THE RELATIONSHIP BETWEEN FINANCIAL DEEPENING AND ECONOMIC GROWTH IN THE LONG-RUN AND SHORT-RUN AND CAUSALITY BETWEEN THEM: EMPIRICAL EVIDENCE FROM TURKEY
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Abstract

The aim of this paper is to analyze empirically the relationship between financial deepening and economic development in Turkey between 2001 and 2013. The central focus is that a high level of financial deepening is a necessary condition for accelerating growth in an economy. The cointegration analysis and error correction models are used to test the long-run relationship and short-run effects respectively. Then, Granger causality test is done to determine the direction of causality between the financial indicators and economic growth. The cointegration analysis shows that there is a long-run relationship between all the variables. The monetization ratio has positive effects and intermediation ratio has negative effects on economic growth in the long-run. The error correction model supports the long-run relationship between the variables and the variables return to their long-run values in a high speed of adjustment. There is causality from economic growth to financial deepening. This result supports the demand-following hypothesis.

Keywords: Financial deepening, economic growth, co integration, error correction model

JEL classification numbers: O11, F43, F33, C32

I- Introduction

The nexus and direction of the relationship between financial deepening and economic growth is a heated subject in the economic literature. The main functions of financial system are to increase financial resources available to the economy and to enable a more efficient use of those resources, i.e., to facilitate financial intermediation and its management. So, this process stimulates and accelerates economic growth. In this process, the degree to which an economy is bank-based or market-based does not matter much (Ray, 2009).

The financial deepening can be defined as the capacity or level of financial system to transfer funds to real sector and to mobilize national and international savings (Pınar and Erdal, 2016). The financial deepening is usually measured by two quantitative indicators:

1The views expressed in this paper are those of the author and do not necessarily represent the official views of the institution.
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monetization ratio and intermediation ratio. The monetization ratio includes money based indicators or liquid liabilities such as the ratio of money supply (M2 or M3) to Gross Domestic Product (GDP). The argument here is that the more liquid money is available to an economy, the more opportunities exist for continued economic growth. The intermediation ratio includes bank-based measures such as the ratio of total assets, deposits and credits to GDP and capital-based measures such as capitalization ratio of stock market. Higher values of financial deepening indicators show that funds are used efficiently in the real economy and this may affect economic growth positively. In other words, higher value of financial deepening is an indicator of the provision of financial services with wide choices directed to the development of economy at all levels.

The theoretical underpinnings of the financial deepening and economic growth nexus can be traced back to Schumpeter (1911), and more recently to Mackinnon (1973) and Shaw (1973). One of the most important contributions of Schumpeter (1911) is the identification of the importance of innovation as a key source of economic growth. Schumpeter (1911) states that the strategic stimulus to economic development is “innovation” defined as the commercial or industrial application of something new, i.e., a new product, process, or method of production; a new market or source of supply; a new form of commercial, business, or financial organization. The commercial application of a new idea often involves the acquisition and redirection of the employment of existing means of production. However, it cannot be financed from the revenues received in the stationary circular flow, because these are just sufficient to cover existing costs and depreciation. Therefore, innovations must be financed by new source of credit above and beyond the circular flow, namely, the commercial bank, the only private financial institution in the capitalist economy with the unique power to create new money, new purchasing power above current saving out of current income.

Financial resources are mobilized and channeled to economic activities by financial institutions or financial intermediaries who channel these financial resources from surplus economic units to deficit economic units. In doing this, they evolve appropriate structures necessary for the intermediation functions which they perform. Various studies have shown that there is a strong and positive relationship between the financial sector and economic development. Porter (1966) states that the level of financial institution development is the best indicator of general economic development. The theoretical literature on the nexus offers robust and plausible explanation regarding the channels through which financial development stimulates growth, but, the empirical literature still remains contentious and

While the causal relation between financial system and economic growth has been firmly established, some studies driving concerns to the direction of causality. Patrick (1966) states two hypotheses for the possible causal directions between financial development and growth. Firstly, a causal relationship from financial development to economic growth is called the supply-leading hypothesis. This suggests that increase in the supply of financial services leads to real economic growth. Secondly, a causal relationship from economic growth to financial development is called the demand-following hypothesis. This suggests that as the real economy grows, an increasing demand for financial services might induce an expansion of the financial sector.

Patrick (1966) also states a further hypothesis known as the stage-of-development hypothesis. This hypothesis states that the direction of causality between financial development and economic growth changes over the course of development. Here, the supply-leading momentum enables real investment in the earlier stages of economic development. The development of new financial institutions, financial services, products and other innovations promotes economic growth. As both financial and economic growth occurs, the supply-leading impetus becomes less important and the demand-following response becomes dominant. On the other hand, Stiglitz (1989) states that financial sector plays limited role in the development process even within well-organized developed countries and their role is likely to be even more circumscribed in less developed countries (LDCs).

Some of the empirical studies about developing countries can be summarised as follows: Obioesio and Atan (2015) shows that the impact of financial development on growth varies with the stage of development of the financial sector in Nigeria. Nzotta and Okereke (2009) shows that the low level of monetization of the economy, high inflation rate and non-performing private credits affect negatively the level of financial deepening in Nigeria. So, the low level of financial deepening leads to lack of provision of loans and credits to real sector of the economy. Iyare, Lorde and Francis (2005) examines the relationship between financial deepening and growth in Caribbean that includes Barbados, Grenada, Jamaica, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago. Iyare, Lorde and Francis (2005) shows that the relationship between financial
deepening and economic growth are country-specific and tends to vary with the kind of proxies used to measure financial development.

Regarding Turkey, Güneş (2013) examines the relationship between financial development and economic growth for the period from 1988 to 2000 using semiannual data. The ratio of money supply (M2Y) to Gross National Product (GNP) and the share of financial sector employment in total employment are used to represent the financial development level and growth rate of real GNP is used to represent economic growth. Güneş (2013) does not find any evidence that financial development is the cause of economic growth or economic growth is the cause of financial development. But, Güneş (2013) finds that economic growth is the cause of increase in the share of financial sector employment in total employment. Öztürk, Barışık and Darıcı (2010) examines the effects of financial deepening on economic growth using panel data for 10 countries including Turkey for the period from 1992 to 2007. Öztürk, Barışık and Darıcı (2010) finds that financial deepening indicators M3/GDP, bank credits/GDP and market capitalization ratio affect the growth of per capita income positively, but, M2/GDP and private credits/GDP affect the growth of per capita income negatively.

The aim of this study is to analyze the long-run and short-run relationship between financial deepening and economic growth as well as the causality between financial deepening and economic growth in Turkey. As compared to previous empirical studies about Turkey, the time period covered and financial deepening and economic growth variables used in this study are different from those used in the previous empirical studies. Besides, this research uses different data sources from the previous empirical studies. The structure of this study is organized as follows: The second part gives theoretical framework of the study. In the third part, methodology of study and data description and data sources are explained. In the fourth part, empirical results of the study are presented and discussed. The last part concludes the study.

II. Theoretical Framework

In the theoretical part of the study, a modified Solow model is used to see the effects of additional growth enhancing shift variables (Bhaskara, 2006). The production function can be written as follows:

$$Y_t = A_o e^{(g_1 + g_2 Z_t) K_t^\beta L_t^{1-\beta}}$$

where “$Y_t$” is output, “$A_o$” is the initial stock of knowledge, “$K_t$” is physical capital, “$L_t$” is labour, “$g$” is assumed a function of growth promoting shift variable “$Z$” and is also some
unknown trended variables proxied with time. So, the “Z” variable could be openness, foreign aid etc., or a vector of some growth improving variables. Let’s take logarithm of both sides of equation. So, the suggestions of this modification are as follows:

$$\ln Y_t = \ln A_o + (g_1 + g_2 Z_t) t + \beta \ln K_t + (1 - \beta) \ln L_t$$  \hspace{1cm} (2)

$$\Delta \ln Y_t = (g_1 + g_2 \Delta Z_t + Z_t) / + \beta \Delta \ln K_t + (1 - \beta) \Delta \ln L_t$$  \hspace{1cm} (3)

$$\Delta \ln y_t = (g_1 + g_2 (\Delta Z_t + Z)) / + \beta \Delta \ln k_t$$  \hspace{1cm} (4)

$$\Delta \ln y_t = g_1 + g_2 Z \text{ as } \Delta \ln k_t \text{ and } \Delta Z \gg 0$$  \hspace{1cm} (5)

If Z is trade openness, economic growth rate will be higher in more open economies in the long-run equilibrium. Let’s now consider non-linear form of this equation:

$$Y_t = A_o e^{(\beta_1 Z + \beta_2 \ln K_t + \beta_3 \ln L_t)}$$  \hspace{1cm} (6)

In equation (6), if Z is research and development expenditures, the economic growth rate will not perpetually increase with ever increasing research and development expenditures. So, it would be useful to use non-linear specification to see the effects of financial deepening on economic growth. Then, to examine the effects of financial deepening on economic growth the following equation is constructed:

$$\text{GROWTHRATEOFREALGDP}_t = B_0 + B_1 M2/GDP_t + B_2 \text{PRIVATECREDIT/GDP}_t + u_t$$

The dependent variable is the growth rate of real GDP. The independent variables and expected signs of the coefficients can be described as follows:

**M2/GDP**: The ratio of money supply (M2) to GDP shows the monetization ratio in the economy. The monetization ratio indicates the level of usage financial system by the economic actors. So, high monetization ratio affects economic growth positively. The sign of the coefficient is expected to be positive.

**PRIVATECREDIT/GDP**: The ratio of total credit to private non-financial sector to GDP shows intermediation ratio in the economy. It is expected that high intermediation ratio has positive effects on economic growth. High credit amount means more opportunities for real investments that may lead to higher economic growth. The sign of the coefficient is expected to be positive.
III. Research Method, Data Description and Data Sources

In the empirical part of the study, the relationship between the financial deepening indicators and growth rate of real GDP is analyzed in Turkey. The Johansen cointegration test is done if there is a long-term relationship between the variables and Error Correction Model (ECM) is estimated to see if there is short-term adjustment to return to long-run values. Then, Granger causality test is done to determine the direction of causality between the growth rate of real GDP and financial deepening indicators. The financial deepening indicators are monetization ratio and intermediation ratio. The data used in the empirical part is quarterly and covers the period from first quarter 2001 to fourth quarter 2013. The estimation equation is as follows:

\[ \text{GROWTH RATE OF REAL GDP}_t = \beta_0 + \beta_1 \frac{M2}{GDP}_t + \beta_2 \frac{PRIVATE CREDIT}{GDP}_t + u_t \]

In this equation, all the variables are in levels, because they are in the ratio form. The dependent variable is the growth rate of real GDP. Real GDP is calculated as nominal GDP/Consumer Price Index (CPI). Source: International Financial Statistics (IFS) of the International Monetary Fund (IMF). The construction of independent variables and their data sources can be described as follows:

- **M2/GDP**: The ratio of M2 to GDP. Source: M2 data is taken from the Federal Reserve Bank of St. Louis Economic Data (FREDII). The GDP data is taken from the IFS of the IMF.

- **PRIVATE CREDIT/GDP**: The ratio of credit to private non-financial sector to GDP. Source: Total credit to private non-financial sector data is taken from the Federal Reserve Bank of St. Louis Economic Data (FREDII). The GDP data is taken from the IFS of the IMF.

IV. Empirical Results

The cointegration analysis is done using the variables that are integrated in the same order and causality test is done using stationary variables. Therefore, firstly, all the variables are tested whether they have a unit root. The E-views econometric program is used in the empirical analysis.

IV.1 Unit Root Test

Each of the variable is tested using Augmented Dickey Fuller (ADF) test whether the variable has a unit root. The ADF test consists of regressing each series on its lagged value and lagged difference terms (Dickey and Fuller, 1981). The ADF test results are shown in
Table 1. The ADF test results show that the growth rate of real GDP, M2/GDP and PRIVATECREDIT/GDP have a unit root at their levels. Then, first differences of the variables are taken and ADF test is done again. The test results show that the first differences of the variables have no unit root. This means that they are not integrated of order (0) and integrated of order (1).

Table 1. ADF Unit Root Test Results

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Level</th>
<th>First Difference</th>
<th>Second Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>GrowthrateofrealGDP</td>
<td>-2.81***</td>
<td>-2.94**</td>
<td>-8.96*</td>
</tr>
<tr>
<td>M2/GDP</td>
<td>-0.39</td>
<td>-2.67***</td>
<td>-6.23*</td>
</tr>
<tr>
<td>PRIVATECREDIT/GDP</td>
<td>1.71</td>
<td>-5.27*</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: "***" shows that the variable is stationary at 1 %, "**" shows that the variable is stationary at 5 % and "*" shows that the variable is stationary at 10%. McKinnon critical values:
For total: -3.56 for 1%, -2.91 for 5%, -2.59 for 10%.

IV.2 Cointegration Analysis

The cointegration analysis is done using the Johansen test statistics trace and maximum eigenvalue (Engel and Granger, 1987). The cointegration test results for growth rate of real GDP and financial deepening indicators monetization ratio (M2/GDP) and intermediation ratio (PRIVATECREDIT/GDP) are presented in Table 2. The test results show that cointegration exists between the variables. The existence of cointegration between variables means that there is a long-run relationship between growth rate of real GDP, M2/GDP and PRIVATECREDIT/GDP.

Table 2. Cointegration Test Results

<table>
<thead>
<tr>
<th>Trace Statistic</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical Value</th>
<th>Probability***</th>
</tr>
</thead>
<tbody>
<tr>
<td>All the variables</td>
<td>0.50</td>
<td>51.75</td>
<td>29.79</td>
<td>0.00</td>
</tr>
<tr>
<td>None*</td>
<td>0.25</td>
<td>16.00</td>
<td>15.49</td>
<td>0.04</td>
</tr>
<tr>
<td>At most 1*</td>
<td>0.01</td>
<td>0.73</td>
<td>3.84</td>
<td>0.39</td>
</tr>
</tbody>
</table>

* denotes rejection of the hypothesis at the 0.05 level
** Trace test indicates 2 cointegrating equations at the 0.05 level

<table>
<thead>
<tr>
<th>Max-Eigen Statistic</th>
<th>Eigenvalue</th>
<th>Max-Eigen Statistic</th>
<th>0.05 Critical Value</th>
<th>Probability***</th>
</tr>
</thead>
<tbody>
<tr>
<td>All the variables</td>
<td>0.05</td>
<td>19.95</td>
<td>17.61</td>
<td>0.01</td>
</tr>
</tbody>
</table>
The estimation of cointegrating relationship for growth rate of real GDP, M2/GDP ratio and PRIVATECREDIT/GDP ratio are presented in Table 3. The sign of the M2/GDP ratio coefficient is positive and statistically significant as expected. The ratio of M2/GDP ratio indicates the monetization degree of the economy and the level of usage financial system by the economic actors. So, high M2/GDP ratio affects economic growth positively. The estimation results show that financial deepening measured by the monetization ratio has positive effects on economic growth in the long-run.

The sign of the PRIVATECREDIT/GDP ratio coefficient is negative and statistically significant. This result shows that financial deepening measured by the intermediation ratio has negative effects on economic growth in the long-run. Actually it is expected that intermediation ratio has positive effects on economic growth. Öztürk, Barışık and Darıcı (2010) also finds negative effects of credits to private non-financial sector on economic growth. The reason for this negative relationship can be explained as the private credits could be used in the areas that have no positive effects on economic growth. In other words, credits could be used in the non-productive sectors that have no positive effects on economic growth.

Table 3: Estimation of cointegrating relationship

<table>
<thead>
<tr>
<th>Dependent variable: Growth rate of real GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variables</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>M2/GDP</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>PRIVATECREDIT/GDP</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Note: "**" shows that the variable is significant at 5 % level. The values in the paranthesis are t-statistics. T- statistics table value (51, 0.05) = 1.6775.
IV.3 Error Correction Model

As a third step, the Error Correction Model (ECM) is estimated. The long-run relationship will be supported if the coefficient of the lag of the error correction model (ECM\(_{t-1}\)) carries a negative and statistically significant coefficient. Besides, the coefficient of ECM\(_{t-1}\) represents the proportion of disequilibrium in the variables in one period corrected in the next period. To do the ECM estimation, three period lags of the independent variables are included in the regression and it is estimated. The statistically insignificant variables are dropped from the regression and the statistically significant ones are kept in the regression and it is re-estimated. The residual of estimated equation is saved as ECM. Then, the regression using first difference of both dependent and independent variables and the lag of the ECM (i.e., ECM\(_{t-1}\)) are estimated. The estimation results of this regression in other words, ECM are given in Table 4. As can be seen in Table 4, the coefficient of ECM\(_{t-1}\) is negative and statistically significant in the regression that shows the cointegration is supported. The value of the ECM\(_{t-1}\) coefficient shows that the short-run dynamic converges to its long-run cointegrating relationship with a high speed of adjustment.

<table>
<thead>
<tr>
<th>Dependent variable: Δ Growth rate of real GDP</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ M2/GDP</td>
<td>-0.12**</td>
</tr>
<tr>
<td></td>
<td>(-2.85)</td>
</tr>
<tr>
<td>Δ PRIVATECREDIT/GDP</td>
<td>-0.008**</td>
</tr>
<tr>
<td></td>
<td>(-2.73)</td>
</tr>
<tr>
<td>ECM(_{t-1})</td>
<td>-1.75**</td>
</tr>
<tr>
<td></td>
<td>(-10.81)</td>
</tr>
<tr>
<td>R(^2)</td>
<td>0.76</td>
</tr>
<tr>
<td>DW statistic</td>
<td>1.84</td>
</tr>
</tbody>
</table>

Note: “Δ” shows the first difference of the variable. “**” shows that the variable is significant at 5 % level. The values in the paranthesis are t-statistics.

IV.4 Granger Causality Test

Granger causality test is done to see the direction of causality between the variables. Since Granger causality test is done using stationary variables, first differences of the variables are used in the causality test. In the Granger causality test, the lag length criteria is determined using Likelihood Ratio (LR) test statistic, Final Prediction Error (FPE), Akaike Information
Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ). Since the most accepted lag lengths by these tests is 3, the lag length is taken as 3 in the test. Granger causality test results (i.e., F-statistic values) are presented in Table 5.

### Table 5: Granger Causality Test Results

<table>
<thead>
<tr>
<th>Pairwise Granger Causality Tests</th>
<th>F-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔM2/GDP does not Granger cause ΔGrowth rate of real GDP</td>
<td>2.84</td>
</tr>
<tr>
<td>ΔGrowth rate of real GDP does not Granger cause ΔM2/GDP</td>
<td>9.17*</td>
</tr>
<tr>
<td>ΔPRIVATECREDIT/GDP does not Granger cause ΔGrowth rate of real GDP</td>
<td>3.08</td>
</tr>
<tr>
<td>ΔGrowth rate of real GDP does not Granger cause Δ PRIVATECREDIT/GDP</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Not: “Δ” shows the first difference of the variable. F-table value (1, 51): 4.04. “*” shows that the value is greater than the F-table value.

As can be seen in Table 5, there is unidirectional causality from the growth rate of real GDP to monetization ratio (M2/GDP). In other words, this result shows that there is a causality from the growth rate of real GDP to financial deepening. This causal relationship from economic growth to financial deepening supports the validity of demand-following hypothesis in Turkey. As the real economy grows, an increasing demand for financial services may lead to expansion of financial sector. On the other hand, any causality does not found between the growth rate of real GDP and intermediation ratio (PRIVATECREDIT/GDP). This test result is also interpreted as the private credits to non-financial sector are used in the sectors that have no positive effects on economic growth.

### V. Conclusion

This paper analyzed empirically the relationship between financial deepening and economic growth in the long-run and short-run as well as causality between financial deepening and economic growth between 1st quarter 2001 to 4th quarter 2013. To do that, cointegration analysis, error correction models and Granger causality test are used. The empirical results indicate the existence of cointegration between financial deepening indicators and economic growth. This means that there is a long-run relationship between the growth rate of real GDP, monetization ratio and intermediation ratio. The monetization ratio has positive effects on economic growth in the long-run as expected. This result could be interpreted as financial deepening measured by the monetization ratio has positive effects on economic growth in the long-run. On the other hand, the ratio of credit to private non-financial sector to GDP or intermediation ratio has negative effects on economic growth in the long-run contrary to expected. The reason for this negative relationship can be explained as the private credits...
could be used in the non-productive activities or sectors that have no positive effects on economic growth. So, policy makers should ensure the channeling of private non-financial credits to real sector that would support and increase economic growth in Turkey.

The ECM results show that the short-run dynamics converge to their long-run values with a high speed of adjustment. Granger causality test shows that there a unidirectional causality from economic growth to financial deepening measured by monetization ratio. The causality from economic growth to financial deepening supports the validity of demand-following hypothesis in Turkey. As the real economy grows, an increasing demand for financial services may lead to expansion of financial system. On the other hand, no causality is found between intermediation ratio and economic growth.

Consequently, it could be said that economic growth is a driving force for higher financial deepening in Turkey. The private credits are not used effectively in the economy to promote the economic growth. So, in order to increase and sustain the economic growth, the policy makers should take necessary precautions to guarantee the use of private credits in the productive sectors that would support the economic growth. Further research could be to examine the usage of private credits. In which sectors, private credits are mostly used and how these credits should be directed to sectors that would support the economic growth?

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