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Abstract

The objective of the present paper is to investigate the impact of financial development along with some selected macroeconomic variables on economic growth in Jordan using annual data covering the period from 1976 to 2013. The research methodology employs the Autoregressive Distributed Lagged (ARDL) Model (Bonding test approach to cointegration) to estimate the relationships among variables. The estimation results of the ARDL model revealed that the said variables are cointegrated and there is a long-run equilibrium relationship among variables, and hence, there is a long-run form of causal relationship. The long-run estimation results disclosed a significant negative relationship between economic growth and financial development in Jordan. Moreover, the negative and significant one lagged period error correction term indicates that the causal direction runs from financial development indicator to economic growth. The results provide support for the finance-led growth hypothesis in Jordan. Moreover, trade openness and government variables have the expected positive impacts on economic growth, while inflation (CPI) variable was positive but insignificant.

Keyword: Economic Growth, Financial Development, ARDL, Causality, Jordan

1. Introduction

The nature and the causal direction of the relationship between economic growth and financial development has been a controversial issue and the focus of great attention in the theoretical and applied literature in the last few decades. As Federici & cariole (2009) posited that “Countries that are relatively financially developed are better suited to void or withstand currency crises” (Zouheir et al, 2015). The recent empirical literature showed that financial development plays an important and vital role in the economic process and contributes to economic growth. The justification for such role lies in several reasons.

1. First, a well-developed financial sector helps in better resource allocation, and hence economic growth. The economic growth due to financial development can be seen through mobilizing savings which increase the resources to finance investment, and through monitoring and screening investment projects which in turn would increase the projects efficiency. Secondly, it affects the volume of foreign investment and the ability to borrow in order to extend their activities in the host countries leading to technological spillovers to domestic growth.

The heart of the debate is whether the finance-led growth hypothesis or growth-led hypothesis prevails. The ongoing debate over the casual direction has its roots back to the turn of the twentieth century led by Schumpeter (1911) and then Mckinnon (1973) and later Lucas (1988). They support the Financial-Led growth hypothesis (known later as the Supply-Leading hypothesis). As Mckinnon (1973) and Shaw (1973) argued that a well-functioning financial sector leads to efficient resource allocation which stimulates economic growth (Samson & Elias 2008). On the other hand, a parallel stream of economic thought supports the Economic growth-Led Finance hypothesis (demand-following hypothesis) that was postulated by

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2For detailed explanation, see (Zouheiret al, 2015)
Robisen (1952) where finance follows economic growth (Abu-Bader et al. 2008). The argument based on the idea that economic growth creates demand for financial services leading to its growth (Samson & Elais, 2008). However, the debate is still going on up to date and has not been settled leaving the door open for future research.

The main objective of the present work is to empirically examine the nature of the causality between economic growth and financial development, in other words whether the finance-led hypothesis or the growth-led finance hypothesis prevails in Jordan using annual time series data from 1976 to 2013 period by applying Autoregressive distributed lag (ARDL) model.

The importance of the paper stems from the fact that the determination of the causal relationship between financial development and economic growth increases the understanding of the nature of causal such relationship by providing an empirical evidence for Jordan. It is believed that increasing the financial development of countries with developing economies may have important positive consequences (Zoubeir et al, 2015). And hence; the empirical results would have vital implication for decision-making authorities in Jordan about proper growth policies to adopt.

The present study consists of five sections organized as follows. Section 2 presents the review of the literature related to the paper subject. Section 3 describes the Data and econometric methodology. Section 4 presents the empirical results and relevant discussions. The final section is the conclusion and some policy implications.

2. Literature Review

Theoretical Background

The direction of the causal relationship between financial development and economic growth has been the core of controversial debate among researchers since the turn of the twentieth century (Nicholas, 2008; Choong et al., 2003). Generally speaking, the economic development theory provides a strong support for the existence of correlation between financial development and economic growth. However there is still no clear cut solution in applied empirical work on the causal direction between the two variables. The empirical research results provided mixed results on the causality direction which can be attributed to a set of reasons, such as differences in data, research methodology, financial development measurement, and country specific—developed or developing country—(Anthony & Tajudeen, 2010).

The literature on the causal relationship between financial development and economic growth can be classified into four different categories: the supply-leading (finance-led growth) hypothesis, the demand-following (growth-led finance) hypothesis, feedback (bidirectional causality), and independence hypothesis.

Finance-Led Growth Hypothesis

The core of Finance-led growth hypothesis is that financial development is vital for stimulating economic growth provided there is a well-functioning financial sector that reallocates resources efficiently scarce resources from surplus agents to deficit agents, and hence, leading to economic growth. Empirical evidence supporting Finance-led growth hypothesis is provided by a considerable studied: Anthony and Tajudeen (2010); Abu-Bader and Abu-Qurn (2005); Khan, et al (2005) for Pakistan; Audu and Okumok (2013); Shaheen et al (2011) Miguel et al. (2014); Shittue (2012) for Nigeria; Audu and OKomoko (2013); Giri, A. K. & Geetilaxmi Mohapatra (2012) for India; and Ercan (2012) for Turkey.

Growth-Led Finance Hypothesis

According to the demand-following phenomenon, the low growth process in the financial sector is a result of the lack of the demand for the financial services (Nicholas, 2008). Hence, this can be translated in the fact that the development of the real side of the economy increases the demand for the financial sector services, leading to its growth. The Growth-led finance theory gained support by the empirical work of Housem & Hessene (2011) for 4 MENA countries; Perera & Paudel (2009) for Sri Lanka.
The Feedback Hypothesis

It postulates that there is a two-way (or bidirectional) effect between economic growth and financial sector development. It asserts that economic growth and financial development are positively interdependent. This means that financial development accelerates and augments economic growth and that economic growth leads to development of the financial sector. This theory supported by the applied work of Hossem & Hessene (2011) for 6 OECD countries, Karime and Emad (2011), Onounga's (2014) and Spinthiropoulos et al. (2010) for Keynia.

Independence Hypothesis

This hypothesis postulates that there is no causality between economic growth and financial development both in the short run and in the long run. Al-Malkawi et al., (2012), and Micheal (2012) work provided a support to this theory.

Review of Empirical Literature

There is a huge and considerable empirical work in economic literature on the causality between financial development and economic growth. However, there is no consensus on the nature of the causal direction between financial development and economic growth. The empirical results were mixed due to nature of the data, the empirical methodology, and modeling. The empirical results, in general, provided support to the four categories based on the different views that merge in the economic literature; the supply-leading theory where there exists a unidirectional running from financial development to economic growth, and the demand-following phenomenon where the causality runs from economic growth to financial development, the bidirectional causal relationship between economic growth and financial development, and the independence theory.

Miguel et al. (2014) examined the validity of the finance-led growth or the growth-led finance for Mexico over the period from 1969 to 2011 using ARDL model. The estimation results lend support to the Supply-following hypothesis that is the financial sector promotes economic growth in Mexico.


Shahrouz & Yusuf (2014) applied the Autoregressive Distributed Lagged Model to examine the impact of financial development on economic growth in Iran using annual time series data from 1980 to 2013 period. The empirical finding supported the Finance-led growth hypothesis (supply-leading) for Iran emphasizing the role of financial sector development in stimulating economic growth.

Audu & Okumoko (2013) examined the causal relationship between financial development and economic growth in Nigeria over the period from 1970 to 2013 using cointegration and Vector Error Correction model (VECM). The estimation results reveal that all financial development indicators have positive impact on economic growth. The results support the Financial-led growth hypothesis exploring the role of financial development in economic growth in Nigeria.

Al-Malkawi et al. (2012) studied the causal relationship between financial development and economic growth in United Arab Emirates using annual data covering the period from 1974 to 2008 using the ARDL approach to cointegration. The result shows a significant negative impact of financial development on economic growth. The Granger-causality in the VECM framework test shows bi-directional causality between the two variables.

Giri and Geetilaxmi (2012) examined the validity of the supply-leading hypothesis versus the demand-following hypothesis for India over the period from 1970 to 2008 using Johansen Cointegration approach and the Vector Error Correction (VECM) model. The Cointegration results show the existence of long run...
equilibrium between financial development and economic growth. The Granger-Causality in the VECM frame work provides support for the supply-leading hypothesis in India.

Micheal (2012) tested the validity of the Shumpeter's theory for South Africa using annual time series data over the period between 1965 and 2010 by utilizing the Fully Modified Ordinary Least Squares (FMOLS) Model. The estimation results did not support Shumpeter's theory and the Granger-Causality showed bi-directional causal relationship between financial development and economic growth.

Shittu (2012) investigated the long run and short-run relationships between financial development and economic growth in Nigeria for the period from 1970 to 2010 using cointegration, ECM, and Engle-Granger methods. The estimation results support the finance-led growth hypothesis for the ratio of broad money to GDP (M₂/GDP) indicator.

Sunde (2012) examined the causal relationship between financial development (M₂/GDP) and economic growth using annual time series over the period from 1975 to 2010 for South Africa by employing the Vector Auto-regression approach and Granger-Causality test. The estimation results provided a support for the Finance-led Growth (Supply-leading) hypothesis confirmed by the Granger-Causality test result where a unidirectional causality running from financial development to economic growth.

Azhar (2011) work focused on determining the relationship between financial development and economic growth in Pakistan from 1979 to 2008 period using the ARDL estimation method. The estimation results show a positive but insignificant relation ship between economic growth and financial development.

Houssem & Hassene (2011) investigated the causal direction between financial development and economic growth for 6 OECD countries and 4 MENA countries using panel data covering the period from 1990 to 2006. The empirical results show a strong positive bidirectional causality in OECD countries case while a unidirectional causality runs from growth to finance in MENA region case (supporting the Growth-led-hypothesis). The possible explanation for this result could be attributed to week financial system and/or government intervention.

Karim and Emad (2011) using annual panel data from 1994 to 2008 for six of Middle Eastern, investigated the short-run and the long-run causality between financial development and economic growth employing GLS, SUR and fixed effect. The estimation results support the feedback-effect hypothesis shown by the bidirectional causality between development and economic growth, and hence.

Shaheen, et al (2011) used the Autoregressive Distributed Lagged (ARDL) Model approach to cointegration to estimate the long-run and short-run relationships between financial development and economic growth in Pakistan over the period from 1973 to 2009. The ARDL results supported the Supply-leading hypothesis shown by unidirectional causal relationship in the Granger-Causality framework.

Anthony & Tajudeen (2010) studied the causal relationship between financial development (financial deepening) and economic growth in addition to two control variables in 10 Sub-Saharan countries using the Granger-Causality in the context of VECM framework over the period from 1980 to 2005. The Granger-Causality supported the finance-led growth (Supply-leading) for some countries, while the Growth-Led (demand-following) for other countries, the Feed-back hypothesis (Mutual effect) was found for Zambia. They argued that the mixed results are the outcome of several reasons: differences in institutional structure, Macroeconomic stability, and the outcomes of the reforms in these countries.

Jenkins (2010) investigated the long-run and short-run relationship between economic growth and financial development measured by broad money supply and domestic credit by banking sector over the period from 1975 to 2005 using the bound test for cointegration approach (ARDL). The cointegration result showed long-run and short-run relationships between variables. The estimation results supported the demand-following hypothesis prevails in Cyprus by the existence of a unidirectional causal relationship running from GDP to financial development.

Spinthiropoulos, et. al. (2010) investigated the causal relationship between economic growth and financial development (the ratio of money supply to GDP) for Greece over the period 1960-2006 using a
multivariate VAR model. The empirical results showed a positive bidirectional causal relationship between the economic growth and financial development.

Kilimani (2009) utilized quarterly data over the period from 1970 to 2006 to empirically investigate the causal relationship between financial development indicators and economic growth in Uganda. The estimation results of the multivariate VAR model showed that financial development is an important source of economic growth. The Granger causality test showed a positive unidirectional causality running from financial development to economic growth when (M$_2$/GDP) is used, while the effect of total credit was negative on economic growth.

Perera and Paudel (2009) examined the validity of finance-led growth hypothesis for Sri Lanka for the period from 1955 to 2005 using Johansen Cointegration approach and ECM model. They utilized six indicators as proxy for financial development. The results were in favor of growth-led finance hypothesis but not for the finance-led growth hypothesis.

Abu-Bader et al. (2008) applied the augmented VAR approach of Toda and Yamamoto to test for Granger-causality between economic growth and indicators of financial development over the period from 1964 to 2004 for six Middle Eastern countries. The Granger-causality results provided a strong support to the Finance-led Growth hypothesis (Supply-leading hypothesis) where financial development causes economic growth.

Odhambo (2008) explore the nature of the causal relationship between financial development and economic growth for Kenya using annual data spans from 1968 to 2002 using Cointegration analysis, Vector-error correction model (VECM), and Granger-Causality model. The empirical results showed that the causality direction depends on the measurement of financial development indicator. Bidirectional causality exists when (M$_2$/GDP) is used as a financial development indicator, while there is a unidirectional causality running from economic growth to Financial Development when the ratio of currency in circulation to M$_1$ and the ratio of credits to GDP were used.

Khan, et al. (2005) investigated the relationship between financial development and economic growth for Pakistan using annual data covering the period from 1971 to 2004 by applying the Autoregressive Distributed Lagged (ARDL) model. The estimation results provided support to Finance-Led Hypothesis, where a significant positive unidirectional impact running from financial development to economic growth in Pakistan was observed.

Choong, et al. (2003) examined the association between economic growth and financial development (stock market development) in Malaysia over the period from 1978 to 2000 using ARDL bounds test approach and the Granger –causality test in the VECM context. The ARDL estimation results provided a strong support to the Finance-led growth hypothesis in Malaysia according to Granger-causality running from stock market development to economic growth.

3. Model Specification and Data

The objective of the present study is to examine the causal relationship between financial development and economic growth in Jordan. Hence, this section describes the nature of the data used in the applied analysis specially measuring the financial development, economic growth, and other control variables. The data consist of annual time series for the period 1976 to 2013 which covers the financial crises and financial liberalization periods in Jordan. The data source is the Central Bank of Jordan publications. It is obvious that the problem in building the econometric model is that there is no consensus on the definition of financial development variable, and hence, this leads to the mixed results of empirical research. Three intermediaries indicators are widely used in empirical research to proxy financial development variables. First, the ratio of broad money supply to nominal GDP (M$_2$/GDP) which was used by Wongpiabvorn, 2014; Abu Bader et al, 2008; Shahrouz & Yousif, 2014; Anthony & Tajudeen, (2010); Spinthiropoulos, et al, (2010); Kilimani (2009); Obhiambo M. (2008); Samson and Elias (2010); Onounga (2014); Audu & Okumoko (2013); Al-Malkawi et al. (2012); Micheal (2012); Shittu (2012); Sunde (2012), Shaheen, et al (2011); Jenkms (2010);
Spinthiropoulos, et. al. (2010); Perera and Paudel (2009) among others. The domestic credit to private sector as a percentage of GDP, (PRC/GDP) which was employed by Wongpiabvorn, (2014); Abu Bader et al, 2008; Nicholas (2009); Samson and Elias (2010); Onounga (2014); Audu & Okumoko (2013); Al-Malkawi et al. (2012); Micheal (2012); Shittu (2012);Perera and Paudel (2009).Finally; the ratio of liquid liabilities to GDP (LGDP) used by Wongpiabvorn, (2014); Samson and Elias (2010) among others.

The present paper will concentrate on the first indicator that is the ratio of broad money supply to nominal GDP (M2/GDP) as a measure the financial depth, and the size of financial intermediation. The ratio indicates the saving activities offered by financial sector (Susan, 2014). As Mckinnon4 (1973) argued that developed financial sector or financial development causes an increase in the supply of money making the transaction in the economy. This process is considered the most important indicator of financial development, and it is known as monetization. Moreover, Makinnon (1973) proposed a measure for monetization as the percentage of broad money supply (M2) of the GDP. Therefore, the ratio of M2 to GDP will be used as a financial development indicator that measures the degree of transactions that is made by M2 as a medium of payments. It is expected that the financial development indicator (M2/GDP) is positively influence economic growth in Jordan as it is believed that financial development can stimulate economic growth by efficiently allocating resources.

The econometric model also includes a set of control variable that are believed to influence economic growth in Jordan. The trade openness as a control variable to capture the effect of international trade on economic growth measured as the sum of the values of exports and imports as a percentage of nominal GDP. It is believed that exports affect positively economic growth if they stimulate the demand for domestically produced goods and services in the international market and generate enough foreign exchange to finance capital imports (Susan, 2014). Moreover, imports can positively affect economic growth if they mainly comprise of capital goods as inputs in the production of goods and services of the country. But this not always the case, imports could have negative impact on economic growth if they displace domestic production of goods and services since total output and employment will decline leading to a reduction in economic growth. Therefore, the net effect of trade openness is undetermined, and the exact effect can be empirically determined (Susan, 2014). Inflation rate (INF) is measured as the annual percentage change in the Consumer Price Index (CPI), and is expected to have a negative impact on economic growth. Also, the model includes the government size measured by government consumptions. The government variable serves as an indicator proxy for fiscal policy showing the macroeconomic stability in Jordan. It is expected that the increased government size would be harmful to the economy by crowding-out the resources available to private sector (Mohammad Zaky, 2015).

Following the steps of the economic and empirical literature, the econometric model can be expressed as follows:

\[ RGDP = \alpha_0 + \alpha_1 FD + \alpha_2 GOV + \alpha_3 INF + \alpha_4 OP + \epsilon, \]  \hspace{1cm} (1)

Where RGDP is the real GDP at constant prices (1994=100) proxy economic growth, FD is the financial indicator (the ratio of money supply to nominal GDP, GOV is government size (Government expenditures), INF is the inflation rate (the annual growth rate of Consumer price index (CPI), and OP is the degree of openness (the ratio of total exports and imports to GDP). All variables (except FD) are in natural logarithmic form to reduce the effect of heteroscedasticity and to obtain the growth rate of the variables.

4. Methodology and Data
- **Bound Test for Cointegration**

In this section we explore the relationships between economic growth and financial development indicator, and the control variables using the vector autoregressive distributed lag (ARDL) approach to cointegration procedure introduced by Pesaran and Shin (1999) and Pesaran, Shin, and Smith (1997, 2001).

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4 For more elaboration, see Yan Wang et al. (2015).
The cointegration test identifies the long-run relationship between variables and it involves the estimation of the unrestricted error correction model (UECM) expressed as follows:

\[
\Delta RGDP = \alpha_0 + \sum_{i=1}^{n} \beta_i \Delta RGDP_{t-i} + \sum_{j=0}^{p} \gamma_i \Delta FD_{t-j} + \sum_{j=0}^{q} \theta_i \Delta INF_{t-j} + \sum_{j=0}^{m} \phi_i \Delta OP_{t-i} \\
+ \sum_{j=0}^{s} \pi_i \Delta GOV_{t-i} + \delta_1 RGDP_{t-1} + \delta_2 FD_{t-1} + \delta_3 INF_{t-1} + \delta_4 OP_{t-1} + \delta_5 GOV_{t-1} \\
+ \varepsilon_t \quad (2a)
\]

\[
\Delta FD = \beta_0 + \sum_{i=0}^{n} \pi_i \Delta RGDP_{t-i} + \sum_{j=1}^{p} \omega_i \Delta FD_{t-j} + \sum_{j=0}^{q} \kappa_i \Delta INF_{t-j} + \sum_{j=0}^{m} \psi_i \Delta OP_{t-i} + \sum_{j=0}^{s} \lambda_i \Delta GOV_{t-i} + \rho_1 RGDP_{t-1} + \rho_2 FD_{t-1} + \rho_3 INF_{t-1} + \rho_4 OP_{t-1} + \rho_5 GOV_{t-1} \\
+ \varepsilon_t \quad (2b)
\]

The ARDL approach to cointegration has various econometric merits that gained the approach greater acceptance over the well-known residual-based approach proposed by Engle and Granger (1987) and the maximum likelihood-based approach proposed by Johansen and Julius (1990) and Johansen (1992). The Engle and Granger -EG- (1987) single equation cointegration analysis is that the EG approach suffers from problems of endogeneity while the ARDL model is able to distinguish between dependent and the explanatory variables. It also shows that appropriate lags in the ARDL to capture the data generating process in a general-to-specific modelling framework to correct for both residual correlation and endogeneity (Laurenceson and Chai 2003, p. 28). Moreover, a dynamic error correction model (ECM) can be derived from ARDL through a simple linear transformation (Banerjee et al. 1993, p. 51), which allows for inferences of long-run estimates, which is not possible under alternative co-integration procedures (Sezgin and Yildirim, 2002). Another advantage is that it does not requires that all variables should be stationary at first level of difference, i.e I(1). Moreover, it is also appropriate if all the variables are integrated in different orders in I(1) form or some in I(0) or they mutually integrated (Naveed et al. 2013; Raza et al. 2015). Moreover, the ARDL test is relatively more efficient regardless of the sample size applying to small and finite sample data sizes, and applying the ARDL approach to cointegration provides unbiased estimates of the long-run model (Harris and Sollis, 2003; Alam et al., 2015; Raza, 2015). Another important advantage of the ARDL procedure is that estimation is possible even when explanatory variables are endogenous (Alam and Quazi, 2003). Hence, the ARDL model provides robust results for small sample sizes. As long as the ARDL model is free of residual correlation, endogeneity is less of a problem (Pesaran and Shin 1999). The short and long-run parameters with appropriate asymptotic inferences can be obtained by applying OLS to ARDL with an appropriate lag length.

The bound testing procedure is based on the Wald test (chi-square) and the F-statistics. The F-statistics tests the joint significance of the coefficients on the one period lagged levels of the variables included in the model. To test for the existence of the long-run relationship among the variables, Wald test imposes restrictions on the estimated long-run coefficients of the variables. For the examination of long-run relationship the Wald test (Chi-square) was calculated. The F-statistics value was compared with the upper and lower boundary described by Pesaran et al. (2001). If the F-statistic is greater than the upper bound value, thus we can easily reject the null hypothesis. The null hypothesis of no cointegration among variables is \( H_0: \delta_i = 0, \quad i = 1, . . . , s \) against the alternative hypothesis \( H_a: \delta_i \neq 0, \quad i = 1, . . . , s \) and \( H_0: \rho_i = 0, \quad i = 1, . . . , s \) against the alternative hypothesis \( H_a: \rho_i \neq 0, \quad i = 1, . . . , s \) of the existence of cointegration among model variables in equations(2a & 2b). Irrespective of whether the variables are I(0) or I(1),if the null hypothesis is
rejected then we conclude that there is a long run relationship between variables.

Pesaran et al. (2001) report two sets of critical values for the significance level when testing for cointegration. The first set of critical values (lower bound) assumes that all variables included in the ARDL model are I(0), while the other set of critical values (upper bound) assumes that all variables are I(1). If, however, the calculated F-statistics is below lower critical values, then the null hypothesis of no cointegration cannot be rejected. On the hand, if the calculated F-statistics falls inside these two bounds, then the results are inconclusive. Once co-integration is established, a lag length is selected for each variable. The ARDL method estimates (p+1) k number of regressions in order to obtain the optimal lag length for each variable, where p is the maximum number of lags used and k is the number of variables in the equation. The model can be selected using model selection criteria such as the Schwartz Bayesian criteria (SBC) or Akaike’s information criteria (AIC). The AIC-based model is selected here as it has a lower prediction error than that of the SBC-based model.

- The Error Correction Model (ECM)

When the long-run relationship among variables is established, then there exists an error correction representation with one lagged period error correction term. Therefore, in the third step, the error correction model is estimated. The estimation results of the error correction model indicate the speed of adjustment back to the long-run equilibrium after a short-run shock. This indicates the deviation in dependent variable for a short period of time to long run equilibrium relationship (Masih and Masih, 1997). The ECM basically provides information about the causal factors that may affect the variables. However, if we find no evidence for cointegration among the variables, the specification of Granger-causality test will be a vector autoregressive representation.

It is possible to calculate the error correction term (ECT) form the long-run equation proposed by Pesaran et al (2001) by replacing the lagged level variables in the ARDL equation with ECT\(_{t-1}\) and estimate the model after imposing the same optimal lags. The error correction model can be written as follows:

\[
\Delta RGDP = \alpha_0 + \sum_{i=1}^{n} \beta_i \Delta RGDP_{t-i} + \sum_{j=0}^{p} \gamma_j \Delta IF_{t-j} + \sum_{j=0}^{q} \theta_j \Delta FD_{t-j} + \sum_{j=0}^{m} \phi_j \Delta OP_{t-j} \\
+ \sum_{j=0}^{s} \pi_j \Delta GOV_{t-j} + \lambda_1 ECT_{t-1} + \epsilon_t \tag{4a}
\]

\[
\Delta FD = \beta_0 + \sum_{i=0}^{n} \tau_i \Delta RGDP_{t-i} + \sum_{j=1}^{p} \omega_j \Delta FD_{t-j} + \sum_{j=0}^{q} \kappa_j \Delta IF_{t-j} + \sum_{j=0}^{m} \psi_j \Delta OP_{t-j} \\
+ \sum_{j=0}^{s} \lambda_j \Delta GOV_{t-j} + \rho_1 ECT_{t-1} + \epsilon_t \tag{4b}
\]

The ECT\(_t\) term basically links the long-run equilibrium implied by the cointegration relationship with the short-run adjustment process describing the mechanism by which the variables react following any shock that takes the out of the long-run equilibrium. The existence of the ECM term in the model means that the changes in the dependent variable are a function of the disequilibrium in the cointegration relationship and the changes in the explanatory variables (Mohammad Zaky, 2015). It reflects the deviation from the long-run equilibrium on the changes in the development variable to restore the long-run equilibrium (Mosih and Mosih, 2002)\(^5\). A negative and statistically significant ECT term indicates adjustment of economic growth towards its long-run equilibrium as indicated by financial development variable follows any short-run disequilibrium. The higher absolute value of the ECT coefficient the faster is the adjustment process.

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\(^5\) This reference is cited in (Mohammad zakey, 2015; P10)
• Stability Test

To ascertain the goodness of fit for the ARDL model a structural stability test for parameter constancy is recommended. Also a diagnostic test that examines the serial correlation, functional form, normality, and heteroscedasticity associated with the model. The structural stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ).

In a figure plot of the CUSUM test, both 5 per cent critical lines and the cumulative sum are plotted. If the cumulative sum crosses the 5 per cent critical lines the parameters are not stable. The second test to check parameter constancy is CUSUMSQ test, which is based on the cumulative sum of squared recursive residuals. Squared residuals are plotted against time and critical lines. Just like the CUSUM test, the significance of deviation from the mean value line is checked by parallel critical lines around the mean value. If the line passes outside the critical bounds, this is an indication of the instability of the regression parameters.

5. Empirical Results and Analysis

The empirical section reports the empirical estimation results of the ARDL approach to cointegration (the bound test) and the Granger causality in the VECM framework and error correction model.

The ARDL approach involves two steps for estimating the long-run relationship (Pesaran et al., 2001). The first step is to examine the existence of a long-run relationship among all variables in the equation. The second step is to estimate the long- and short-run coefficients of the same equation. We run the second step only if we find a long-run relationship in the first step. For the examination of long-run relationship the bound cointegration test based on critical values taken from Pesaran (2001) will be used with the null H0 (no long-run relationship) and alternative hypotheses H1 (a long run relationship). The approximate critical values for the F-test are obtained from Narayan (2005).

• Unit Root Test Results

Before conducting the bound test to cointegration, it is required that none of the variables is integrated of order two/I(2). The critical values for the F-statistic test are based on the assumption that variables are I(1) or I(0) (Persaran et al. 2001; Narayan 2005). Table (1) reports the unit root test results at the level both intercept only/with trend. The ADF test results reveal that all variable are non-stationary (except FD) at level at 5% level of significance level, and hence, this requires running ADF test at the first difference.

<table>
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<th>Variable</th>
<th>ADF</th>
<th>CV</th>
<th>Lags</th>
<th>ADF</th>
<th>CV</th>
<th>Lags</th>
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<td>0</td>
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</tr>
</tbody>
</table>

CV: critical value; *1%; otherwise at 5%.

Table (2) reports the unit root test results at the first difference since variables are non-stationary at the level. The ADF results show that all variables are integrated of order one/ I(1).
The Bound Test to Cointegration

The next step of the procedure is to estimate the coefficients of the long-run relationships and associated error correction model (ECM) using the ARDL model. The order of distributed lag on the dependent variables were selected by the Akaike information Criterion (AIC) and turned out to be two since we are using annual data. The Akaike information Criterion selects an ARDL (2, 2, 0, 1, 0) for the variables included in the model. In order to examine the long run cointegration relationships among economic growth and financial development along with other variables, the bounds tests using the calculated F-statistics from the joint significance of lagged levels of variables is employed to confirm the presence of cointegration. The result of the (F-Statistic) test is presented in Table (3).

Table 2: ADF Test Results at First Difference (at 5%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF</th>
<th>CV</th>
<th>Lags</th>
<th>ADF</th>
<th>CV</th>
<th>Lags</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRG</td>
<td>-5.92*</td>
<td>-3.63</td>
<td>0</td>
<td>-5.85*</td>
<td>-4.235</td>
<td>0</td>
</tr>
<tr>
<td>LOP</td>
<td>-5.15*</td>
<td>-3.63</td>
<td>0</td>
<td>-5.07*</td>
<td>-4.235</td>
<td>0</td>
</tr>
<tr>
<td>LFD (M2/GDP)</td>
<td>-5.86*</td>
<td>-3.26</td>
<td>0</td>
<td>-7.02*</td>
<td>-4.235</td>
<td>0</td>
</tr>
<tr>
<td>LP</td>
<td>-3.64</td>
<td>-3.62*</td>
<td>0</td>
<td>-3.7</td>
<td>-4.24*</td>
<td>0</td>
</tr>
<tr>
<td>LRGDP</td>
<td>-3.43</td>
<td>-2.94</td>
<td>0</td>
<td>-3.48</td>
<td>-3.20</td>
<td>0</td>
</tr>
</tbody>
</table>

CV: critical value; * 1%, otherwise at 5%.

Table 3: The F-Statistic Test for Cointegration

<table>
<thead>
<tr>
<th>Bound Critical Values (restricted Intercept and Trend)</th>
<th>Significance level</th>
<th>F-statistics F(5,24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I(1)</td>
<td>I(0)</td>
<td></td>
</tr>
<tr>
<td>4.305</td>
<td>3.028</td>
<td>1%</td>
</tr>
<tr>
<td>3.614</td>
<td>2.467</td>
<td>5%</td>
</tr>
<tr>
<td>3.285</td>
<td>2.192</td>
<td>10%</td>
</tr>
</tbody>
</table>

* The critical values are obtained from Pesaran et al. (2001), table CI(iii). P.300unrestricted intercept and trend.

It is clear from table (3) that the computed F-statistic 10.95 which is above the upper critical bound 4.305 at 1% significance level, and hence, the null hypothesis of no cointegration is rejected. This indicates that at least one cointegration relationship exists among economic growth, financial development indicator, inflation rate, trade openness, and government consumption expenditures in Jordan. Contrary to this, the computed F-statistic (1.276) for the financial indicator (FD) is lower than the lower critical value, and hence, there is no long-run equilibrium relationship among variables. In order to obtain further evidence of the existence of the long run relationship among economic growth and financial development, the ARDL approach estimates the long-run coefficients along with the short run dynamics and then the ECM is estimated to confirm the presence of the relationship only for the co-integrated equation.

Table 4: Estimated Long-run Coefficients: ARDL(2,2,0,1,0)

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-ratio [Prob]</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD1</td>
<td>-0.236</td>
<td>0.112</td>
<td>-2.10 [0.045]</td>
</tr>
<tr>
<td>op</td>
<td>0.266</td>
<td>0.099</td>
<td>2.67[0.013]</td>
</tr>
<tr>
<td>LP</td>
<td>0.208</td>
<td>0.117</td>
<td>1.23[0.232]</td>
</tr>
<tr>
<td>GOV</td>
<td>0.625</td>
<td>0.115</td>
<td>5.44[0.000]</td>
</tr>
<tr>
<td>C</td>
<td>1.667</td>
<td>1.415</td>
<td>1.17[0.250]</td>
</tr>
<tr>
<td>TR</td>
<td>0.011</td>
<td>0.011</td>
<td>1.03[0.309]</td>
</tr>
<tr>
<td>Dum</td>
<td>0.037</td>
<td>0.026</td>
<td>1.14[0.170]</td>
</tr>
</tbody>
</table>
Table (4) also reports the long-run estimates using the ARDL (2,2,0,1,0) approach where financial development has a significant negative impact at 5% level on economic growth, which contradicts the wisdom of the economic theory and the empirical work that financial development positively affects economic growth. Most of the studies who found negative relationship they found it in less developed countries, not in developed ones (Yan, 2015; Al-Malkawi, 2012; Narayan and Narayan, 2013; Abu-Bader and Abu-Qarn, 2008 cited in Zoheir, 2015; Arcend et al., 2012 and Law & Singh, 2014 cited in Yan, 2015; and Urgaia, 2015). The negative relationship can be justified as follow:

1. The inefficient allocation of resources by banks, the absence of proper investment climate, and the poor quality of credit disposal of the banking sector in less developed countries.

2. Another possible explanation for a negative impact of the financial sector on economic growth is that the financial system may still be in the transition phase and need to reach a certain level of development before it will be able to promote economic growth.

3- Financial intermediaries operating in a weak regulatory environment combined with the expectation that government will bail out failing banks.

The results also show that trade openness and government expenditures have the expected positive impact on economic growth. However, the inflation variables were positive and insignificant.

The long-run and short-run effect between the financial development indicator and economic growth in Jordan is shown by the significance of the lagged error correction term, while the short-run causation is explored via the significance of the financial development indicator. Table (5) reports the findings of the error-correction estimate for the ARDL model (2, 2, 0, 1, 0) which reveals a unidirectional causality running from financial development indicator to economic growth both in the long-run and short-run. The long-run causality from financial development indicator to economic growth can be examined via the coefficient of the error-correction term which is statistically significant at level 1% level with the expected negative sign. On the other hand, the short-run causality is clear for the significance of the financial development indicator at 5% level. The ECM coefficient is (-0.44) suggesting relatively fast speed of adjustment process. It implies that the disequilibrium resulting due to a shock is corrected in about 2.3 years.

### Table 5: Error Correction Estimates and Short-run Dynamics

| Dependent Variable: ∆LY ARDL (2, 2, 0, 1, 0): 1978 to 2013 |
|---------------------------------|-----------------|-----------------|-----------------|
| Variable | Coefficient | Standard Error | T-ratio (Prop) |
| ∆LYt-1 | 0.2815 | 0.9663 | 2.9127 (0.007) |
| ∆FDt-1 | -0.2706 | 0.0886 | -3.0556 (0.005) |
| ∆FDt-2 | 0.21137 | 0.0881 | 2.3991 (0.024) |
| ∆OP | 0.1154 | 0.0434 | 2.6566 (0.013) |
| ∆LP | -0.4479 | 0.1124 | -3.9868 (0.000) |
| ∆GOV | 0.2712 | 0.0684 | 3.9645 (0.001) |
| ∆Trend | 0.0049 | 0.0045 | 1.0735 (0.293) |
| ∆Dum | 0.1594 | 0.0107 | 1.4880 (0.149) |
| ECM(-1) | -0.4339 | 0.0574 | -7.5653 (0.000) |

ECM = LY + 0.2361FD - 0.266OP - 0.208LP - 0.625GOV 1.668Constant - 0.011Trend - 0.068Dum

| R2 | 0.874 |
| S.E. of regression | 0.230 |
| Mean of dependent variable | 0.049 |
| Residual. Sum of Squares | 0.127 |
| AIC | 79.97 |
| DW-statistic | 2.610 |
| R-Bar-squared | 0.816 |
| F-stat. | F(9,26) 18.56 (000) |
| S.D. of Dependent Var. | 0.0538 |
| Equation Log-Likelihood | 91.971 |
| Schwarz Bayesian Criterion | 70.47 |
Stability Test Results

The stability tests for the long-run and short run dynamics to ensure the robustness of the estimation results is indicated by the Cumulative sum of Squares Recursive Residuals (CUSUMSQ) and Cumulative Sum of Recursive Residuals (CUSUM). Fig (1) contains the graphical representation of CUSUM & CUSUMSQ stability tests. It can be seen that the plots of CUSUM and CUSMSQ fall within the 5% critical bounds, indicating that there is stability; and there is no systematic change detected in the coefficient at a 5% significance level over the sample period, and hence, we cannot reject the null hypothesis of coefficient stability.

Figure 2

6. Conclusion

The causal relationship between financial development and economic growth has gained a considerable attention both in theoretical and applied literature in the last few decades. The core of this concern focuses on the direction of causality, and hence, the proper economic policy to be implemented. The results of the empirical research were mixed, therefore, there is no consensus on the causal direction between economic growth and financial development. The applied research used different measures of financial development, different control variables and different empirical methodologies. In the line of this empirical research, the present paper attempts to explore the relationship between economic growth and financial development in Jordan for the period 1976 to 2013 by using the Autoregressive Distributed Lag (ARDL) model. The ratio of broad money to nominal GDP ($M_2/GDP$) was used as proxy for financial development indicator, along with a set of control variables which were included in the model.

The estimation results of the ARDL model revealed the existence of a long-run equilibrium relationship among the variables. Moreover, the stability tests showed that the model is stable and there are no structural breaks. The long-run estimation results showed a significant negative impact of financial development indicator on economic growth. The long-run causality shown by the significant and negative error term shows a negative unidirectional causality running from financial development indicator to economic growth supporting the finance-led growth hypothesis. The results of the error correction model showed that the error correction term was significant and negative. This result indicates that the causality runs from financial development to economic growth. The coefficient of the ECM term is about (-0.434) showing that the deviation from long equilibrium in the short run is corrected by 43.2 per cent around each year and it takes about 2.3 years to return to long-run equilibrium. The short-run causality is represented by the significance level of the explanatory variables. In the short-run, financial development indicator causes economic growth and it is negative and significant. Moreover, trade openness and government expenditures both cause
economic growth and they are positive and significant. The inflation variable (LP) was positive but insignificant.

References


