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Does Finance – Led Growth Hypothesis Hold in Jordanian Economy? An Empirical Analysis

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ABSTRACT

The current study investigates whether Finance–Led Growth Hypothesis Holds in Jordanian Economy for the period of 1992Q1–2016Q4, by implying autoregressive distributed lag (ARDL) bound test. The current study used four financial development (FD) indicators namely: Economics volatility variable (EV) measured by the ratio of bank credit to the private sector to nominal gross domestic product (NGDP), monetization variable (BMV) measured by the ratio of broad money supply to NGDP, board money velocity variable (MSD), measured by the ratio of deposit demand to narrow money supply, and finally, stock market development (MC) measured as the ratio of market capitalization value to NGDP. These indicators were used to capture the effect of FD on economic growth (EG). Empirical results revealed that FD indicators have a positive and statistically significant impact on EG in Jordan, which in confirms the existence of finance –led growth hypothesis in the Jordanian economy.

Keywords: Financial Development, Economic Growth, Autoregressive Distributed Lag Bound Test Approach, Jordan
JEL Classifications: E44, F43

1. INTRODUCTION

In the history of development economics, the relationship between financial development (FD) and economic growth (EG) has been widely addressed since the influential work of Schumpeter work (1911). Who indicated the positive role of FD on EG. Although (King et al., 1993) there is a growing body of literature that recognizes the theoretical relationship between FD and EG, there is an inconsistency among these evidences. Some studies have shown that financial sector development spur EG such as Shaw (1973), McKinnon (1973), Karlsson and Mansson (2015), Waqas et al. (2014). While others revealed that EG stimulate financial sector development as Robinson (1952), Ali et al. (2015), Ndlovu,(2013). On the other hand, some studies shown a bidirectional effect between FD and EG, like Luintel and Khan (1999) Kyophilavong et al. (2014), Lawal et al. (2016). In the early 1990s, Jordan had taken several actions to liberalize the financial system as a response to economic adjustment programs represented by deregulated interest rate, encouraging banking mergers and minimizing restrictions on foreign exchange transactions, despite that the FD and EG literature in Jordan has shown divergent results regarding the causality between FD and EG. Thus, it is profoundly imperative for policy makers to prioritize the various policy reforms to enhance the EG based on the premise that FD influences the EG. Therefore, the aim of the current study is to answer the following question:

1.1. Does the Finance – Led Growth Hypothesis Holds in a Jordanian Economy?

More specifically, to answer the study main question, several objectives have to be achieved, these are:

1. Determining the impact of economics volatility variable (EV) on EG in Jordan.
2. Determining the impact of monetization variable (BMV) on EG in Jordan.
3. Determining the impact of market stock development (MC) on EG in Jordan.
4. Determining the impact of board money velocity variable (MSD) on EG in Jordan.

The present study is structured as follows: Section (2) provides the theoretical framework and empirical literature, section (3) demonstrate the FD and EG nexus literature. Data source and variables definition will be discussed in section (4). Section (5) is dedicated to outline the model specification and empirical

investigation. Finally, section (6) highlights and discusses the current study findings and conclusions.

2. THEORETICAL FRAMEWORK AND EMPIRICAL LITERATURE

The nexus between FD and economics growth has been extensively investigated weather on theoretical level or empirical level, despite that a divergent view has been emerged. Generally, the theoretical relationship between FD and economics growth can be classified as follows:

- Finance - led growth hypothesis (or supply leading hypothesis),
- Growth - led finance hypothesis (or demand following hypothesis),
- Reciprocal hypothesis(or bi-directional causality hypothesis), and
- Finance - growth indifference hypothesis (or independence hypothesis)

2.1. Finance – Led EG

According to this hypothesis the FD leads to the EG. since financial intermediaries transferring excess fund from surplus unit traditionally low growth sector (Lawal et al., 2016) to deficit unit the productive sector, offering an attractive innovative instrument to encourage saving mobilizing and reduces risk management (Coong and Chan, 2011), the finance- led economic hypothesis has been advance by prominent economics growth model (Carby and Craigwell, 2012) such as classical EG model for example Horrod - Domar growth model, Schumpeter's work (1911), and neo- classical EG model like Solow's growth model.

2.2. Growth – Led Finance Hypothesis

The core of this hypothesis is that FD is an outcome of growth economic, which means that any creation of a new financial institutions is a response to the demand for these institution by savers and investors in real side of the economy (Lawal et al., 2016) in other word any grow in real sector will increased the demand for financial services leading to its growth (Darrat, 2015). This hypothesis has been supported by well- known pioneers like Robinson (1952), Patrick (1966), Shaw and Gurley (1967), Stigliz (1994).

2.3. Reciprocal Hypothesis

The reciprocal hypothesis indicated the existence of co-integration between EG and FD, which means that the EG and FD causes each other, this mutual causality between growth economic and FD can be explained as follows the well functional financial system can stimulate EG by presenting anew innovative product and services, which increases the demand for this new financial instrument by real sector, and the response of financial sector to these demand will lead to its growth. Marashdeh and Al-Malkawi (2014) this hypothesis gained supported by Odedokun, 1996; Luintel and Khan (1999), Biackburn et al. (2005), Kyophilavong et al. (2014), Lawal et al. (2016).

2.4. Finance – Growth Indifference Hypothesis

The finance - growth indifference hypothesis states that there is no causality between FD and EG, which means that the FD and EG are independent variables, (Onwumere, 2012; Darrat, 2015). Lucas (1988) rejects the existence of the finance - growth hypothesis, when he says "economists badly overstress the role of finance in EG" explanation of this hypothesis is very simply the growth in real sector will leads to EG and historical financial institution will lead to FD (Lawal et al., 2016), this hypothesis gained support by Seers and Meier (1984), Stern (1989), Adeyey et al. (2015), Acaravci et al. (2009).

3. FD AND EG NEXUS LITERATURE

3.1. Evidences from Developed and Developing Countries Except Jordan

Adeyey et al. (2015) examines the causality between FD and EG in Nigeria economy, using the Granger pairwise causality test, he reports a strong evidence of a bi-directional causality between FD and EG in Nigeria economy which supporting the reciprocal hypothesis. Ali et al. (2015) applied autoregressive distributed lag (ARDL) bound test to investigate the relationship between FD and economics growth in South Africa economy, the study reveals the existence of supply - leading hypothesis. The Karlsson and Mansson (2015) tested in their study the relationship between FD and economics growth by applying wavelet analysis on the data of 10 Asian economies, the outcome of their study indicated the finance – led EG hypothesis. Also, Ali et al. (2014) using the ARDL model to investigate whether EG effect financial sector development in South Africa for the period of 2005–2014, the study reveals that the EG enhance financial sector development through stock market development, confirmed the demand following hypothesis. Wagas et al. (2014) analysis the relationship between FD and EG in Pakistan, for the period 1972–2011, by applying the Granger causality test, the study's finding supports the supply leading hypothesis.

While the Kyophilavong et al. (2014), examined the two hypotheses, the demand following hypothesis and supply leading hypothesis by implying using ARDL model, using data from Laos economy, the results confirmed the reciprocal hypothesis for Laos economy. Relationship between FD and economics growth in Zimbabwe economy for the period (1980–2006) has been examined by Ndlovu (2013), using multivariate Granger causality test, the study reveals the existence of the demand following hypothesis in Zimbabwe economy. Carby and Craigwell (2012) tested the Patrick' hypothesis for Barbados economy over the period 1946–2011, the study showed that the EG causes FD in short- run while the causality between them become bi-directional causality in long-run. FD and economics growth relationship in UK economy was investigated by Vazakidis and Adamopoulos (2011) by using error correction model (ECM) model, the study reveal that the FD spur the EG in UK economy.

Jenkins and Katircioglu (2010) examines the relationship between FD as measured by broad money supply and domestic credit by banking sector and EG in Cyprus, over the period 1975–2005, using ARDL model, the results of the study confirmed the demand following hypothesis. While Acaravci et al. (2009) examines the causality between FD and economics growth in sub Saharan Africa from 1975 to 2005, using panel co-integration and panel GMM

estimation for causality, the empirical results show a bi- directional causality between FD and EG, since the African countries can accelerate their EG by improving their financial systems and vice versa, this conclusion affirmed the reciprocal hypothesis for Sub –Saharan African countries.

Odhiambo (2008) studied the FD and economics growth in Kenya using a dynamic granger causality model, the empirical results of his study confirmed the finance -led growth hypothesis. Darrat (2015), investigates the nexus between FD and EG in three middle eastern countries (Saudi Arabia, Turkey and United Emirate), by applying a multivariate Granger causality test, the results of his study affirmed the supply - leading hypothesis which indicated that financial deepening stimulated EG.

3.2. Evidences from Jordanian Economy

Alrabadi and Kharabsheh (2016) studied the dynamic relationship between financial deepening and EG in Jordan over the period 1992–2014, a VAR model was applied by using quarterly data, the study results showed that there is no statistically significant short term effect of financial deepening on EG in Jordan, however the results indicated the long run causality between the financial deepening and EG in Jordan. Bashier (2015) investigates the impact of FD on EG in Jordan economy, implying ARDL bounds testing approach by using annual data covering the period from 1976 to 2013, the results of ARDL model showed that the study variables are co-integration and there is a long run equilibrium relationship among variables, also the study reveals that the causal direction runs from FD to EG, which confirmed the finance –led growth hypothesis.

Mugableh (2015), investigates the dynamic causality relationship among economic development and FD in Jordanian economy over the 1976–2011 period using ARDL approach, the results of this study indicate that the FD stimulate EG in Jordan which supported finance –led growth hypothesis. Also Abual et al. (2014), examined the relation between FD and EG in Jordan for the period 1965–2004, using Toda Yamamoto granger – no - causality model, the study reveals that there is a uni-directional granger causality from EG to FD which affirmed the growth –led –finance hypothesis. Al-Khatib and Al-Saffar (2013) investigated the linkage between FD and EG in Jordan using annual data for the period 2001–2012, the study results confirmed finance - led growth hypothesis.

Al-Jarrah et al. (2012), tested the impact of FD on EG in Jordan over the period 1992–2011, the notable finding in this study is that despite the noticeable growth in FD indicators namely the percent of credit to private sector as a percent of gross domestic product, the parallel progress in EG is relatively mush lesser, this conclusion support the finance - growth indifference hypothesis. Finally Mishal and Mashal (2012) examined the causal relationship between FD and EG for Jordanian economy over the last three decades, the study results indicated the finance – led growth hypothesis.

4. DATA SOURCE AND VARIABLES DEFINITION

The current study will use the real gross domestic product (RGDP) as proxy for EG, while four indicators will be used as proxies of FD which were widely used in the literature, namely: Economics volatility variable (EV) measured by the ratio of bank credit to the private sector to nominal gross domestic product (NGDP), and BMV measured by the ratio of broad money supply to NGDP, board money velocity variable (MSD), measured by the ratio of deposit demand to narrow money supply, and stock market development (MC) measured as the ratio of market capitalization value to NGDP. In order to achieve the purpose of the current study, quarterly data for all study variables for the period from 1992Q1 to 2016Q4 were used, and it have been extracted from the Central Bank of Jordan publications. The study has taken log of all proposed variables to remove the problem of heteroscedasticity, and to obtain the growth rate for them. Based on economic theory, and on findings of applied study's like, Schumpeter (1911), Shaw,(1955), Goldsmith (1969), Mckinnon (1973), Al-Zoubi et al. (2013) the present study hypothesized that all the FD indicators as independent variables willexert positive and significant impact, on EG as dependent variable.

5. MODEL SPECIFICATION

In order to capture the potential impact of FD on EG, the current study adopts the endogenous growth model: The AK model where aggregate output is a function of aggregate capital stock (Diaz, 2013), therefore the impact of FD on EG, can be explained as following

$$Y_t = AK_t \quad (1)$$

Where: Y_t,A, and K_t are output at time t, total factor productivity and capital stock respectively can be expressed as the previous period amount of capital K_{t-1} plus gross investment (It), and by assuming that the capital is depreciating at rate the gross investment will be

$$I_t = K_{t+1}-(1-\delta)K_t \quad (2)$$

The necessary condition for capital market equilibrium required that saving investment must be equal, so saving and investment relationship can be expressed as:

$$\partial S_t = I_t$$

Where ∂ is a fraction of total saving which can be used to finance investment. From equation (1) the growth rate at time t+1 is

$$g_{t+1} = Y_{t+1}/Y_{t-1} = K_{t+1}/K_{t-1} \quad (3)$$

Now we can write the steady state growth of output as

$$g_y = AI/Y-\& = A\partial S-\& \quad (4)$$

If gross saving rate denotes as (s) or S_t/Y_t, and by using equation (1) the

$$s = S_t/Y_t = S_t/AK_t$$

Therefore, and depending on the above the output (Y_t) can be written as follows:

$$Y_t = \beta_0 + \frac{\beta_1 S_t}{Y_{it}} + \varepsilon \quad (5)$$

Where Y_t is a log of real GDP, as a proxy of EG and S_t/Y_{it} is log of saving to nominal GDP the proxies of financial deepening, β_0 is intercept, β_1 is the coefficient that represented the impact of financial deepening on EG, and ϵ is error term. In order to achieve the purpose of the current study, the equation (5) will be rewritten as follows after adding the government expenditure as a control variable, so the relationship between EG and FD can be modeled as follows:

$$RGDP_t = \beta_0 + \beta_1 FD_t + \beta_2 X_t + \epsilon_t \quad (6)$$

Where EG is proxy by RGDP, X_t is government expenditure, and FD in equation (6) represents each alternative indicators of FD namely: Economics volatility variable (EV), BVM, board money velocity variable (MSD), and stock market development (MC). As follows:

Economic volatility (EV) and EG (RGDP)

$$RGDP_t = \gamma_0 + \gamma_i EV_{it} + \gamma_2 Xit + \epsilon_t \quad (6\text{-}1)$$

BVM and EG (RGDP)

$$RGDP_t = \omega_0 + \omega_i BVM_{it} + \omega_2 Xit + \epsilon \quad (6\text{-}2)$$

Board money velocity (MSD), and EG (RGDP)

$$RGDP_t = \pi + \pi_i MSD_{it} + \pi_2 Xit + \epsilon_t \quad (6\text{-}3)$$

Stock market development (MC), and EG (RGDP)

$$RGDP_t = \propto_0 + \propto_i MC_{it} + \propto_2 Xit + \epsilon_t \quad (6\text{-}4)$$

6. EMPIRICAL INVESTIGATION

6.1. Unit Root Test

Before executing the ARDL bounds test and to ensure that the study variables are not second - order -integration, since the F-statistics which Pesaran et al. provide are not valid in the presence of I(2), we need to specify the order of integration of the study variables, so the Augment Dickey fuller (ADF) and Phillips-Perron unit root tests were used in the current study Al-Majali and Alrfua (2017), Alamro (2017) and the results are reported in Tables 1 and 2, the outcomes reveal that the all the study variables are either I(1) or have mutually co-integration of I(0) and I(1), so we can employ the ARDL bounds test in the current study.

6.2. ARDL Bounds Testing to Co–integration

Having concluded from the above unit root tests that the ARDL model bounds testing approach is a proper method to be employed in the present study, since it has a several advantage over other estimation techniques such as Engle and Granger (1987), Johansen (1991), and it is applied regardless of the order co-integration of the variables Adayleh and Radi (2015), and allows for the variables to have different optimal lags (Lawal et al., 2016). So to investigate the existence of long run relationship among the EG (the dependent variable) in Jordan represented by RGDP, and the FD indicators (the independent variables) namely: EV, BVM, board money velocity (MSD), and stock market development (MC), the ARDL bounds testing to co-integration approach was implied, and the results are shown in Table 3. The results reveal that the calculated F's -statistics for FD indicators, (BMV, MSD, EVMC) is (22.78780, 13.06185, 4.993081, 5.320134) respectively, which are exceed the upper critical bound at 1% and 5%, therefore the null hypotheses as listed hereunder are rejected:

$H_0: \propto_1 = \propto_2 = \propto_3 = 0,$
$H_0: \pi_1 = \pi_2 = \pi_3 = 0$
$H_0: \gamma_1 = \gamma_2 = \gamma_3 = 0$
$H_0: \omega_1 = \omega_2 = \omega_3 = 0$

Against the alternative hypotheses:

$H_0: \propto_1 \neq \propto_2 \neq \propto_3 \neq 0$
$H_0: \pi_1 \neq \pi_2 \neq \pi_3 \neq 0$
$H_0: \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq 0$
$H_0: \omega_1 \neq \omega_2 \neq \omega_3 \neq 0$

Which indicated the presence of co-integration between FD indicators, and EG in Jordanian economy, and thus confirmed the existence of long run relationship among FD indicators (independent variable), and EG (the dependent variable) in Jordan.

As the long - run relationship among study variables has been established, then we proceed to estimate the equations ([6-1], [6-2], [6-3], [6-4]) in order to obtain the long run coefficients, surely this will be after remodeled these equations as ARDL as follows:

$$\begin{aligned}\Delta LNRGDPt = {} & \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LNRGDP_{t-1} + \sum_{j=0}^{p} \alpha_{2i} \Delta LNFD_{t-i} \\ & + \sum_{j=0}^{p} \alpha_{3i} \Delta LNGOV_{t-j} + \delta_1 LNRGDP_{t-1} \\ & + \delta_2 \ LNFD_{t-1} + \delta_3 LNGOV + \varepsilon_t\end{aligned} \quad (7)$$

$$\begin{aligned}\Delta LNRGDPt = {} & \omega_0 + \sum_{i=1}^{n} \omega_{1i} \Delta RGDP_{t-1} + \sum_{j=0}^{p} \omega_{2i} \Delta LNBMV_{t-i} \\ & + \sum_{j=0}^{p} \omega_{3i} \Delta LNGOV_{t-j} + \theta_1 LNRGDP_{t-1} \\ & + \theta_2 LNLNBVM_{t-1} + \theta_3 GOV + \varepsilon_t\end{aligned} \quad (7\text{-}1)$$

$$\begin{aligned}\Delta LNRGDPt = {} & \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta LNRGDP_{t-1} + \sum_{j=0}^{p} \gamma_{2i} \Delta LNEV_{t-i} \\ & + \sum_{j=0}^{p} \gamma_{3i} \Delta LNGOV_{t-j} + \beta_1 LNRGDP_{t-1} \\ & + \beta_2 LNEV_{t-1} + \delta\beta_3 LNGOV + \varepsilon_t\end{aligned} \quad (7\text{-}2)$$

Table 1: The ADF unit root test for stationarity of study variables

Variables	ADF test					
	ADF level			ADF first difference		
	Const	Const, linear trend	Decision inference	Const	Const, linear trend	Decision inference
ln RGDP	−0.712204 (0.8379)	−3.960647 (0.0136) ***	I (0)	−4.133081*** (0.0014)	−4.161966*** (0.0073)	I (1)
LnBMV	−2.240924 (0.1935)	−2.233241 (0.4657)	N.S	−4.347772 (0.0008) ***	−4.323556 (0.0045) ***	I (1)
LnEV	−3.242054 (0.0206) **	−3.422182 (0.0545)	I (0)	−3.243651 ** (0.0205)	−3.163058 * (0.0983)	I (1)
LnMSD	−0.860369 (0.7967)	−1.952645 (0.6191)	N.S	−5.542796 (0.0000)***	−5.513223*** (0.0001)	I (1)
LnMC	−1.720924 (0.4175)	−1.665738 (0.7588)	N.S	−3.094060** (0.0303)	−3.079365 (0.1173)	I (1)

***, **, *Imply significant at 1%, 5%, 10%, respectively. Source: Author's calculation using E-view 9 package ADF: Augment Dickey fuller

Table 2: The PP unit root test for stationarity of study variables

Variables	PP test					
	PP at level			PP at first difference		
	Const	Const linear trend	Decision inference	Const	Const, linear trend	Decision inference
Ln RGDP	−1.103445 (0.7121)	−6.438184 (0.0000)***	I (0)	−16.37171 (0.0001)***	−16.31010 (0.0000)***	I (1)
LnBMV	−6.406111 (0.0000)***	−6.406168 (0.0000)***	I (0)	−15.86166 (0.0001)***	−15.83592 (0.0000)***	I (1)
LnEV	−4.269925 (0.0009)***	−4.077826 (0.0093)***	I (0)	−14.05082 (0.0001)***	−15.93612 (0.0000)***	I (1)
LnMSD	−2.760298 (00678)*	−4.598379*** (0.0018)	I (0)	19.16304*** (0.0001)	23.45056*** (0.0001)	I (1)
Ln MC	−1.167095 (0.6862)	−0.880822 (0.9534)	N.S	−8.299217 (0.0000)***	−8.398755 (0.0000)***	I (1)

***, **, *Imply significant at 1%, 5%, 10%, respectively. Source: Author's calculation using E-view 9 package, PP: Phillips-Perron

$$\Delta LNRGDPt=\pi_0+\sum_{i=1}^{n}\pi_{1i}\Delta LNRGDP_{t-1}+\sum_{j=0}^{p}\pi_{2i}\Delta LNMSD_{t-i}+\sum_{j=0}^{p}\pi_{3i}\Delta LNGOV_{t-j}+\varnothing_1 LNRGDP_{t-1}+\varnothing_2 LNMSD_{t-1}+\delta\varnothing_3 LNGOV+\varepsilon_t \quad (7\text{-}3)$$

$$\Delta LNRGDPt=\mu_0+\sum_{i=1}^{n}\propto_{1i}\Delta LNRGDP_{t-1}+\sum_{j=0}^{p}\propto_{2i}\Delta LNMC_{t-i}+\sum_{j=0}^{p}\propto_{3i}\Delta LNGOV_{t-j}+\forall_1 LNRGDP_{t-1}+\forall_2 LNMC_{t-1}+\forall_3 LNGOV+\varepsilon_t \quad (7\text{-}4)$$

Where: ln is the log of the study variables as previously defined,indicates the first difference operator and, ω_0, γ_0, π_0, α_0 are the constant terms, α_{1i}, π_{1i}, γ_{1i}, ω_{1i}, are the short run coefficients, and θ_1, β_1, $\varnothing_1$, $\forall_1$ are the long run coefficients. Equations ([7-1], [7-2], [7-3], [7-4]) were estimated after the optimal lag-length for ARDL model's selected by the Schwarz Bayesian criterion and Akaike information criteria and the results are reported in Table 4.

The results mentioned in Table 4 indicated that when EG as proxy by RGDP is dependent variable, the FD indicators in specific (board money velocity variable [MSD], and stock market development [MC]) EV variable, BMV, have positive and significant impact on EG in Jordan at 1% as hypothesized by current study. A (1%)

Table 3: The ARDL bound test estimated results (null hypothesis: No long - run relationship exist)

Model to be estimated	F-statistics	Significance (%)	Decision inference
$F_{RGDP\ (BMV,\ GOV)}$	22.7878	1	Co-integration
$F_{RGDP\ (MSD,\ GOV)}$	13.0619	1	Co-integration
$F_{RGDP\ (EV,\ GOV)}$	4.99308	5	Co-integration
$F_{RGDP\ (MC,\ GOV)}$	5.320134	5	Co-integration

Critical value bounds: (1% (I (0) 5.15, I (1) 6.36)), (5% (I (0) 3.79, I (1) 4.85)), (10% (I (0) 3.17, I (1) 4.14)). Source: E-views 9 package output, ARDL: Autoregressive distributed lag

Table 4: The long –run relationships analysis results: Where the EG is the dependent variable

Model estimated	Coefficient	Standard error	t-statistic	P
Model F_{RGDP} (LNMSD, LNGOV)				
LNMSD	1.490946	0.130525	11.422697	0.0000
LNGOV	−0.390086	0.115392	−3.380527	0.0011
C	11.236620	0.926984	12.121702	0.0000
Model F_{RGDP} (LNMC, LNGOV)				
LNMC	3.186933	0.874299	3.645131	0.0005
LNGOV	0.046141	0.030847	1.495795	0.1384
C	7.887252	1.040373	7.581179	0.0000
Model F_{RGDP} (LNEV, LNGOV)				
LNEV	4.121406	1.759738	2.342056	0.0216
LNGOV	1.608756	0.917648	1.753129	0.0834
C	−7.888790	7.939462	−0.993618	0.3234
Model F_{RGDP} (LNBMV, LNGOV)				
LNBMV	9.377811	4.246817	2.208198	0.0300
LNGOV	1.232259	0.723809	1.702463	0.0925
C	−15.451890	9.608799	−1.608098	0.1117

Source: E-views 9 package output

increase in one of FD indicators board money velocity variable (MSD), stock market development (MC), EV variable and BMV, will lead to an increase in EG as proxy by RGDP by (1.490946, 3.186933, 4.121406, 9.377811) respectively.

6.3. The ECM

While the existence of co-integration among the study variables is confirmed, then the ECM's can be estimated Al-Majali and Al-Assaf (2014), thus the representation of the ECM's associated with long-run estimate for present study are as follows:

$$\Delta LNRGDPt=\alpha_0+\sum_{i=1}^{n}\alpha_{1i}\Delta LNRGDP_{t-1}+\sum_{j=0}^{p}\alpha_{2i}\Delta LNFD_{t-i}+\sum_{j=0}^{p}\alpha_{3i}\Delta LNGOV_{t-j}+Z1ECT_{t-1} \quad (7\text{-}5)$$

$$\Delta LNRGDPt=\omega_0+\sum_{i=1}^{n}\omega_{1i}\Delta RGDP_{t-1}+\sum_{j=0}^{p}\omega_{2i}\Delta LNBMV_{t-i}+\sum_{j=0}^{p}\gamma\omega_{3i}\Delta LNGOV_{t-j}+Z2ECT_{t-1} \quad (7\text{-}6)$$

$$\Delta LNRGDPt=\gamma_0+\sum_{i=1}^{n}\gamma_{1i}\Delta LNRGDP_{t-1}+\sum_{j=0}^{p}\gamma_{2i}\Delta LNEV_{t-i}+\sum_{j=0}^{p}\gamma_{3i}\Delta LNGOV_{t-j}+Z3ECT_{t-1} \quad (7\text{-}7)$$

$$\Delta LNRGDPt=\pi_0+\sum_{i=1}^{n}\pi_{1i}\Delta LNRGDP_{t-1}+\sum_{j=0}^{p}\pi_{2i}\Delta LNMSD_{t-i}+\sum_{j=0}^{p}\pi_{3i}\Delta LNGOV_{t-j}+Z4ECT_{t-1} \quad (7\text{-}8)$$

$$\Delta LNRGDPt=\infty_0+\sum_{i=1}^{n}\infty_{1i}\Delta LNRGDP_{t-1}+\sum_{j=0}^{p}\infty_{2i}\Delta LNMC_{t-i}+\sum_{j=0}^{p}\infty_{3i}\Delta LNGOV_{t-j}+Z5ECT_{t-1} \quad (7\text{-}9)$$

The short run dynamic analysis results of individual regression model where the EG in Jordan is proxy by D(LNRGDP) as the dependent variable**,** are presented in Table 5, revealing that the LNBMV, LNEV, LNMC and LNMSD have a positive and statistically significant impact on EG in Jordan, which are in line with long run results which confirmed the finance - led growth hypothesis in Jordanian economy. A 1% increase in one of development financial indicators, (board money velocity variable [MSD], stock market development [MC], EV variable, and BMV) will lead to an increase in EG as proxy by RGDP by (0.111401, 0.766925, 0.000129, 0.000163) respectively. The equilibrium correction coefficient in all individual regression model estimated (ECM]s [−1]) has a right sign (negative sign), and statistically highly significant, and the absolute value of it indicated the speed of adjustment to equilibrium following a short run shock. Also the results reveal the existences of short run relationship between FD, and EG in Jordan.

Table 5: The short run dynamic results where EG D (LNRGDP) is dependent variable and FD Indicators are independent variables

The short run dynamic results where Economic Growth is dependent variable and MSD is independent variable				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
D (LNMSD)	0.111401	0.023263	4.788844	0.0000
D (LNGOV)	−0.001582	0.002549	−0.620471	0.5366
ECM(−1)	−0.074718	0.014828	−5.03917	0.0000
The short run results where EG is dependent variable and MC is independent variable				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
D (LNMC(−1))	0.766925	0.232064	3.304806	0.0014
D (LNGOV)	0.000002	0.000002	1.156597	0.2507
ECM(−1)	−0.000051	0.000021	−2.378413	0.0196
The short run dynamic results where EG is dependent variable and EV is independent variable				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
D (LNEV)	0.000129	0.000032	3.996485	0.0001
D (LNGOV)	0.000003	0.00019	−0.015768	0.9875
ECM(−1)	−0.000011	0.000004	−2.497048	0.0145
The short run dynamic results where EG is dependent variable and BMV is independent variable				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
D (LNBMV)	0.000163	0.000034	4.75813	0.0000
D (LNGOV)	−0.000001	0.000002	−0.400953	0.6895
ECM(−1)	−0.000011	0.000005	−2.364826	0.0204

Source: E-views 9 package output

6.4. The Variance Decomposition Results

The results of variance decomposition estimated of all FD indicators, and EG in Jordan were mentioned in Table 6, with a ten-quarter forecast horizon, and it explains how much of an EG in Jordan predicated error variance is described by the innovation from each FD indicators. As shown in Table 6 the results reveal that the EG in Jordan is explained by FD indicators as follows the BMV explained of (11%), EV variable, explained of (33%), stock market development (MC) of (6%), andboard money velocity variable (MSD) explained of (22%), at period −10. Thus among the major shocks to EG in Jordan are mainly from (EV), and (MSD). The remaining periods of Table 6 it can be interpreted likewise.

6.5. The Impulse Response Functions

Figure 1 demonstrates the impulse response function, which indicates how the EG in Jordan represented by LNRGDP responds to shocks occasioned by four FD indicators (LNMSD, LNBMV, LNEV, and LNMC). It is noticed that the response of EG to one

Table 6: Variance decomposition of study variables

Variance decomposition of LNRGDP of model F (LNRGDP, LNBMV, LNGOV)				
Period	**SE**	**LNRGDP**	**LNBMV**	**LNGOV**
1	0.000	100.000	0.000	0.000
2	0.001	98.363	1.632	0.004
3	0.001	94.682	5.197	0.122
4	0.002	91.811	7.740	0.449
5	0.003	90.020	8.972	1.008
6	0.004	88.648	9.573	1.779
7	0.004	87.274	10.004	2.721
8	0.006	85.800	10.398	3.801
9	0.007	84.263	10.736	5.001
10	0.008	82.699	10.994	6.306
Variance decomposition of LNRGDP of model F (LNRGDP, LNEV, LNGOV)				
Period	**S.E**	**LNRGDP**	**LNEV**	**LNGOV**
1	0.058722	100.0000	0.000000	0.000000
2	0.075258	91.28133	8.715312	0.003363
3	0.081452	84.43084	15.26511	0.304054
4	0.085464	80.81901	18.69268	0.488310
5	0.089195	78.00294	21.48980	0.507264
6	0.092564	75.26740	24.24799	0.484617
7	0.095517	72.79900	26.74581	0.455185
8	0.098198	70.62949	28.92664	0.443879
9	0.100705	68.66325	30.85761	0.479135
10	0.103076	66.83767	32.57862	0.583707
Variance decomposition of RGDP of model F (LNRGDP, LNMC LNGOV)				
Period	**S.E**	**LNRGDP**	**LNMC**	**LNGOV**
1	0.067134	100.0000	0.000000	0.000000
2	0.087510	99.68633	0.190417	0.123252
3	0.102890	98.84778	0.567662	0.584562
4	0.115256	97.58721	1.104236	1.308550
5	0.125844	96.01024	1.754722	2.235034
6	0.135248	94.21934	2.479163	3.301492
7	0.143816	92.30152	3.243737	4.454741
8	0.151763	90.32647	4.021779	5.651754
9	0.159225	88.34733	4.793270	6.859401
10	0.166293	86.40285	5.543902	8.053249
Variance decomposition of LNRGDP of model F (LNRGDP, LNMSD LNGOV)				
Period	**S.E**	**LNRGDP**	**LNMSD**	**LNGOV**
1	0.063897	100.0000	0.000000	0.000000
2	0.084664	94.36861	5.630338	0.001050
3	0.097191	91.14874	8.843440	0.007818
4	0.108004	88.73819	11.22544	0.036374
5	0.117546	86.27266	13.59214	0.135194
6	0.126039	83.94781	15.75025	0.301941
7	0.133836	81.80710	17.64679	0.546112
8	0.141121	79.82874	19.30472	0.866544
9	0.148009	78.00436	20.73630	1.259334
10	0.154585	76.32258	21.95638	1.721037

Source: E-views9 package output

standard deviation shock FD indicators was positive from the first period, and continued to be positive beyond the ten period.

6.6. ARDL Diagnostic Test

The robustness of the study models has been defined by several diagnostic tests such as normality test using the Jarque–Bera test, the Breusch -Godfrey Serial Correlation LM test, and heteroscedasticity test: Breusch-Pagan-Godfrey. All diagnostic tests as shown in Table 7 reveal that the study models are normally distributed, serially uncorrelated, and heteroscedasticity problem doesn't appear. Finally to test the stability of short-run, and long-run coefficients in ARDL ECM, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) were used in the present study, the graphical presentation of these two tests are shown in Figure 2, indicating that CUSUM, and CUSUMSQ are within the critical bounds of 5% level of significance which confirmed that all study models are structurally stable.

7. CONCLUSIONS

The main aim of the current study was to answer the following question: Does the finance -led growth hypothesis hold in a Jordanian economy for the period 1992Q1–2016Q4. To capture the effect of FD on EG in Jordan, the current study used four FD

Figure 1: Impulse response function

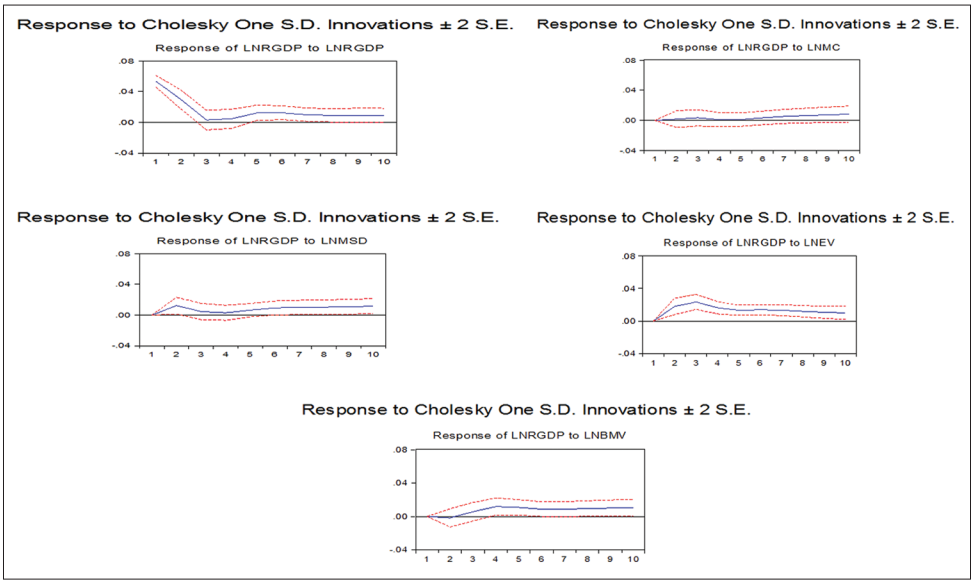

Figure 2: Response of economic growth (LNRGDP) to financial development indicators

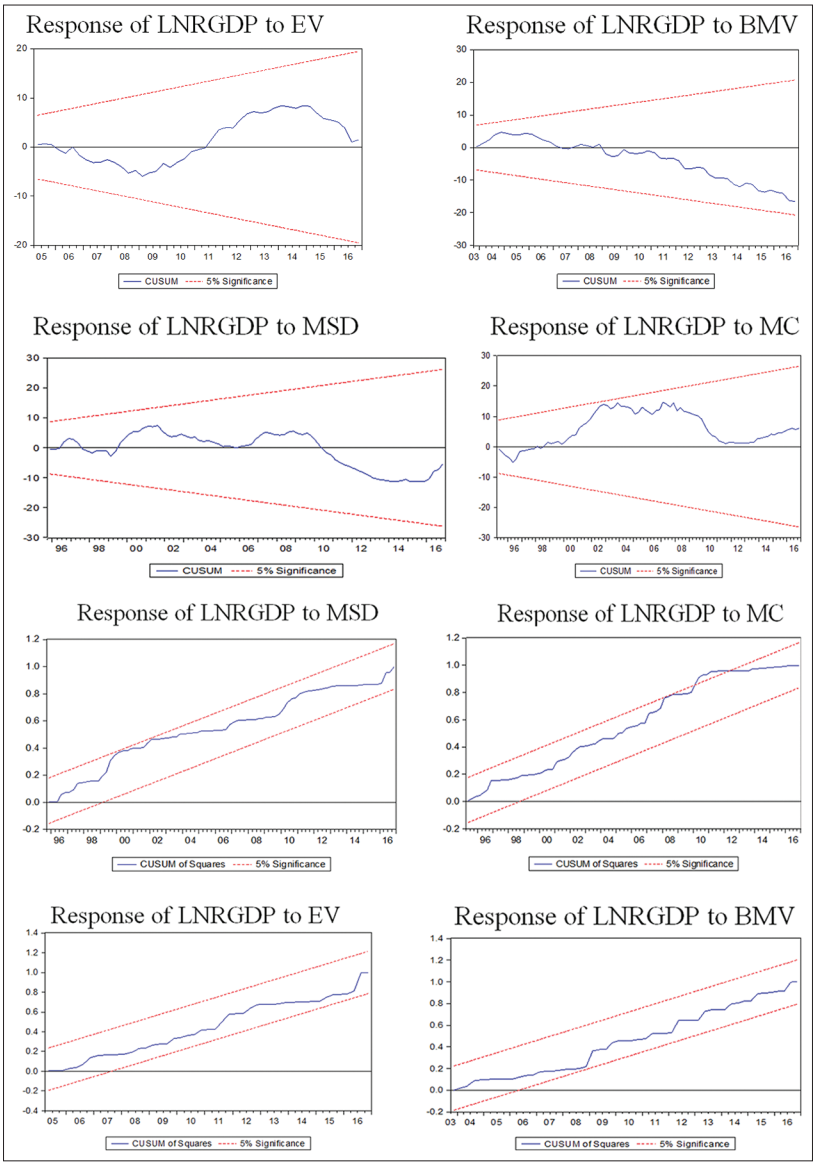

Table 7: ARDL diagnostic test results

Normality test	Jarque-Bera	P
Model $F_{RGDP\ (BMV,\ GOV)}$	3.595192	0.165697
Model $F_{RGDP\ (MSD,\ GOV)}$	2.067114	0.355739
Model $F_{RGDP\ (MC,\ GOV)}$	4.177212	0.12386
Model $F_{RGDP\ (EV,\ GOV)}$	1.691652	0.429203
Breusch-Godfrey serial correlation LM test	**F-statistic**	**P**
Model $F_{RGDP\ (BMV,\ GOV)}$	1.304281	0.2273
Model $F_{RGDP\ (MSD,\ GOV)}$	0.390532	0.5337
Model $F_{RGDP\ (MC,\ GOV)}$	3.520146	0.0641
Model $F_{RGDP\ (EV,\ GOV)}$	1.61837	0.1919
Heteroscedasticity test: Breusch-Pagan-Godfrey	**F-statistic**	**P**
Model $F_{RGDP\ (BMV,\ GOV)}$	0.985067	0.4533
Model $F_{RGDP\ (MSD,\ GOV)}$	0.897064	0.5396
Model $F_{RGDP\ (MC,\ GOV)}$	1.447022	0.1887
Model $F_{RGDP\ (EV,\ GOV)}$	1.224821	0.2772

indicators namely: EV variable measured by the ratio of bank credit to the private sector to NGDP, and BMV measured by the ratio of broad money supply to NGDP, board money velocity variable (MSD), measured by the ratio of deposit demand to narrow money supply, and stock market development (MC) measured as the ratio of market capitalization value to NGDP.

Empirical findings indicate that, the ADF unit root test and ARDL Bounds testing revealed evidences of stationary and long-run equilibrium relationship among the variables in the model's. Findings from the ARDL long-run and short-run regression revealed that FD have positive and significant impact on EG in Jordan during the period studied, which affirmed the existence of the finance - led growth hypothesis in a Jordanian economy.

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