables are independent.

d. $\alpha_{2i} \neq 0 \; and \; \beta_{1i} \neq 0$: It means both of variables are interactive each other and have feedback relationship.

Series Autocorrelation

Ljung and Box (1978): Researchers have brought up the Ljung-Box Q. test to examine if data series have autocorrelation or linear dependence existence. The test formula is:

$Q = T(t+2)\sum_{k=1}^{q} r_k^2 / (T-K) \sim \chi^2(q)$, Whereas T is sample size and q is time lag length. As model rejects H_0 that means series has correlative existence.

Generalized Autoregressive Conditional Heteroskedasti city (GARCH) Process

An econometric term developed in 1982 by Robert F. Engle, to describe an approach to estimate volatility in financial markets. There are several forms of GARCH modeling. The GARCH process provides a more real-world context to predict the prices and rates of financial instruments. The general process for a GARCH model involves three steps. The first is to estimate a best-fitting autoregressive model; secondly, compute autocorrelations of the error term and lastly, test for significance. Based on Engel (2005). and (Bollerslev, 1986): Researchershave suggested LM test to examine GARCH effect existence . The test hypothesis is:

$$H_0 : No \; ARCH \; effect \; existence$$

$$R_t = \alpha + \varepsilon_t$$

$$\varepsilon_t^2 = \beta_0 + \sum_{i=1}^{q} \beta_i \varepsilon_{t-i}^2 + e_t$$

Owning to above LM test indicates the statistic is $TR^2 \sim \chi^2(q)$. If $TR^2 > \chi^2(q)$ then model needs to reject H_0 that series regression have to consider ARCH effect existence. Whereas T is sample size and R^2 is regression's coefficient. That two times together is ARCH LM test's TR^2 statistic.

Generalized Autoregressive Conditional Heteroskedasti city (GARCH) Model

The conditional variance is influence past p period of residual error term and past q period of conditional variance.

$$GARCH(p,q)$$

$$R_t = aX_t + \varepsilon_t \ , \ \varepsilon_t \mid \Omega_{t-1} \sim N(0, h_t)$$

$$h_t = \beta_0 + \alpha_1 \varepsilon_{t-1}^2 + ... + \alpha_q \varepsilon_{t-q}^2 + \beta_1 h_{t-1} + ... + \beta_p h_{t-q}$$

$$= \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-q}^2 + \sum_{j=1}^{p} \beta_j h_{t-1}$$

Whereas R_t is variable X_t exogenous, Ω_{t-1} is all collected messages till t-1 period, aX_t is conditional mean that is the linear portfolio of exogenous and endogenous variables, and h_t is conditional variance that it influenced by past q period sum of squared error term and past p period of itself conditional heteroskedasticity.

TEST RESULTS AND ANALYSIS

Table-1. Compiled Data set

year	Nominal Interest (%)	Nominal GDP	Cpi*	Real GDP	Real Economic Growth (ΔGDP)%	Inflation (%)
2000	5.75	5154	0.84	6135.714	----	0.70
2001	3.88	5470	0.85	6435.294	4.8826	1.8
2002	2.88	5850	0.87	6724.138	4.4884	1.8
2003	2.12	6301	0.89	7079.775	5.2890	1.6
2004	2.805	7195	0.91	7906.593	11.6786	2.6
2005	4.629	7964	0.94	8472.34	7.1554	3.5
2006	6.495	9363	1.0	9363	10.5126	6.25
2007	5.147	10805	1.05	10290.48	9.9058	4.7
2008	4.645	13971	1.19	11740.34	14.0893	13.9
2009	2.645	15045	1.19	12642.86	7.6874	-0.7
2010	2.15	16417	1.25	13133.6	3.8816	----

***:Cpi: consumer price index,data was compiled as follows:**

- Real GDP was calculated by dividing nominal GDP by CPI index.
- Economic growth rate was calculated by using the mathematical formula:
- Real economic growth = [(real GDP_t – real GDP_{t-1})\real GDP_{t-1}] x100%

Analysis of Data

This study adopts data from Jordanian central bank and research period from 2000 to 2010. The main purpose in this study tries to find the effect of economic factors: realGDP, interest rate and inflation, on real growth rate. Table 2 is four variables' descriptive statistics .It finds growth rate and inflation are non-normal distribution, but GDP and interest rate are normally distributed because J-B ratio is significant. According to Kurtosis all variables appear leptokurtic phenomena.

Table-1. The Descriptive Statistics of Variables

	Growth	GDP	INF	INT
Mean	10.46771	8075.192	3.782500	6.311500
Median	8.675644	6181.158	3.150000	6.400000
Maximum	27.88530	19527.88	13.90000	12.08000
Minimum	2.999918	2958.000	-0.700000	-4.490000
Std. Dev.	6.849994	4862.384	3.212282	3.775792
Skewness	1.351753	1.211097	1.592657	-1.013095
Kurtosis	3.900093	3.255807	6.046742	4.420739
Jarque-Bera	6.765927	4.943715	16.19072	5.103286
Probability	0.033947	0.084428	0.000305	0.077953
Sum	209.3542	161503.8	75.65000	126.2300
Sum Sq. Dev.	891.5258	4.49E+08	196.0564	270.8755
Observations	20	20	20	20

Table 3below indicates that all variables do not reject unit root null hypothesis except inflation. This means that variables - other than inflation – in the level stage are of non-stationary existence. First difference I (1) in the Unit root test showed that all of variables achieved1% significant level. The lag length for growth rate is 0, GDP - 3, inflation - 0, interest rate - 1.

Table-2. Unit Root Test Based on Augmented Dickey-Fuller test and Lag Length Based on Schwartz Bayesian Information Criterion

	Level I(0)	First Difference I(1)	Lag Length
Growth Rate	-2.435994	-9.814166***	I(1)
	(0.14892)	(0.0000)	0
GDP	-0.058033	-3.665997**	I(1)
	(0.9388)	(0.0163)	3
Inflation Rate	-5.022752	-7.670441***	I(1)
	(0.0007)	(0.0000)	0
Interest Rate	-2.476788	-7.360783***	I(1)
	(0.1362)	(0.0000)	1

Table-4: co integration test is conducted to examine if variables have long term equilibrium relationship. This study adopted Johansentest, results are show in table 3. From the findings, it has been realized that no matter which is traced, Eigen value static showed four equations have significant existent at 1%,5%, and 10%. This means that all variables have long term equilibrium relationship.

Table-3. Panel A: Unrestricted Co integration Rank Test

Hypothesized Number of Co integrating Equations	Eigen value	Trace Statistic	5% Critical Value	1% Critical Value
None **	0.956544	87.85933	47.85613	0.0000
At most 1 **	0.588692	31.41123	29.79707	0.0323
At most 2 ***	0.392923	15.41979	15.49471	0.0513
At most 3 *	0.300616	6.436003	3.841466	0.0112

*(**) denotes rejection of the hypothesis at the 5 %, 10 %(1%) level

Table-3. Panel B:

Hypothesized Number of Co integrating Equations	Eigen value	Max-Eigen Statistic	5% Critical Value	1% Critical Value
None **	0.956544	56.44811	27.58434	0.0000
At most 1 **	0.588692	15.99143	21.13162	0.2253
At most 2 *	0.392923	8.983789	14.26460	0.2875
At most 3 *	0.300616	6.436003	3.841466	0.0112

*(**) denotes rejection of the hypothesis at the 5 %(1%) level

Table 5 below showed that study adopted Pair wise Granger Causality test to examine the causal relations between interest rate and inflation rate, GDP, and real growth rate. Study adopted four variables which are real growth rate, GDP, inflation and interest rate. Results indicated that inflation caused interest rate. Also findings indicated that GDP Granger caused interest rate, real growth rate, Granger caused inflation rate, and real growth rate and interest rate had feedback relationship that each one caused to the other, this was shown by the flow chart below. On the other hand all other variables were independent to each other; inflation with GDP, real growth rate with GDP, and interest rate with inflation rate, all are independent. Also, interest rate did not cause GDP and inflation rate did not cause real growth rate.

Table-4. Pair wise Granger Causality

Null Hypothesis	Obs	F-test	P-value
GDP does not Granger Cause G	18	0.18513	0.8332
G does not Granger Cause GDP		1.16672	0.3420
INF does not Granger Cause GDP	19	0.52893	0.6006
GDP does not Granger Cause INF		0.51359	0.6092
INT does not Granger Cause INF	19	2.13153	0.1556
INF does not Granger Cause INT		6.99442	0.0078
G does not Granger Cause INT	18	0.70384	0.5126

INT does not Granger Cause G		1.18132	0.3378
INT does not Granger Cause GDP	19	2.28287	0.1386
GDP does not Granger Cause INT		1.91029	0.1847

Following flow chart shows the lead-lag relationship

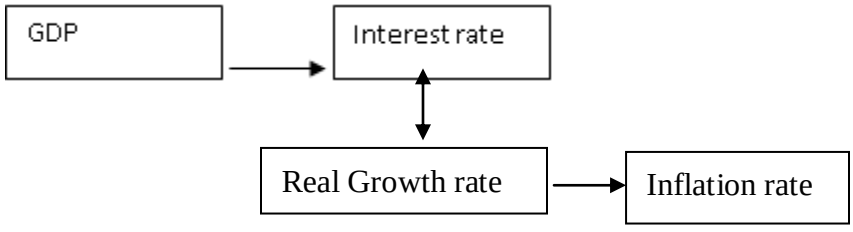

Figure-1. Flow Chart for Granger Causality relationship

Table 6: panel A showed: R square of GDP, interest rate, and inflation rate were 0.942, 0.492, and 0.386 consequently. From the regression test, growth rate with GDP relationship showed a current and one lag, GDP had influenced growth rate with coefficients 0.009662 and -0.01059, t-test results: 12.77989 and -8.53333. From the regression test, growth rate and interest rate showed that current interest rate had influence power on growth rate; coefficient and t-test were: -1.196347 and -3.575196. Also regression test, growth rate and inflation showed that inflation rate had influence power on growth rate; coefficient and t-test were 1.323841 and 3.359709. Finally GDP, interest rate, and inflation together to run regression test showed that current GDP and one lag GDP have influence power to growth rate.

After running regression study process, it needs to examine Ljung-Box and ARCH effect to check whether regression exists autocorrelation or heteroskedasticity phenomena. Panel B showed that there were no regressions' LB2 (12) existed in significance; this means that regressions did not reflect an autocorrelation situation. However, interest rate had ARCH effect existence, which means regression needed to adjust autoregressive conditional heteroskedasticity. After regressions runs test: GARCH (1, 1) indicated one lag of interest rate had influence power on growth rate. LB2 (12) and ARCH found that all regressions had no significant p value existence; this means that all regressions had adjusted and coefficients were more accurate to reflect real situation.

Table-5: Panel A; The regression of growth rate (G) with GDP, (INT), and (INF)

Model		Intercept	GDP	GDP(-1)	GDP(-2)	GDP(-3)	INT	INT(-1)	INF	R^2		$LB^2(12)$		ARCH Effect
1	coefficient	7.806856	**0.009662**	**-0.01059**	-0.000411	0.000595				0.942	Q-Stat	14.438	F	3.640227
	t-test	4.886300	**12.77989**	**-8.53333**	-0.52726	0.463934								
	p-value	0.0003	**0.0000**	**0.0000**	0.7299	0.6504					p-v	0.274	p-v	0.0757
2	coefficient	18.90111					**-1.196347**	-0.151606		0.492	Q-Stat	6.6657	F	3.611713
	t-test	7.739327					**-3.575196**	-0.555217						
	p-value	0.0000					**0.0023**	0.5860			p-v	0.879	p-v	0.0493
3	coefficient	5.460280							**1.323841**	0.386	Q-Stat	7.3144	F	0.049263
	t-test	2.822155							**3.359709**					
	p-value	0.0113							**0.0035**		p-v	0.836	p-v	0.8270
4	coefficient	17.03809	0.010705	-0.01333	0.002913	-0.001459	-0.406868	-0.253898	**-0.844946**	0.964	Q-Stat	9.7422	F	0.046229
	t-test	**3.911683**	**7.469712**	**-6.55970**	1.432997	-0.982471	-1.382489	-1.023393	**-2.011783**					
	p-value	**0.0029**	**0.0000**	**0.0001**	0.1824	0.3490	0.1969	0.3302	0.0720		p-v	0.639	p-v	0.8327

Table-5: Panel B; after using GARCH (1, 1) to run the regression of growth rate (G) with gross domestic product GDP, interest rate (INT), and inflation rate (INF).

Model		Intercept	GDP	GDP(-1)	GDP(-2)	GDP(-3)	INT	INT(-1)	INF		$LB^2(12)$		ARCH Effect
1	Coefficient	7.804622	**0.009651**	**-0.010644**	-0.000397	0.000677				Q-Stat	17.846	F	1.627264
	z-test	11.24271	**19.74272**	**-15.82214**	-0.335409	0.826660							
	p-value	0.0000	**0.0000**	**0.0000**	0.7373	0.4084				p-v	0.120	p-v	0.2215
2	Coefficient	21.22205					**-1.376430**	**-0.344094**		Q-Stat	6.2102	F	0.207831
	z-test	17.77066					**-9.448606**	**-2.101332**					
	p-value	0.0000					**0.0000**	**0.0356**		p-v	0.905	p-v	0.6542
3	Coefficient	3.775927							**1.700234**	Q-Stat	9.6093	F	
	z-test	2.663320							**4.010238**				
	p-value	0.0077							**0.0001**	p-v	0.650	p-v	
4	Coefficient	**16.98374**	**0.010760**	**-0.013406**	0.003130	-0.001692	**-0.363914**	-0.257344	**-0.845643**	Q-Stat	4.3659	F	2.869440
	z-test	**8.847608**	**5.816192**	**-8.804889**	1.080071	-1.137420	**-4.110501**	-0.939796	**-2.504817**				
	p-value	**0.0000**	**0.0000**	**0.0000**	0.2801	0.2554	**0.0000**	0.3473	**0.0123**	p-v	0.976	p-v	0.1109

The summary of this part uses regression to discuss the relation between: growth rate and GDP, interest rate and inflation. Findings indicated that: current GDP, one lag of GDP, current interest rate, one lag interest rate, and current inflation could have influence power on interest rate. All regressions of GARCH runs model showed that variables were of no volatility or spillover effect existence in the regressions.

FINDINGS

The main purpose in this study tries to find out the effect of real GDP, interest rate, and inflation on real economic growth in Jordan. Study had adopted a set of econometric tools such as: Unit root, Cointegration test, Granger Causality, ARCH effect, Ljung-Box Q statistic, and GARCH model. In order to obtain accurate results, researchers had to analyze the relationship between econometric factors which are: interest rate, inflation rate, GDP, and real growth rate. From unit root method, the study adopted ADF unit root to test the results that all of variables were belonging to I (1) structure and lag length in interest rate was 0, inflation rate was 3, GDP was 1, and real growth rate was 0.

Co integration tests: the study adopted cointegration test to examine whether the five variables had long term equilibrium relationship. The findings indicated that all the variables in this test had significant existence in co integrated vector. This means that all the variables had long term equilibrium existence. Granger Causality examined the causal relations between interest rate and inflation rate, GDP, and real growth rate. The findings indicated that GDP was affected by interest rate and real growth rate was affected by inflation rate. Meanwhile interest rate and real growth rate had feedback relation existence. However, this study proved that interest rate and real growth rate have interdependent lead and lag relationship. Regressionshadtested variables' relations and had indicated one and two lags of inflation rates which influenced current interest rate and one lag of GDP had influenced power to current interest rate.

According to all the regressions which included ARCH effect and variables did not have the volatility or spillover risk existence after test GARCH (1, 1). However testing the regressions indicated that interest rate and inflation rate had some kind of relations. Granger Causality had adopted Granger Causality to examine the causal relations between interest rate and inflation rate, GDP, and real growth rate. The findings indicated that GDP did cause interest rate and real growth rate did cause inflation rate. Meanwhile interest rate and real growth rate had feedback relation existence. The results seem like Mundell theory that: interest rate did not have the same pace with inflation rate.

One thing was proved by this study that interest rate with real growth rate have lead and lag relationship with each other. From the regressions of testing those variables; relations indicated one and two lag of inflation rate had influenced the current interest rate and one lag of GDP also had certainly influenced the power of current interest rate. All regressions had shown ARCH effect existence while some variables did not show the volatility or spillover risk existence after test GARCH (1, 1). However some regression tests indicated that interest rate and inflation rate had

some kinds of relations; one or two lag of inflation rates had shown significant power to explain interest rate.

CONCLUSIONS

Many macroeconomic theories tried to find the interrelationship between interest rate, GDP, inflation, and real economic growth. Fisher (1930) suggested that expected interest rates change in proportion to the changing expected inflation, or expected real interest rates are invariant to the expected inflation rates. Mundell (1963) concluded that: nominal interest rate and expected inflation rate do not have one to one adjustable relationships. This study, investigated the effect of interest rate, inflation, and GDP on Jordan's economic growth over the period of 2000-2010.It is well known that regional economy is not yet out of the woods and since the global recovery from last recession seems to have encountered further delays; economic growth outlook for Jordan is increasingly challenging. Although adverse external environment continues to add to domestic uncertainties associated with the regional socio-political unrests, have thus weighing on Jordan's aggregate demand and economic growth. Although Jordan's economy has achieved strong growth in recent years after a number of key reforms were introduced by the government; yet, the kingdom's economy still faces a major threat from soaring inflation; the kingdom's economic growth is being offset by rising inflation which has hit all-time highs Group Research Dept. (2012). However, This study advocated the results of some previous researches that showed a positive effect of real interest rate on both national income and on (GDP) Bader and Malawi (2010).

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