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The Short Run and Long Run Causality between Financial Development and Economic Growth in the Middle East

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Using panel data error correction models, we investigate the short- and long-run causality between financial development and economic growth in the Middle East. Three different indicators are used to measure financial developments. Generalized Least Square (GLS) method with cross-section Seemingly Unrelated Regression (SUR) and fixed effects in cross dimension is used to estimate the models. Our estimation results suggest that there is bidirectional causality between financial development and economic growth in both the short- and long run. The result underscores the feedback between finance and growth and hence advocates the third view that emphasizes on mutual causality between financial development and economic growth. In other words, finance can promote growth and in turn output growth will enhance financial development in the Middle East. This result can have important policy implications for both policymakers and international institutions.

Keywords: Financial development; Growth; Causality; Middle East; Panel cointegration.
JEL Classification: G20; C12; O16.

1. Introduction

The issue of financial development and economic growth linkages is currently one of the hotly debated topics in the economic literature. Ever since Schumpeter (1934) numerous researchers have studied the relationship between financial development and economic growth.

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Many researchers such as McKinnon (l973), and Galbis (1977) support the leading role of finance in economic development. Financial intermediaries through savings mobilization, risk management, acquiring information about investment opportunities, monitoring borrowers and exerting corporate control contribute to growth of output.[1]

There are other economists such as Robinson (1952), Gurley and Shaw (1967), and Jung (1986) who oppose the above view and argue that where the real sector leads finance follows.[2] A third view advocated by some economists[3] emphasizes on mutual causality between financial development and economic growth.

While various empirical studies have shown that there is a casual relationship between financial development and economic growth, the direction of this causality remains unclear[4]. The causality problem was raised by Patrick (1966) and highlighted by Goldsmith (1969). These researchers acknowledged that it is difficult to predict the direction of causality between economic growth and financial development.

Patrick (op cit.) proposed supply-leading and demand –following hypothesis to discuss the directions of causality between financial development and growth. According to the supply-leading hypothesis there is unilateral causality running from financial development to economic growth. In other words, the expansion of financial institutions boosts the supply of financial services and this in turn leads to output growth. According to this hypothesis, financial activity is a key determinant of real economic growth. Several empirical works like McKinnon (1973), King and Levine (1993), Ahmed and Ansari (1998), Neusser and Kugler (1998), Levine *et al*. (2000), Fase and Abma (2003), and Christopoulos and Tsionas (2004) confirm the validity of this hypothesis.

In contrast, the demand-following hypothesis suggests a causality running from economic growth to financial development. The main idea is that the expansion of the real sector increases the demand for financial services. Some empirical researches such as Gurley and Shaw (1967), Goldsmith (1969), and Jung (1986) support the second

1. For more details see Greenwood and Jovanovic (1990), Bencivenga and Smith (1991),Saint-Paul (1992), King and Levine (1993), and Levine (1997).
2. For example, Robinson (1952 p. 52) argues that " *it seems to be the case that where enterprise leads finance follows.*"
3. For example see Demetrides and Hussein (1996).
4. For a quick review see Christopoulos and Tsionas (2004).

hypothesis. Some empirical studies such as Luintel and Khan (1999), and Al-Yousifi (2002) have found bilateral relationship between financial development and economic growth. However, the empirical works show that the Patrick's (1966) problem is not settled and the question of causality between financial development and economic growth remains unresolved.

Al-Awad and Harb (2005) have recently studied the linkages between financial development and economic growth in the Middle East. Their data set covers the period up to 2000 and hence excludes the more recent changes in the financial development indexes. As will be seen shortly, their set of variable, and also their estimation method are different from us. More specifically, they use the ratio of private sector credit to base money as the only index for financial development in the Middle East and ignore some other important financial indicators.

Moreover, they could not get robust results regarding the direction of causality between finance and growth. Their results indicate that, in the long run financial development and economic growth may be related to some level. In the short run, they find that real economic growth is the driving force behind financial development. However, for individual countries, they fail to find any clear evidence of the direction of causality.

Our paper contributes to the existing literature by using a panel data cointegration model to test the Patrick's hypotheses for the Middle East over the period 1994-2008. The time span captures the most recent changes in financial indicators in the region. More specifically, using an error correction modeling approach, this paper investigates the short- and long-run causality between M2/GDP, DC/GDP and FS/GDP as indicators of financial development[1] and economic growth in the Middle East. The countries chosen for this study are all from the same region, have similar culture and institutions and engage each other in trade. Knowing the direction of causality between financial depth and economic growth in this region can have important policy implications for both policymakers in the region and international institutions.

In particular, we estimate different Error Correction Models (ECM) to study the causality between finance and output growth. Generalized

1. These variables will be explained shortly.

Least Square (GLS) technique is used to estimate cointegrated vector. This estimation technique allows us to control for autocorrelation and heteroscedasticity problems.

The paper is organized as follows. Section 2 is devoted to methodology and data description. The estimation results are presented in Section 3. Section 4 is the concluding remarks.

2. Methodology and Data Description

2-1. Panel cointegration analysis

The concept of Granger causality from a process W to a process X is based on studying whether we can improve the forecast of X_{t+1} by using information about the past and present values of W.[1] Hence, the following equations are used extensively by many researchers to examine the short-run causality between financial development and economic growth:

$$y_{it} = f(z_{it}) \quad (1)$$

$$F_{it} = g(z_{it}) \quad (2)$$

in which $z_{it} = [y_{i(t-1)}, \cdots, y_{i(t-l)}, F_{i(t-1)}, \cdots, F_{i(t-l)}]$, y_{it} is a measure of economic growth (i.e., the growth of GDP per capita)[2] of country *i* at time *t*, and F_{it} is a measure of financial development of country *i* at time *t*. If past values of y contributes to the prediction of F, *y* Granger causes *F* and visa versa if past values of F helps to forecast *y*, *F* Granger causes y. More specifically, y would, in the sense of Granger, cause F if it occurs before F and it contains information useful in forecasting F and visa versa. Hence, it is possible for y to Granger cause F and for F to Granger cause y, a feedback stochastic system.

However, the direction of Granger causality between *y* and *F* as examined by equations (1) and (2) is a short run notion. In order to complete our analysis, we will apply an error correction model (ECM) as part of the cointegration analysis - as often used in the literature- to examine both the short- and long-run causality. According to Bruneau, C. and E. Jondeau (1998) a variable X is said to be causal for another variable Y in the long run if the past knowledge of the former improves long-run predictions of the latter. Hence, X is not causal for

1. Dufour and Renault (1998, p.1103).
2. Levine *et al*. (2000)

Y in the long-run "if and only if the knowledge of the past of X does not improve the long-run prediction of Y".[1]

However, prior to our estimations, the IPS panel data unit root test proposed by Im, Pesaran and Shin (2003) is used to examine whether the variables are stationary. This test suggests a standardized t-bar test statistic based on the augmented Dicky-Fuller statistics averaged across the groups. It also allows for residual serial correlation and heterogeneity of the dynamics and error variances across groups.[2]

For a balanced panel data set y_{it} (i =1, 2, . . ., N; t =1, 2, . . ., T), where i and t denote cross-sectional unit and time, respectively, Im *et al.* (op. cit.) use the average of the unit-specific Augmented Dickey Fuller (ADF) test statistics, called $\tilde{t}-bar$ statistic given below:

$$\tilde{t}-bar=\frac{1}{N}\sum_{i}^{N}t_{iT_i}\ ,$$

in which t_{iT} is the standard DF statistic for the ith group. According to Im *et al.* (op. cit. p.4), t_{iT} statistic is given by the t-ratio of β_i in the regression of $\Delta y_i=(\Delta y_{i1},...,\Delta y_{iT})'$ on $\tau_T=(1,1,...)'$ and $y_{i,-1}=(y_{i0},y_{i1},...,y_{iT-1})'$. More specifically, t_{iT} are the individual t-statistic for testing $H_0:\beta_i=0$ for all i in ADF.[3]

If the unit root tests show that the variables are non-stationary, we will use the same procedure to perform the Engle–Granger bivariate cointegration analysis. In other words, we test the existence of a long-run relationship between F and y. The following equations are also used in the literature to study the long-run relationship between economic growth and financial development index.[4]

(3) $$y_{it}=\alpha_{1i}+\beta_{1i}F_{it}+\varepsilon_{it}$$

(4) $$F_{it}=\alpha_{2i}+\beta_{2i}y_{it}+v_{it}$$

1. Bruneau and Jondeau (1998, p.2).
2. Im, Pesaran and Shin (2003, p.53-54)
3. Im *et al*. (2003) show that under certain assumptions when T goes to infinity the standardized $\tilde{t}-bar$ converges to standard normal distribution.
4. Christopoulos and Tsionas (2004).

in which ε_{it} and v_{it} are error terms. Different panel cointegration tests are used in the literature to investigate the existence of long run equilibrium relationship between *F* and *y*. In this paper, we use Kao test to conduct panel data cointegration test.[1] As will be seen shortly, the above equations will be used to estimate error correction terms.

Finally, we use panel data regression technique to estimate an error correction model (ECM). Provided our variables are integrated of order one, I(1) but are cointegrated, the following ECM is used to study the causality between economic growth and financial development indicators:

$$\Delta y_{it} = c_1 + \sum_{j=1}^{T_{11}} \alpha_j \Delta y_{it-j} + \sum_{j=1}^{T_{12}} \beta_j \Delta F_{it-j} + \varepsilon_{yf} ECY_{it-1} + u_{1it} \quad (5)$$

$$\Delta F_{it} = c_2 + \sum_{j=1}^{T_{21}} \gamma_j \Delta F_{it-j} + \sum_{j=1}^{T_{22}} \lambda_j \Delta Y_{it-j} + \varepsilon_{fy} ECF_{it-1} + u_{2it} \quad (6)$$

in which y_{it} is a measure of economic growth of country *i* at time *t*, F_{it} is a measure of financial development of country *i* at time *t*, Δ denotes the first difference of variables, T_{kl} (for *k,l*=1,2) denotes the number of lags, c, α, β, γ, λ and ε are parameters; u_{lit}, *l*=1,2 are white noises, and finally ECY_{it-1} and ECF_{it-1} are error correction terms (ECT) that are obtained from estimating equations (3) and (4), respectively. The speed of adjustments of variables towards their long-run equilibrium are captured by ε_{yf} and ε_{fy}.

We use the above set up to determine the nature of long- and short-run Granger causality between economic growth and financial development. More specifically six different cases may arise:

1. if $\beta_j = 0 \ \forall$ j and $\varepsilon_{yf} = 0$, F does not Granger cause y;
2. if $\lambda_j = 0 \ \forall$ j and $\varepsilon_{fy} = 0$, y does not Granger cause F;
3. if (1) holds but (2) does not hold, Granger causality is unidirectional from y to F;

1. One might also conduct the IPS unit root test for the residuals obtained from the above regressions. In this case, the cointegration test is done twice. First, *yit*is treated as dependent variable and *Fit* as independent variable. Second, the status of these variables is changed and treat *Fit* as dependent variable and *yit*as independent variable. The IPS unit root test can be applied to estimated residuals of both models.

4. if (1) does not hold but (2) holds, there is unidirectional causality from F to y.
5. if both (1) and (2) do not hold, there is bidirectional Granger causality between y and F; and
6. if both (1) and (2) hold, there is no Granger causality between y and F.[1]

We use three different indicators to measure financial development. The first measure of financial development is the logarithm of the ratio of broad definition of money, M2 to nominal Gross Domestic Product, GDP denoted by LM2. This measure is used as a monetization variable. The logarithm of the ratio of financial saving[2] or quasi-liquid assets to GDP denoted by LFS is used as another financial indicator. This variable is a better measure for financial source of investment than M2. The logarithm of the ratio of credit to private enterprises to GDP denoted by LDC is used as the third measure of financial development. The basic assumption underlying this measure is that a financial system should allocate more credit to private firms, be more engaged in exerting corporate control, provide risk management services, mobilize savings, and facilitate transactions.[3] Finally, the logarithm of GDP per capita (LY) is used to measure economic growth.

Annual data for the period 1994-2008 are used for estimation. The data on financial development indicators and gross domestic product per capita for the Middle East countries are from World Development Indicators 2010 (WDI, 2010) published by the World Bank. Sample of countries consists of Bahrain, Egypt, Iran, Jordan, Kuwait, Libya, Oman, Qatar[4], Saudi Arabia, Syria, United Arab Emirates and Yemen.[5]

3. Empirical results

Prior to estimation we study the correlation between the variables under consideration. Table 1 reports the correlation coefficients between each pair of variables. As the results show there is positive relationship between each financial development indicator and the

1. Dinda *et al*. (2006, p.179-180). These authors use this approach in another context.
2. Financial saving is the difference between M3 and M1.
3. King and Levine (1993b)
4. For the case of Qatar, the data for year 2008 are prediction.
5. Exceptions are Lebanon and Iraq because of non-availability of data for these two countries.

economic growth index, LY. The biggest coefficient belongs to correlation between private credit, LDC and log of real GDP, LY.

However, positive correlation between financial development indicators and economic growth index does not always mean that there is a causal relationship between these two variables. Hence, we will examine the direction of causality between these variables. In order to avoid spurious regression for panel data model, we first conduct IPS panel data unit root test developed by Im, Pesaran and Shin (2003) to examine the stationarity properties of the data. As Table 2 shows all variables are integrated of order one, I(1).[1] Hence, we can use the Engle–Granger bivariate cointegration analysis to test whether the pairs of LY and financial development indicators are conitegrated.

Table 1. Correlation coefficients among variables

	LY	LM2	LFS	LDC
LY	1	0.01	0.17	0.53
LM2		1	0.81	0.55
LFS			1	0.70
LDC				1

Table 2. IPS panel unit root test

VARIABLES	IPS	
	Individual intercept	
	Level	First Difference
LY	1.39	-7.86*
LM2	-0.86	-6.77*
LFS	-1.3	-9.2*
LDC	0.003	-6.63*

* denotes the significance level at 1%

Table 3. Kao Panel cointegration test for individual intercept

Variables	ADF t-statistic values
LY,LM2	2.13(Prob=0.01)*
LY,LFS	2.48(Prob=0.006)*
LY,LDC	1.69(Prob=0.04)**

*, ** denote the significance level at 1%, 5% respectively.

In this paper, we use Kao panel cointegration test to examine the existence of long-run equilibrium relationship between the log of

1. The optimal lags for variables are determined by Schwarz criteria.

output and the log of financial development indicators. Table 3 reports the results of Kao cointegration tests for each pair of variables. As the table shows, the null hypothesis of no cointegration is rejected for the pair of variables (LY, LM2), (LY, LFS), and (LY, and LDC).[1]

Since all pairs of variables are cointegrated, we can now estimate our error correction models (i.e., equations 5 and 6). Equations (3) and (4) are estimated to obtain error correction terms. Hence, our dependent variable in equation (5) is LY and in equation (6) is one of financial development indicators.[2] Prior to our estimation we should choose appropriate estimation method.

In order to choose the estimation method for our panel data models, we conduct likelihood ratio test to examine the null hypothesis of redundant fixed effects. The results of this test are reported in Tables 5, 7, and 9. The results show that the null hypothesis is rejected for all cases. This means that we can used fixed effects method to estimate our error correction models.

More specifically, Generalized Least Square (GLS) method with cross-section Seemingly Unrelated Regression (SUR) and fixed effects in cross dimension is used to estimate Equations (5) and (6). This estimation technique allows us to control for problems of heteroscedasticity and correlation of observations. The estimation results are reported in Tables 4, 6 and 8.

The estimated coefficient of Error Correction Term (ECT) is used to examine the presence of long-run causality between economic growth and financial development. Tables 4, 6, and 8 show that when LY is dependent variable, all ECTs are statistically significant. When one of LM2, LFS, and LDC is used as dependent variable, the ECTs remaine statistically significant. This means that there is long-run bidirectional causality between financial development and economic growth.

In ordre to study the existence of short-run causality between variables, we should check whether the null hypotheses $H_0^1 : \beta_j = 0, j = 1,...,T$ and $H_0^2 : \lambda_j , j = 1,...,T$ can be rejected. If both hypotheses are rejected, there is short-run bidirectional causality between growth and financial development. If H_0^1 is rejected but H_0^2

1. We also conduct IPS unit root test on the residual obtained from the estimation of the long run model. This method also confirmed the result of Kao cointegration test.
2. LM2, LFS, and LDC.

is not rejected, there is unidirectional causality from economic growth to financial development and visa versa if H_0^1 is not rejected but H_0^2 is rejected, there is short-run unidirectional causality running from financial development to economic growth. If both H_0^1 and H_0^2 are not rejected, there is no short-run causality between the two variables. Hence, the nature of Granger causality between the two variables may be examined by testing the null hypotheses specifying relevant parametric restrictions on the estimated ECM.

Table 4 shows that regardless of whether LY or LM2 is dependent varaible, the correpsonding coefficient for the first lag of independent variable is significant.[1] This means that there is a bidirectional casulity between these two variables in the short run.

Table 4. Estimation of ECMs for LY and LM2

	Intercept	Δ LY(-1)	Δ LM2(-1)	ECT	*R2*	*DW*
Dependent: Δ LY	0.068(18.05)*	0.26(6.5)*	0.05(5.72)*	0.06(9.5)*	0.68	2. 1
Dependent: Δ LM2	-0.01(-155.8)*	0.11(204.2)*	0.19(52.5)*	-0.18(-162)*	0.99	2.2

The numbers in the paranthesis are t-ratios.
* Significant at one percent level.

As mentioned before, we also conduct likelihood ratio test to examine the null hypothesis of redundant fixed effects. The result of this test for the LM2 is reported in Table 5. As the result shows, the null hypothesis is rejected at 1% significance level. This confirms the use of fixed effects method to estimate our ECM.

Table 5. Redundant fixed effect test

Effect test	Dependent variable	statistic	d.f.	Prob
Cross-section F	Δ LY	3.13*	(11, 141)	0.00
Cross-section F	Δ LM2	10.86*	(11, 141)	0.00

Table 6 shows that regardless of whether LY or LFS is dependent varaible, the correpsonding coefficient for the first lag of independent variable and ECT are significant. This means that there is a bidirectional relationship between LY and LFS in short-ran.

1. We have estimated the models for different lag periods and the appropriate lag is chosen based on R-square and diagnostic tests such as DW. Given our relatively short period of time, the models with one lag give us the best estimation results.

Table 7 reports the result of (Chow test) likelihood ratio test of redundant fixed effects for the above model. It shows that the null hypothesis of redundant fixed effects for LFS model is rejected at 1% level and hence approves the use of fixed effects method.

Table 6. Estimation of ECMs for LY and LFS

	Intercept	Δ LY(-1)	Δ LFS(-1)	ECT	*R2*	*DW*
Dependent: Δ LY	0.06(19.8)*	0.26(13.8)*	0.06(44)*	0.05(6.4)*	0.95	2.1
Dependent: Δ LFS	0.005(1.89)*	-0.07(-3.08)*	-0.14(-4.7)*	-0.16(-13.7)*	0.84	2.09

The numbers in the paranthesis are t-ratios.
(*) Significant at one percent level.

Table 7. Redundant fixed effect test

Effect test	Dependent variable	statistic	d.f.	Prob
Cross-section F	Δ LY	13.5*	(11, 141)	0.00
Cross-section F	Δ LFS	36.39*	(11, 141)	0.00

(*) Significant at one percent level

Table 8. Estimation of ECMs for LY and LDC

	Intercept	Δ LY(-1)	Δ LDC(-1)	ECT	*R2*	*DW*
Dependent: Δ LY	0.07(15)*	0.2(3.91)*	0.02(4.64)*	0.05(4.34)*	0.38	2.07
Dependent: Δ LDC	0.002(1.2)	0.14 (5.97)*	0.23(5.97)*	-0.16(-8.67)*	0.82	2.06

The numbers in the paranthesis are t-ratios
(*) Significant at one percent level..

Table 9. Redundant fixed effect test

Effect test	Dependent variable	statistic	d.f.	Prob
Cross-section F	Δ LY	1.83**	(11, 141)	0.05
Cross-section F	Δ LDC	3.11*	(11, 141)	0.00

(*) and (**) Significant at 1% and 5% level respectively

The estimation resluts of ECMs for LY and LDC are reported in Table 8. As the results show, no matter whether LY or LDC is dependent varaible, the coefficients of the lagged independent variables are significant. Hence, our findings support the existence of short-run bidirectional causality between economic growth and the LDC.[1]

1. We also used the logarithm of the ratio of liquid liabilities M3 to nominal GDP denoted by LM3 as another financial indicator and estimated equations (5) and (6) for this variable as well. The problem is that the data for LM3 is not reported by WDI for most Middle East countries in the recent years. While our data set for all other variables covers the period 1994-

The results of Table 9 indicate that the null hypothesis of redundant fixed effects for (LY, LDC) model is rejected at 1% level and thus endorse s the use of fixed effects method to estimate our panel data error correction model for LDC.

To sum up, the above results support the existence of both the short- and long-run bidirectional causality between economic growth and the financial development indicators. Our findings show that y Granger causes F and F Granger cause y, which approve the presence of a feedback stochastic system for the Middle East.

The evidence of a bidirectional causal relationship between financial development and economic growth highlights the importance of finance for output growth. Likewise, economic growth is crucial in providing the necessary resources for financial depth.

4. Concluding Remarks

Using a panel data error correction model, we investigate the short- and long-run causality between financial development and economic growth in the Middle East. We use the ratio of broad definition of money to GDP, the ratio of liquid liabilities M3 to nominal GDP, the ratio of financial saving or quasi-liquid assets to GDP and the ratio of credit to private enterprises to GDP as four different indicators to measure the financial development.

Generalized Least Square (GLS) method with cross-section Seemingly Unrelated Regression (SUR) and fixed effects in cross dimension is used to estimate the models. Our estimation results suggest that there is bidirectional causality between the financial development indicators and economic growth in both the short - and long run. Thus, our findings underscore the feedback effects between LM2, LDC, and LFS and output growth in the Middle East. This result might have important policy implications for both policymakers and international institutions. Policymakers can promote economic growth and expect the output growth extends financial depth. Likewise, they can pay more attention to policies that bring about

2008, the data for LM3 was only available for the period 1994 to 2004. Since different time span might yield different estimation results we decided not to include the results of the estimation for LM3 in this paper. However, despite this limitation, we estimated our error correction model for LM3. The result showed that there is long run bidirectional casual relationship between LM3 and LY but, the short run causality were found to run from LM3 to LY. Those estimation results are not reported here but are available upon request.

financial development and expect them to bring about economic growth.

Finally, this research did not study the impact of a third variable, such as stock market indexes on the causal relationship between the variables. Since the stock markets are not well developed in the Middle East, we do not expect that the inclusion of this variable change our main findings regarding the causal relationship between LM2, LDC, and LFS and output growth in this region. However, one might extend our paper to include a third variable and conduct multivariate Granger causality tests to examine whether the presence of a third variable (such as stock market index) can also affect the overall results.

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