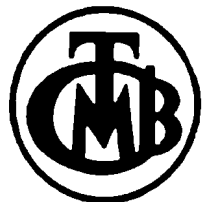*Research Department Working Paper*   *No:3*

THE CAUSALITY BETWEEN FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: THE CASE OF TURKEY
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Abstract

This study investigates the direction of the causal relationship between the financial development and economic growth in Turkey. The Granger non-causality tests are applied for two different conditions (non-stationary and non-cointegrated variables, and non-stationary and cointegrated variables) using five different proxies for financial development. For the series, which have a unit root and not lead to a cointegrating relationship, the traditional Granger non-causality test is applied in a vector auto regression (VAR) context, after making the non-stationary series stationary. When the variables are non-stationary, integrated of the same order and lead to a cointegrating relationship, Granger non-causality test is applied using the cointegration and the vector error correction methodology (VECM). The empirical findings in the paper suggest that, in the short-run, except for one of the proxies used, causality runs from financial development to economic growth. In the long-run, the test results in the context of VECM for the coefficients of all cointegrated series show a two way causality between financial deepening and economic growth. In the empirical analyses, time-series data was used for the period 1970-2001.

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I. INTRODUCTION

Patrick (1966), who first introduced the idea of the bi-directional relationship between financial development (FD) and economic growth (EG), suggested two patterns in the relationship between financial development and economic growth. In the first pattern, which is called "supply-leading", FD causes EG by allocating resources to more productive sectors. Patrick explains the functions of the supply-leading phenomenon as follows: "to transfer resources from the traditional, low-growth sectors to the modern, high-growth sectors and stimulate an entrepreneurial response in these modern sectors".

In the second pattern suggested by Patrick, called "demand-following", economic growth creates demand for developed financial institutions and services. According to Patrick, the creation of modern financial institutions, their financial assets and liabilities and related financial services are a response to the demand for these services by investors and savers in the real economy.

Since Patrick, a large empirical literature emerged testing the causal relationship between FD and EG. The main finding of these studies was the strong positive correlation between the financial structure and rate of growth of the economy. The relevant literature can be found in the detailed surveys of Levine (1997) and Tsuru (2000).

Levine (1997), after reviewing many studies on the relationship between FD and EG, states that broad cross-country comparisons, individual country studies, industry-level analyses, and firm-level investigations point in the same direction: the functioning of financial systems is important for economic growth. According to the survey results, countries with larger banks and more active stock markets grow faster over subsequent decades even after controlling for many other factors underlying economic growth. Furthermore, according to these results, industries and firms that rely heavily on external financing grow disproportionately faster in countries with well-developed banks and securities markets than in countries with poorly developed financial systems. Levine also emphasizes that there exists a less-developed theoretical literature on the influence of the level and growth rate of the economic activity on the financial systems, and this is an area that needs additional theoretical research.

Recently, there are mainly three approaches in testing for the correlation between FD and EG. One approach is to test the hypothesis on a group of countries by using either cross-section or panel data techniques (King and Levine 1993, La Porta, Lopez-de-Silanes, Sheifer and Vishny, 1997, Levine 1998). Another approach is to present industry-level or firm-level evidence that measures this correlation (Rajan and Zingales 1998, Demirgüç-Kunt and Maksimovic, 1998). The third approach is to test the hypothesis for a particular country

using time series techniques (Kar and Pentecost 2000), which is also the approach used in this paper.

The aim of this study is to examine the relationship between financial development and economic growth for Turkey. The study is carried through the causality analyses, carrying out regressions and testing of the various hypotheses.

In the second part, the models, data and methodology that employed in the analysis are introduced. In the third part, the magnitude and the direction of the casual relationship between the financial and real growth will be investigated for Turkey. Finally, these results will be evaluated.

II. DATA, MODEL AND METHODOLOGY

The annual data of the Turkish economy for the period 1970-2001 is used in the empirical analysis. GNP (gross national product) at current and 1968 prices was obtained from the State Institute of Statistics, other data were derived from the Quarterly Statistical Bulletins of the Central Bank of Turkey. The domestic credit and private credit extended by the deposit banks[1] were used instead of total private and domestic credits as they are the available data for the time period and constitute more than 90 percent of the total.

The Granger non-causality tests are applied using five commonly used proxies for financial development, which were also used in the work by Kar and Pentecost (2000) for Turkey[2]. These proxies are: domestic credit as a ratio of GNP, **LDCG**; private credit as a ratio of GNP, **LPCG**; private credit as a share of domestic credit, **LPCDC;** broad money supply (M2Y) as a ratio of GNP, **LM2YG;** and total deposits as a ratio of GNP, **LTLDG**. These proxies are considered in turn. The economic growth is proxied by the change in per capita GNP at constant prices, denoted by **DLPCI**. All variables are in logarithmic forms.

The first step is to estimate a simple bi-variate VAR model, using a proxy for FD and the proxy for the EG. If both of these variables are found out to be I(1), we search for a cointegrating relationship between these variables. If there is no cointegrating relationship, we make the variables stationary by first differencing and test for non-causality in a VAR context. Finally, for non-stationary variables and a cointegrated relationship, we estimate a vector error correction model and again test for Granger non-causality in this context.

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[1] Private credit is the credit extended only to the real sector, whereas domestic credit also includes credit to the financial sector.

The VAR model to be used in our analysis is:

$$EG_t = \mu_1 + \pi_{11.1}FD_{t-1} + \pi_{12.1}FD_{t-2}+\ldots+ \pi_{1p.1}FD_{t-p}+ \pi_{11.2}EG_{t-1} + \pi_{12.2}EG_{t-2} +\ldots+ \pi_{1p.2}EG_{t-p} + e_{t1}$$

$$FD_t = \mu_2 + \pi_{21.1}FD_{t-1} + \pi_{22.1}FD_{t-2}+\ldots+ \pi_{2p.1}FD_{t-p}+ \pi_{21.2}EG_{t-1} + \pi_{22.2}EG_{t-2} +\ldots+ \pi_{2p.2}EG_{t-p} + e_{t2}$$

where p is the order of the VAR, μ is the constant term, FD denotes financial development and EG denotes economic growth.

If variables are non-stationary, say I(1), it may be helpful to take the first difference of the variables to make them I(0) and then use the differenced variables in the VAR. However, if the I(1) variables are cointegrated, by differencing the variables, there will be loss of important and useful information about the long-run relationships. Omitting the cointegrating combination is a specification error in a VAR in first differences and in addition, such a VAR provides no information about the long-run which is often considerable interest to economists (Patterson, 2000).

A vector error correction model (VECM) is a restricted VAR designed for use with non-stationary variables that are known to be cointegrated. VECM specification restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics.

The VECM corresponding to our situation is

$$\Delta EG_t = \delta_1 + \gamma_{11.1}\Delta FD_{t-1} + \gamma_{12.1}\Delta FD_{t-2}+\ldots+ \gamma_{1p-1.1}\Delta FD_{t-(p-1)}+ \gamma_{11.2}\Delta EG_{t-1} + \gamma_{12.2}\Delta EG_{t-2} +\ldots+ \gamma_{1p-1.2}\Delta EG_{t-(p-1)} + \alpha_1 EC_{t-1} + \epsilon_{t1}$$

$$\Delta FD_t = \delta_2 + \gamma_{21.1}\Delta FD_{t-1} + \gamma_{22.1}\Delta FD_{t-2}+\ldots+ \gamma_{2p-1.1}\Delta FD_{t-(p-1)}+ \gamma_{21.2}\Delta EG_{t-1} + \gamma_{22.2}\Delta EG_{t-2} +\ldots+ \gamma_{2p-1.2}\Delta EG_{t-(p-1)} + \alpha_2 EC_{t-1} + \epsilon_{t2}$$

where EC is the error correction term, p is the order of the VAR, which translates into a lag of p-1 in the VECM. For example, when the order of the VAR is one, we have no lagged difference terms in VECM. In this case the only right hand side variable is the error correction term.

Short-run dynamic adjustments are captured by nonzero values for the γ's. In this model, the sources of causation can be investigated using three different tests. The first one is a joint test applied to the lags of the coefficients of each variable seperately in each equation above, that is $\gamma_{ii.1}$'s in the first equation and $\gamma_{ii.2}$'s in the second equation, in turn.

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[2] In this study, different from that of Kar and Pentecost, the domestic credit volume does not include loans to the government (treasury bills and bonds). Secondly, this study covers the period 1970-2001, whereas the analysis by Kar and Pentecost covers the period 1963-1995.

The second test is a t-test on the coefficient of the lagged error correction term α, for each equation, which is in fact, a weak exogeniety test. A significant coefficient for the error correction term indicates a long-run relationship between the variables. The last test is a joint test of both $\gamma_{ii.1}$'s and α_1 in the first equation and $\gamma_{ii.2}$'s and α_2 in the second equation.

III. EMPIRICAL RESULTS

Table.1 represents the unit root test results for each variable. In applying the unit root tests, the Dickey-Fuller approach is used. For these series, we also tested whether constant term and time trend belongs in the data generating processes (DGPs). Using the t-tests and F-tests and the relevant Dickey-Fuller distributions, we did not find significant deterministic terms in the DGPs.

All of the variables are found out to be non-stationary for the 5 percent level of significance. Under the assumption of one unit root, we apply the unit root test procedure to the first differences of the data and we do not find second unit roots.

Table 1. Unit Root Tests

	τ_τ	τ_μ	τ	results	
DLPCI	-2.3120	-2.4722	-1.4547	unit root	no 2nd unit root
LPCG	-3.1123	-2.8493	0.20274	unit root	no 2nd unit root
LDCG	-1.1436	-1.5028	-0.14985	unit root	no 2nd unit root
LPCDC	-2.4149	-1.3569	0.9585	unit root	no 2nd unit root
LTDG	-1.5443	0.59567	1.8268	unit root	no 2nd unit root
LM2YG	-1.2908	1.4756	1.8107	unit root	no 2nd unit root

As VECM specification only applies to cointegrated series, we run the Johansen cointegration approach. In this particular situation, we have a bi-variate model, so, we have two possibilities: one cointegrating relationship or no cointegration.

Johansen suggests two test statistics to determine the cointegration rank. The first one is known as the trace statistic and the second one is known as λmax test (maximum eigenvalue test). For both of these LR test statistics the asymptotic distribution depends upon the deterministic terms included in the VAR, and do not have the usual χ2 distribution. It is necessary to apply a sequence of tests to establish the cointegrating rank. The non-standard critical values are from Osterwald-Lenum (1992), which is also provided by the EVIEWS program.

After applying the Johansen test procedure to the data, we cannot find a cointegrating relationship between the pairs DLPCI-LTDG and DLPCI-LPCDC. The cointegration test results for the other three pairs (cointegrated at 5 percent level of significance) are presented below. Furthermore, the relationship between EG and FD is found to be positive in each cointegrating vector.

Table 2. Cointegration Tests

		cointegration test		results
		trace test	max. eigen value test	
DLPCI-LPCG	r=0	24.21356	22.75391	cointegrated
	r=1	1.459648	1.459648	
DLPCI-LDCG	r=0	26.40271	20.99926	cointegrated
	r=1	5.403449	5.403449	
DLPCI-LM2YG	r=0	23.39507	19.63606	cointegrated
	r=1	3.75901	3.75901	

As a final step, we start testing for non-causality. First, we test for the non-causality between the non-stationary but non-cointegrated variables. We first difference each series in order to make each variable stationary. The order of VAR for each pair is selected by using the relevant information criteria and Adjusted LR statistics. Then we test for the joint significance of the coefficients of the lagged variables using an LR test. Table.3 indicates the results of the block non-causality tests. The outcome of these tests indicates different results for the two the proxies DLTDG and DLPCDC.

Table 3. Tests for the Direction of Causality, Non-Cointegrated Variables

	order	test of non-causality		direction of causality
		direction 1	direction 2	
DDLPCI-DLTDG	var(2)	7.3546	3.8160	financial dev. to growth
DDLPCI-DLPCDC	var(4)	2.1038	10.6388	growth to financial dev.

The next step is to test for the causality between the cointegrated variables. We first test for the significance of the error correction term by using a t-test, secondly, we test for the joint significance of the lagged variables and finally we test for the joint significance of both the lagged variables and the error correction term.

Table 4. Tests for the Direction of Causality, Cointegrated Variables

	t-ratio for EC		χ2 for lagged coef.s		χ2 for both		direction of causality
	direction		direction		direction		
	1	2	1	2	1	2	
DLPCI-LPCG	-4.710	-2.253	31.449	1.869	36.451	14.077	two way causality in the LR and from FD to EG in the SR
DLPCI-LDCG	-3.166	-4.858	11.558	0.310	20.794	9.723	two way causality in the LR and from FD to EG in the SR
DLPCI-LM2YG	-5.150	1.941	-	-	-	-	two way causality in the LR

As the order of the VAR is one in the LM2YG case, we are able only to test for the coefficient of the error correction term. At the 5 percent level of significance, empirical results indicate a two-way causality between FD and EG in the long-run. In the short-run, according to the results above, except for one of the proxies of FD, the causality seems to run from FD to EG.

IV. CONCLUSION

The performance of the financial intermediation plays an important role in real economic activity in all countries in the world, and also in Turkey. Recent experiences in Turkey showed that, the deregulation and the fragility of the banking sector can be very costly for the real economy especially during and after the financial crises. Like other countries in the world, also in Turkey, a healthy banking sector has been assumed to contribute to the growth of the economy.

In this paper, the direction of causality between the financial development and economic growth is investigated for Turkey for the period 1970-2001. The Granger non-causality tests are applied for two different conditions (non-stationary and non-cointegrated variables, and non-stationary and cointegrated variables) using different proxies for financial development.

The empirical results show that, except for one of the proxies, financial development significantly causes economic growth in the short-run, and in the long-run, there is a bi-directional relationship between financial development and economic growth. In other words, the Turkish case supports the supply-leading phenomena in the short-run and both the supply-leading and the demand-following cases (mutual causality) in the long-run.
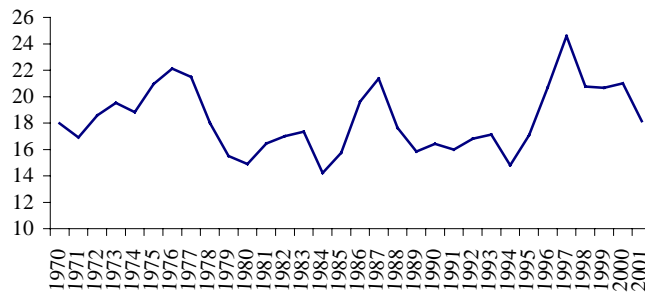
Plots of the Data

**Difference of the Per Capita Income
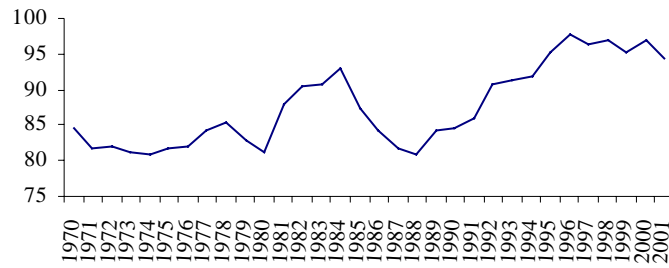(in 1968 constant prices)**
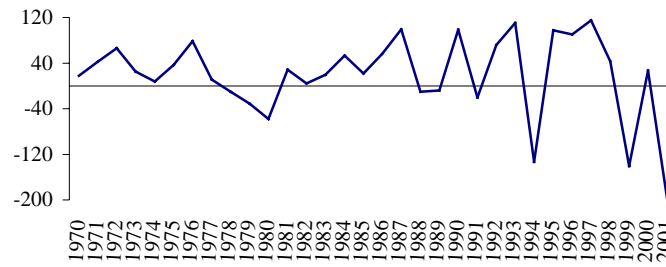
**Private Credit Extended by the Deposit Banks as a ratio
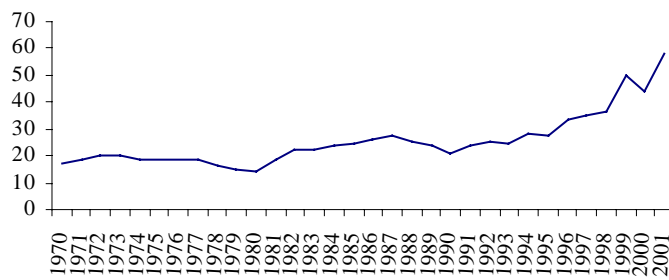of GNP (percentage)**
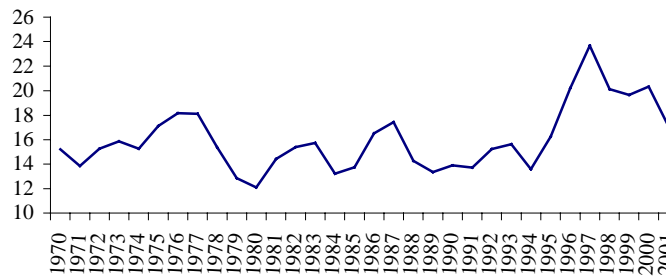
**Domestic Credit Extended by the Deposit Banks as a
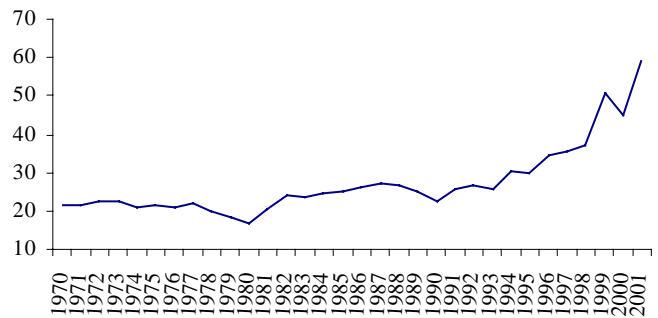ratio of GNP (percentage)**

**Private Credit as a share of Domestic Credit
(percentage)**

Total Deposits as a ratio of GNP (percentage)

Broad Money (M2Y) as a ratio of GNP (percentage)

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