International Journal of Economic Perspectives, 2009, Volume 3, Issue 2, 107-119.

Financial Development and Investment: Cointegration and Causality Analysis for the Case of Turkey

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ABSTRACT

The purpose of this study is to investigate the causality between investment and financial development in Turkey both in the short and long-run. The study employs two analytical tools in investigating the causal link between investment and financial development. While the Dolado and Lutkepohl (1996) causality test technique is utilized as the methodological tool for the short-run, the study makes use of Bounds Testing Approach to Cointegration for measuring the long-run relation between financial development and investment. Since previous literature highlights the sensitivity of the results to the choice of proxies, the study employs several different proxies for both financial development and investment in the analysis. Quarterly data covering 1987-I to 2007-I period is employed. The study finds a strong relationship between investment and financial development in the long run. The short-run causality analysis suggests that both private investment and gross investment have a bidirectional causal relation with financial development while the causality runs from government investment to financial development.

JEL Classification: O11.

Keywords: Financial Development; Investment; Cointegration: Causality, Turkey.

1. INTRODUCTION

Various economic theories have been put forward justifying the relationships between financial development and other economic variables such as; financial development and economic growth (e.g. Jung,1986; Roubini and Sala-i-Martin, 1992; King and Levine, 1993; Levine and Zervos, 1993; Rajan and Zingales 1998; Demirgüç-Kunt and Maksimovic, 1998; Tample. 1999; Luintel and Khan,1999; Levine, 1997; Stulz, 2001; Morales, 2003; Rioja and Valev, 2004) , financial development and either international trade or openness (e.g. Levine and Renelt, 1992; Beck, 2002), institutional structure and financial development (e.g. Beck and Levine, 2002; La Porta et al. 1998; La Porta et al. 2002) and financial development and political economy (e.g. Pagano and Volpin, 2001; Rajan and Zingales, 2003). Overall, the bulk of the research has been in trying to show a casual relation between financial development and economic growth. In addition to this direct link implied by financial development and economic growth, there is another possible avenue that financial development may be connected with economic growth via indirect way. The link between financial development and physical capital formation is the other link or the indirect link that should be addressed. Being paid relatively little attention by scholars from both theoretical and empirical spheres of economic literature, the link between financial development and investment may delineate another important avenue and this study is aimed at inquiring the existence of such links for Turkey.

The theoretical framework focusing on the positive effects of financial development over

economic performance dated back to Schumpeter (1911) and was rediscovered and became the empirically popular theme with studies of Goldsmith (1969). McKinnon (1973), Shaw (1973) and King and Levine (1993). Opposed to the traditional growth theories, endogenous growth models could incorporate financial development into growth process by allowing the possibility that the developments in financial structure would stimulate savings, increase the quality and quantity of physical capital formation and improve the efficiency of intermediation activities (Pagano, 1993) which in turn may promote entrepreneurship (Rajan and Zingales, 1998).

The endogenous growth framework differentiates and internalizes the possible ways that outline explicitly the transmission mechanism through which the financial development interacts with real variables within an economic system. One possible system incorporating such a mechanism would be the effects of the financial development over private physical capital formation or private investment. In neoclassical investment theory, private investment is characterized as a function of costs of capitals, and the theory asserts that the elasticity of private investment with respect to the costs of capital is negative. In connecting this issue with financial development, the main argument proposed by McKinnon (1973) and Shaw (1973) asserts that as financial markets deepen the cost of capital will decline because the institutions in financial markets will reduce asymmetric information problems which in turn would stimulate investment. This mechanism describes the questions addressed by this research. The purpose of this paper is to research these mechanisms: in particular, this study is aimed at investigating short and long term effects of financial development over investment for Turkey by using time series methodology.

Although there is a large body of studies linking financial development and economic growth, the link between financial development and investment is not a fertile research ground. Only few studies took this road and examined the link (Ndikumana, 2001). Schich and Pelgrin (2002) provide evidence that financial development is significantly related to investment levels using a dynamic panel error correction approach. Additionally, Carlin and Mayer (2003) investigated for different countries the relationship between the structures of countries' financial systems and how the characteristics of industries related to growth and investment of different industries, and they provided some evidence that there is a link between the financial system, investment and economic growth.

The liberalization effort which has been a noticeable economic agenda since late 1980s has had significant economic and financial implications. With these liberal reforms, the Turkish financial system transformed from a repressed system to a liberal and comparably well financial system. Although there has been more than two decades since the initiation of financial liberalization reforms in Turkey, the studies over financial development and economic growth started to only flourish in the late 90s. One of the earliest empirical studies was Darrat (1999) and the study found unidirectional causality running from financial development to economic growth. This result is consistent with Halicioglu (2007). However, in other studies (for example, Demetriades and Hussein; 1996; Al-Awad and Harb, 2005), the direction of causality is found to be running from economic growth to financial development. These results are contradictory, the main reason is due to fact that the financial development and economic growth nexus for Turkey is sensitive to the choice of proxies used as measuring financial development (Kar and Pentecost, 2000; Boulila and Trabelsi, 2004).

Although the intuitive premise with financial development is intrinsic to increasing physical capital stock, this intuition has not given enough motivation to scholars in the economic and financial disciplines. The inadequate treatment of this issue in the literature is the main motivation of this study. Although the financial repression has been eliminated and the liberal financial intermediary system gained significant know-how and professionalism, the tangible results of such transformation have not been studied adequately. Therefore, we believe this study will at least partially fulfill this gap and may contribute to the empirical literature. Therefore, this study is aimed at focusing on both the dynamic behavior and causality links for financial development and physical investment by employing a recently developed econometric time series techniques by using quarterly data for Turkey covering 1987-1 to 2007-1 period.

This paper is organized as follows. In the next section, we present the data and the research method and also briefly explain possible shortcomings due to data and methodology. In section 3, the study explains Pesaran et al. (2001)'s the bounds testing cointegration approach and Dolado and Lutkepohl (1996) Causality test. In section 4, we provide the results of the tests. In the final part, we interpret the results and give some policy recommendations.

2. THE MODEL, DATA AND RESTRICTIONS

In the empirical literature, the relationship between financial development and investment is described by using a regression equation:

$$\ln Inv_t = \alpha + \beta \ln FD_t + \varepsilon_t \qquad (1)$$

where Inv is the investment. FD is the indicator of financial development, and ε is the error term. As observed from the equation, in order to acquire a stationary variance for the model, we take natural logarithm of the series.

The study is based on quarterly data covering the time period 1987:1- 2007:1. We also added seasonal dummies to consider seasonality in the estimation of the models. The data for the investment is derived from the Electronic Data Distribution System (EVDS) of the Central Bank of the Republic of Turkey. The data for financial development indicators was obtained from the International Financial Statistics (IFS) of the International Monetary Fund.

We analyze the relationship between investment and financial development by using three investment indicators and six financial development indicators. The proxies for investment are as follows:

- GFCF: the ratio of gross fixed capital formation to nominal GDP.

- GINV: the ratio of government investment to nominal GDP.

- PINV: the ratio of private investment to nominal GDP.

Choosing an appropriate empirical measure of financial development is crucial for empirical analysis. In order to control some of the problems that can be caused during the indicator selection procedure, we employed six different indicators so as to at least partially avoid such problems. These six indicators are consistent with previous studies aimed at linking financial development with other economic variables. These proxies for financial development are as follows:

- M2Y: the ratio of money (IFS line 35) to income,

- BDY: the ratio of banking deposit liabilities (IFS line 24+25) to income (IFS line 99B),

- DCY: the ratio of domestic credit (IFS line 32) to income,

- PCY: the ratio of private sector credit (IFS line 32d) to income,

- PCDC: the share of private sector credit in domestic credit (line 32d/line 32),

- LLY: the ratio of liquid liabilities (line 34+35) to income.

In this study, only quarterly data is used for the period 1987:1 to 2007:1. Since we use Turkish quarterly data, the result is based on Turkey for the specified period and on specified time frequency. Therefore, the result may not be generalized for other countries.

3. ECONOMETRIC METHODOLOGY

Our empirical analysis consists of the following two steps. First, we test for cointegration relationships among the variables of interest in the long-run. Second, by using the Granger causality test, we analyze the short run dynamics and causal relation between the variables.

The long run or cointegration relation is investigated by using Autoregressive Distributed Lag (ARDL) approach. The ARDL approach known also as the bounds testing approach to cointegration was developed by Pesaran et al. (2001). Pesaran et al. (2001) pointed out the advantages of this approach over other cointegration tests (i.e. Engle and Granger (1987) and Johansen and Juselius (1990)). While the other cointegration methods concentrate on cases in which the variables are integrated at the same order (and most of the order one), the bounds testing approach could be implemented without such a requirement. In other words, the test does not depend on the integration order (i.e. whether the variables are purely I(0), purely I(1), or mutually integrated). This means pre-testing analysis (which is a must in other tests) to determine the order of integration of the variables is not required. Finally, Pesaran and Shin (1999) indicated that the ARDL approach performs better with small sample sizes. It also yields consistent estimates of the long-run parameters asymptotically distributed as standard normal irrespective of whether the underlying variables are I(0) or I(1).

The bounds testing approach involves estimating the following ARDL version of equation (1):

$$\Delta \ln Inv_t = \alpha + \sum_{i=1}^{p} \omega_k \Delta Invy_{t-i} + \sum_{i=0}^{p} \lambda_k \Delta \ln FD_{t-i} + \delta_1 \ln Inv_{t-1} + \delta_2 \ln FD_{t-1} + u_t \qquad (2)$$

where $\Leftarrow$ is the difference operator, p is the lag length, and u_t is serially uncorrelated error term.

The ARDL procedure involves two stages. In the first stage, the null hypothesis of no-cointegration relationship in the long-run defined as $H_0 : \delta_1 \copyright \delta_2 \copyright 0$ is tested against $H_1 : \delta_1 \gamma 0, \delta_2 \gamma 0$. Testing the cointegration relationship is based on the F-statistic that the asymptotic distribution of this F-statistic is non standard irrespective of whether the variables are I(0) or I(1). Pesaran et al. (2001) have therefore produced two sets of critical variables. One set assumes that all variables are I(0) and the other set assumes that all variables are I(1). This provides a bound covering all possible classifications of the variables. If the calculated F-statistics lies above the upper level of the bound, H_0 is rejected, indicating a cointegration relationship in the long-run. If the calculated F-statistic lies below the lower level of the bound, H_0 can not be rejected, supporting a lack of cointegration. If the calculated F-statistic falls between the bounds, then the test becomes inconclusive. In the case of inconclusive results, the error-correction term in the ARDL model is used to determine the existence of cointegration. If a negative and significant error-correction term is obtained, the variables are said to be co integrated.

The existence of a cointegration relationship among the variables indicates that Granger causality should exist in at least one direction (Engle and Granger, 1987). To test causality relationships among the variables, we used modified Wald (MWALD) test developed by Dolado and Lutkepohl (henceforth, DL) (1996). The main advantage of this causality test is that the preliminary unit root analysis is not necessary, similar to the bounds testing approach, since the estimated model is robust to the type of integration and cointegration properties exhibited by the data (Booth and Ciner, 2005).

The Granger causality test requires carrying out zero restrictions on VAR coefficients using familiar χ^2 or F-tests based on the Wald principle. The presence of I(1) variables in the VAR model may cause nonstandard asymptotic distribution of these statistics. Particularly, Wald tests for Granger causality may result in nonstandard limiting distributions based on the cointegration properties of the system and possibly on nuisance parameters.

These nonstandard asymptotic properties of the test of the zero restriction on cointegrated VAR processes are due to the singularity of the asymptotic distributions of the estimators (Lutkepohl and Kratzig, 2004). The DL causality test overcomes this singularity problem by adding an additional lag to the true order of the VAR model. The testing procedure involves two steps. Firstly, a VAR (k) is determined by a model selection criterion such as the Schwarz Bayesian Criterion (SBC). Secondly, a VAR(k +1) is estimated and then the standard Wald test is applied on the first k lags.

4. EMPIRICAL FINDINGS

The first step in the bounds testing approach is to carry out the F-test on selected ARDL models including appropriate lag lengths. Since the cointegration analysis is very sensitive to the number of lags employed in the model (Bahmani-Oskooee and Brooks, 1999; Bahmani-Oskooee et. al. 2006; Bahmani-Oskooee and Harvey, 2006), the lag selection process requires a systematic workout. In the lag selection procedure, we follow Jonhston and DiNardo's (1997: 250) suggestions and impose the maximum 5 lags on the level of variables for quarterly data. The other important choice in the cointegration analysis is about whether the cointegration equation includes a time trend or not (Pesaran et al., 2001). In this aspect, we follow Narayan and Narayan (2008) and use standard information criterions in specifying our model. To this end, we utilize both the AIC and SBC criterions according to which in most cases allow deterministic trend in most of the cases. In order to interpret the results in consistent and compatible way, we choose to include deterministic trends for all models.

The F-statistics for cointegration analysis are reported in Table 1, 2, and 3. The results show that there is at least one lag order at which the calculated F-statistic exceeds the upper bound critical value, supporting cointegration relationship among the variables in the long-run.

In order to assess the long-run impacts of financial development on investment, we estimated the long-run cointegration equation and the results are illustrated on Table-4. Although most of the estimated long-run parameters for GFCF and GINV are insignificant, all the estimated long-run elasticities for PINV with respect to financial development are found to be statistically significant. Regarding diagnostic tests all of the models, with a few exceptions, pass through the diagnostic checking. Accordingly, serial correlation, functional misspecification, non-normality, and heteroscedasticity do not pose any problems in the estimates.

In Table 4, although both GFCF and PINV are found to be negatively correlated with most of the financial development indicators, the sign of the

correlation for GINV is found to be positive. The negative relationship between some of the financial development indicators and GFCF and PINV seems to be puzzling at first. In neoclassical investment theory, private investment is characterized as a negative function of the costs of capitals. McKinnon (1973) and Shaw (1973) argue that financial development would lead to a reduction in the cost of capitals. Our result is conflicting with these postulates.

Table 1. The F-statistics for cointegration and information criterions for model selection (Dependent variable: lnGFCF)

		Without Deterministic Trend			With Deterministic Trend		
FD	Lag	AIC	SBC	F-stat	AIC	SBC	F-stat
M2Y	1	-2.01	-1.74	14.33	-2.01	-1.71	15.63
	2	-2.08	-1.75	3.07	-2.10	-1.73	4.38
	3	-2.22	-1.82	1.03	-2.39	-1.96	7.35
	4	-2.26	-1.80	1.00	-2.37	-1.88	5.10
	5	-2.19	-1.66	0.86	-2.31	-1.76	5.06
BDY	1	-1.95	-1.68	13.98	-1.93	-1.63	13.94
	2	-2.02	-1.68	2.86	-2.00	-1.64	3.05
	3	-2.13	-1.73	0.98	-2.20	-1.77	3.56
	4	-2.19	-1.73	1.37	-2.26	-1.77	3.34
	5	-2.14	-1.61	1.59	-2.21	-1.66	3.86
DCY	1	-1.87	-1.60	8.70	-1.84	-1.54	8.43
	2	-1.97	-1.63	2.11	-1.94	-1.58	1.97
	3	-2.11	-1.71	0.88	-2.11	-1.68	1.05
	4	-2.21	-1.75	2.21	-2.23	-1.74	2.64
	5	-2.16	-1.63	2.44	-2.18	-1.62	3.15
PCY	1	-1.78	-1.51	2.47	-1.92	-1.62	8.35
	2	-2.00	-1.66	0.51	-2.08	-1.72	4.45
	3	-2.18	-1.78	0.08	-2.22	-1.79	2.06
	4	-2.24	-1.78	0.70	-2.25	-1.76	1.99
	5	-2.21	-1.69	1.16	-2.23	-1.67	2.30
PCDC	1	-1.80	-1.53	21.96	-1.78	-1.48	21.64
	2	-1.91	-1.58	6.70	-1.89	-1.53	6.80
	3	-1.95	-1.56	3.53	-1.95	-1.52	4.07
	4	-2.11	-1.65	5.26	-2.09	-1.60	5.29
	5	-2.04	-1.51	4.04	-2.03	-1.47	4.20
LLY	1	-1.94	-1.67	13.48	-1.92	-1.62	13.43
	2	-2.01	-1.68	2.59	-2.00	-1.63	2.69
	3	-2.12	-1.73	0.87	-2.18	-1.75	2.86
	4	-2.20	-1.74	1.39	-2.25	-1.76	2.74
	5	-2.13	-1.61	1.41	-2.19	-1.64	2.96

Note:
The F-statistics critical values for the model without deterministic trend are (4.04-4.78) for 10% critical value, (4.94-5.73) for 5% critical value, and (6.84-7.84) for 1% critical value. The critical values are obtained from Table CI(iii) Case III. The F-statistics critical values for the model with deterministic trend are (5.59-6.26) for 10% critical value, (6.56-7.30) for 5% critical value, and (8.74-9.63) for 1% critical value. The critical values are obtained from Table CI(v) Case V.

Table 2. The F-statistics for cointegration and information criterions for model selection (Dependent variable: lnGINV)

FD Indicator	Lag	Without Deterministic Trend			With Deterministic Trend		
		AIC	SBC	F-stat	AIC	SBC	F-stat
M2Y	1	-0.12	0.15	5.62	-0.17	0.13	8.86
	2	-0.18	0.16	3.02	-0.21	0.15	5.02
	3	-0.52	-0.12	1.44	-0.50	-0.07	0.96
	4	-0.50	-0.04	1.68	-0.48	0.01	1.52
	5	-0.46	0.07	1.76	-0.44	0.11	1.74
BDY	1	-0.08	0.19	4.84	-0.21	0.09	11.33
	2	-0.16	0.17	2.46	-0.24	0.13	6.09
	3	-0.50	-0.10	1.01	-0.49	-0.06	1.17
	4	-0.47	-0.01	1.31	-0.47	0.02	1.86
	5	-0.46	0.06	1.49	-0.46	0.09	2.14
DCY	1	0.00	0.27	3.97	-0.18	0.12	12.52
	2	-0.06	0.28	2.31	-0.14	0.22	6.39
	3	-0.49	-0.09	0.63	-0.48	-0.05	1.10
	4	-0.46	0.00	1.05	-0.46	0.03	1.69
	5	-0.45	0.08	1.44	-0.46	0.10	2.58
PCY	1	0.12	0.39	1.28	-0.06	0.24	9.41
	2	-0.07	0.26	2.18	-0.28	0.08	11.23
	3	-0.57	-0.17	3.27	-0.68	-0.26	8.34
	4	-0.52	-0.06	1.57	-0.63	-0.14	6.43
	5	-0.50	0.02	0.51	-0.60	-0.05	4.27
PCDC	1	0.15	0.42	7.53	0.07	0.37	11.96
	2	0.10	0.43	5.97	0.08	0.44	7.26
	3	-0.44	-0.04	4.91	-0.43	0.00	4.90
	4	-0.45	0.01	3.41	-0.43	0.06	3.08
	5	-0.40	0.13	3.21	-0.37	0.18	3.00
LLY	1	-0.08	0.19	4.69	-0.22	0.08	11.80
	2	-0.16	0.17	2.36	-0.25	0.11	6.37
	3	-0.49	-0.10	1.00	-0.48	-0.06	1.26
	4	-0.48	-0.02	1.29	-0.48	0.01	2.03
	5	-0.46	0.07	1.42	-0.47	0.09	2.35

Note:
The F-statistics critical values for the model w ithout deterministic trend are (4.04-4.78) for 10% critical value, (4.94-5.73) for 5% critical value, and (6.84-7.84) for 1% critical value. The critical values are obtained from Table CI(iii) Case III . The F-statistics critical values for the model with deterministic trend are (5.59-6.26) for 10% critical value, (6.56-7.30) for 5% critical value, and (8.74-9.63) for 1% critical value. The critical values are obtained from Table CI(v) Case V.

Table 3. The F-statistics for cointegration and information criterions for model selection (Dependent variable: lnPINV)

FD Indicator	Lag	Without Deterministic Trend			With Deterministic Trend		
		AIC	SBC	F-stat	AIC	SBC	F-stat
M2Y	1	-1.86	-1.59	6.57	-1.93	-1.63	10.34
	2	-1.92	-1.58	2.38	-1.97	-1.61	5.25
	3	-1.96	-1.56	0.49	-2.08	-1.66	5.66
	4	-1.96	-1.50	0.22	-2.12	-1.63	6.11
	5	-1.90	-1.37	0.14	-2.06	-1.51	5.87
BDY	1	-1.76	-1.49	7.33	-1.80	-1.50	9.76
	2	-1.81	-1.48	2.43	-1.83	-1.47	3.93
	3	-1.82	-1.42	0.58	-1.89	-1.46	3.47
	4	-1.89	-1.43	0.35	-2.01	-1.52	4.36
	5	-1.82	-1.30	0.38	-1.96	-1.41	4.77
DCY	1	-1.81	-1.54	5.54	-1.80	-1.50	5.98
	2	-1.88	-1.55	2.08	-1.86	-1.49	2.08
	3	-1.90	-1.51	0.78	-1.90	-1.47	1.18
	4	-1.94	-1.48	0.99	-2.00	-1.51	2.91
	5	-1.88	-1.36	1.06	-1.95	-1.39	3.23
PCY	1	-1.82	-1.55	3.60	-1.84	-1.54	4.75
	2	-1.90	-1.56	1.41	-1.94	-1.58	3.43
	3	-1.90	-1.51	1.04	-1.92	-1.49	2.14
	4	-2.02	-1.56	1.98	-2.00	-1.51	2.09
	5	-1.97	-1.44	2.28	-1.95	-1.39	2.31
PCDC	1	-1.52	-1.25	6.51	-1.53	-1.23	8.02
	2	-1.68	-1.35	2.67	-1.67	-1.31	3.04
	3	-1.68	-1.28	1.45	-1.66	-1.24	1.66
	4	-1.76	-1.30	1.68	-1.74	-1.25	1.88
	5	-1.70	-1.17	1.23	-1.68	-1.12	1.47
LLY	1	-1.77	-1.50	7.07	-1.81	-1.51	9.57
	2	-1.82	-1.49	2.29	-1.83	-1.47	3.65
	3	-1.83	-1.43	0.55	-1.88	-1.45	2.99
	4	-1.90	-1.44	0.40	-2.01	-1.52	3.68
	5	-1.83	-1.31	0.37	-1.95	-1.39	3.77

Note:
The F-statistics critical values for the model without deterministic trend are (4.04-4.78) for 10% critical value, (4.94-5.73) for 5% critical value, and (6.84-7.84) for 1% critical value. The critical values are obtained from Table CI(iii) Case III . The F-statistics critical values for the model with deterministic trend are (5.59-6.26) for 10% critical value, (6.56-7.30) for 5% critical value, and (8.74-9.63) for 1% critical value. The critical values are obtained from Table CI(v) Case V.

First of all, various empirical studies concentrating on the costs of capital and investment for developing nations found that the link generally does not exist or if does only weekly for some of these countries (see Chirinko, 1993 and Ram, 1993 for an overview). In the literature, two arguments which portray the extraneous behavior of investment from the cost of capital are proposed. Firstly, the credit availability might be a binding constraint so that even if firms are willing to use external credits for their capital good purchases at a given interest rate, some of the firms are not able to access credits due to credit rationing or lack of well-functioning financial markets (Blejer and Khan, 1984; Ramirez, 1994; Erden, 2002). The other theoretical explanations provided in the literature focus on the uncertainty of the costs of capital (Dixit and Pindyck, 1994; Abel and Eberly, 1995). In supporting this argument Erden (2002) showed that both credit availability and uncertainty surrounding costs of capital in Turkey are two major variables explaining private investment.

In connecting our findings with the importance of uncertainty and credit availability for private investment in Turkey, we need to clarify some important points. Close examination of Table-4 shows that the total credit devoted to private sector is positively related to the private investment. This result is consistent with Erden (2002) and suggests that credit constraint is binding for Turkey throughout the period. Mismanaged fiscal policy can be shown as one of the most important factors in explaining excessive volatility and uncertainty throughout the period. Turkish economic performance in terms of inflation, unemployment and economic growth during the late 80s and 90s and early 2000s was extremely unstable. High budget deficits financed through banking system resources created two adverse effects for private investment.

On the first hand, the excessive amounts of government borrowing requirements caused a significant crowding out of the private sector. An exceptionally high real interest rate offered by government debt instruments attracted the Turkish banking sector (which constitutes the biggest share in financial system) to investing in these papers. The largest part of the assets on their balance sheets were devoted to public sector papers, rather than supplying credits for the private sector. In addition to crowding-out effects, the budget deficits caused several other problems creating a volatile environment within the economy (see for example Özatay, 1996; Agenor et al. 1997; Önis and Aysan, 2000; for an overview) . In sum, the fiscal mismanagement throughout the period might eliminate the expected efficiency benefits of financial development.

As we explain briefly above, the coefficient on the share of the private sector credit in total domestic credit (PCDC) carries on a positive impact for all the type of investment in Turkey. This finding implies that the policies or regulations which lead to an increase in credits transferred to the private sector would be likely to stimulate a proportion of investment in domestic products. In addition this, prudent fiscal policy not dramatically squeezing financial sector funds would create a friendly environment for investment.

To apply the causality test of DL (1996), the first step is to select the number of optimal lags for the variables in the VAR system. The SBC is used to determine the appropriate lag order because Lutkepohl (1985) shows that this criterion is preferred in small samples. At the same time, we apply the LM test for serial correlation. The LM test shows that autocorrelation does not pose any problem in the estimation of the models. In the second step of the causality analysis, we estimated VAR models with an additional lag to the selected optimal lags order, and applied a standard Wald test to the first k coefficient matrix. Table 5 includes the results of causality analysis.

For GFCF and PINV, most of the tests show that there is two-way Granger causality between financial development and investment. In terms of government investment (GINV), the result indicates that the causality runs from GINV to financial development indicators. This result might be partly due to the budget deficit argument we outlined above. The story might work this way: As the government pushes for investment, more funds from financial markets are demanded which in turn increases the interest rate. Higher interest rates attract both domestic and foreign investors so that more funds would become available in the system. In other words, an increase in government investment seems to lead to increase in financial assets in the system in the short run.

5. CONCLUSION

In this study, we investigated the long and short-run relations between investment and financial development in Turkey using quarterly data covering the period of 1987-1-2007-1. The study utilized a bounds testing cointegration approach as a device in searching for common stochastic trends between these variables, while the short-run causal relation is investigated by using the Dolado and Lutkepohl causality test. In these analyses we utilize three different investment variables and six different financial development indicators so as to avoid non- robust conclusions.

The long run analysis shows that statistically significant common stochastic paths exist between various pairs of variables for financial development and investment. This long-run equilibrium relation, estimated by using ARDL approach, involves some seemingly paradoxical results. Particularly, although the private investment and total investment respond positively to an increase in two financial development indicators (total credit and credit to the private sector), these investment variables seem to be affected adversely from other financial development indicators (M2Y, banking deposit liabilities, and liquid liabilities).

The former results (the stimulation effects of total credit and credit to private sector to investment) are consistent with Erden (2002), indicating available credit supplied by the financial system creates a binding constraint for investment spending (particularly private investment) in Turkey.

Table 4. The Long-run Coefficient Estimates and Diagnostic Tests

	FD Indicator					
	M2Y	BDY	DCY	PCY	PCDC	LLY
Panel A: lnGFCF						
lnFD	-2.38 (1.45)	-1.93 (1.45)	-0.75 (1.45)	0.42 (1.36)	0.52 (5.19)	-1.79 (1.43)
Constant	1.56 (2.33)	-0.83 (2.33)	-0.69 (2.33)	-0.08 (0.12)	-1.14 (12.83)	-0.53 (0.62)
R^2	0.90	0.89	0.89	0.89	0.87	0.88
$LM_{SC}(\chi^2_4)$	2.91 [0.572]	2.42 [0.658]	4.12 [0.389]	4.79 [0.309]	6.81 [0.146]	4.13 [0.388]
$FF(\chi^2_1)$	5.21 [0.022]	7.01 [0.008]	5.80 [0.016]	0.19 [0.663]	0.84 [0.359]	8.00 [0.005]
$JB(\chi^2_2)$	1.49 [0.474]	2.99 [0.224]	6.52 [0.038]	1.97 [0.372]	0.91 [0.631]	3.34 [0.187]
$LM_{het}(\chi^2_1)$	1.39 [0.237]	0.80 [0.371]	0.16 [0.689]	2.66 [0.103]	1.94 [0.163]	1.66 [0.197]
Panel B: lnGINV						
lnFD	0.25 (0.40)	0.47 (0.75)	0.53 (1.29)	1.71 (2.70)	0.87 (0.87)	0.93 (2.25)
Constant	-1.84 (3.51)	-2.21 (4.76)	-1.84 (4.73)	-0.63 (0.90)	-2.12 (3.61)	-2.09 (8.22)
R^2	0.89	0.89	0.89	0.91	0.89	0.89
$LM_{SC}(\chi^2_4)$	4.73 [0.316]	3.33 [0.503]	5.64 [0.227]	1.80 [0.772]	2.54 [0.636]	1.93 [0.747]
$FF(\chi^2_1)$	3.88 [0.049]	4.62 [0.031]	4.09 [0.043]	7.14 [0.008]	5.85 [0.016]	1.55 [0.018]
$JB(\chi^2_2)$	17.54 [0.000]	11.81 [0.003]	21.12 [0.000]	3.55 [0.169]	22.36 [0.000]	8.26 [0.016]
$LM_{het}(\chi^2_1)$	1.13 [0.287]	0.86 [0.353]	1.38 [0.240]	1.24 [0.264]	1.37 [0.241]	1.10 [0.292]
Panel C: lnPINV						
lnFD	-2.58 (2.65)	-2.30 (2.74)	-1.05 (2.73)	-0.08 (2.73)	0.62 (2.84)	-2.23 (2.89)
Constant	-2.55 (5.33)	-2.08 (6.41)	-1.27 (2.48)	-0.33 (2.48)	-1.54 (9.59)	-1.74 (7.07)
R^2	0.89	0.88	0.88	0.88	0.85	0.88
$LM_{SC}(\chi^2_4)$	4.73 [0.316]	1.69 [0.791]	2.15 [0.708]	6.43 [0.169]	2.98 [0.560]	1.68 [0.794]
$FF(\chi^2_1)$	3.88 [0.049]	0.20 [0.651]	0.32 [0.568]	0.48 [0.486]	4.36 [0.037]	0.51 [0.472]
$JB(\chi^2_2)$	17.54 [0.000]	3.96 [0.138]	0.38 [0.824]	0.28 [0.866]	2.13 [0.345]	4.39 [0.111]
$LM_{het}(\chi^2_1)$	1.13 [0.287]	1.04 [0.306]	0.04 [0.838]	1.05 [0.305]	1.87 [0.171]	0.74 [0.388]

Notes:
LM_{SC} is the Breusch–Godfrey Lagrange Multiplier test statistic for no serial correlation; FF is the Ramsey's test statistic for no functional misspecification; JB is the Jarque–Bera statistic for normality; LM_{het} is the White's test statistic for homoskedasticity. Numbers in parentheses and brackets are t-ratios in absolute terms and p-values, respectively.

Table 5. Dolado and Lutkepohl Test of Granger Causality

Hypothesis	Lag	MWALD (Chi-sqaure)	Degrees of freedom	p-value	Causal
M2Y does not cause GFCF	4	31.90	4	0.0000	Yes
GFCF does not cause M2Y	4	24.67	4	0.0001	Yes
BDY does not cause GFCF	4	25.25	4	0.0000	Yes
GFCF does not cause BDY	4	30.78	4	0.0000	Yes
DCY does not cause GFCF	4	16.02	4	0.0030	Yes
GFCF does not cause DCY	4	13.03	4	0.0111	Yes
PCY does not cause GFCF	5	3.33	5	0.6489	No
GFCF does not cause PCY	5	8.89	5	0.1134	No
PCDC does not cause GFCF	3	18.14	3	0.0004	Yes
GFCF does not cause PCDC	3	4.15	3	0.2454	No
LLY does not cause GFCF	4	24.09	4	0.0001	Yes
GFCF does not cause LLY	4	29.04	4	0.0000	Yes
M2Y does not cause GINV	4	2.99	4	0.5589	No
GINV does not cause M2Y	4	13.84	4	0.0078	Yes
BDY does not cause GINV	4	3.22	4	0.5205	No
GINV does not cause BDY	4	16.02	4	0.0030	Yes
DCY does not cause GINV	4	0.71	4	0.9501	No
GINV does not cause DCY	4	11.01	4	0.0264	Yes
PCY does not cause GINV	4	5.93	4	0.2037	No
GINV does not cause PCY	4	13.86	4	0.0077	Yes
PCDC does not cause GINV	4	2.66	4	0.6152	No
GINV does not cause PCDC	4	3.20	4	0.5240	No
LLY does not cause GINV	4	3.34	4	0.5022	No
GINV does not cause LLY	4	16.63	4	0.0023	Yes
M2Y does not cause PINV	2	16.50	2	0.0003	Yes
PINV does not cause M2Y	2	9.45	2	0.0089	Yes
BDY does not cause PINV	2	13.31	2	0.0013	Yes
PINV does not cause BDY	2	12.36	2	0.0021	Yes
DCY does not cause PINV	2	9.31	2	0.0095	Yes
PINV does not cause DCY	2	17.20	2	0.0002	Yes
PCY does not cause PINV	2	12.80	2	0.0017	Yes
PINV does not cause PCY	2	1.80	2	0.4064	No
PCDC does not cause PINV	2	13.61	2	0.0011	Yes
PINV does not cause PCDC	2	3.43	2	0.1796	No
LLY does not cause PINV	2	13.92	2	0.0009	Yes
PINV does not cause LLY	2	11.76	2	0.0028	Yes

During the 1980s and 1990s the extensive amount of government borrowing requirements boosted real returns fom financial investment and made financial intermediaries (i.e. banks) collect funds from both domestic and foreign savers. The increase in total financial assets (e.g. M2Y, banking deposit liabilities and liquid liabilities) in the system were not translated into a credit for physical investment. In addition, the drastically high level of borrowing requirements determined by the government led to an uncertain environment for the real sector, which in turn further squeezed investment. ARDL analysis shows that investment decisions are very sensitive to the available credit offered by the financial system and uncertainty mainly caused by mismanaged fiscal policies. The policy conclusion should involve measures that both stimulate credits to the private sector and reduce uncertain environment.

The short-run causality analysis indicates that there is generally bidirectional causality between financial development and private and total investment. The causality for government investment involves one way causality patterns, running from investment to financial development. The results seem to be consistent with the long run pattern where higher government investment might be financed with debt securities which in turn lead to larger financial assets.

Finally, it is important to note some limitations of this study. First, we estimate the model using only financial development indicators as an explanatory variable for investment. Future studies could extend the literature by estimating model(s) including various control variables which are likely to effect investment. Second, both the ARDL cointegration and the Dolado-Lutkepohl causality approaches strictly assume linear relationships among the variables in question. Since structural breaks created by economic cris es could lead to non-linear relationships, non-linear relations have been taken into account in order to provide more empirical evidence for policy designs. Future studies should therefore concentrate on addressing this issue by testing structural breaks and then conducting non-linear analysis, which is our primary aim in the near future.

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