Asian Economic and Financial Review, 2016, 6(3): 127-134

Asian Economic and Financial Review
ISSN(e): 2222-6737/ISSN(p): 2305-2147

URL: www.aessweb.com

FINANCIAL DEVELOPMENT AND INVESTMENT AMOUNT NEXUS: A CASE STUDY OF TURKEY

Banu Demirhan[1]
[1]*Afyon Vocational School, Department of Economics and Administrative Programs, Afyon Kocatepe University, Turkey*

ABSTRACT

The paper examines the relationship between financial development and investment amount in Turkey over the period of 1998:01-2015:02 by using Toda-Yamamoto method. Banking sector and stock market measures of financial development are used in the econometric analysis. Our findings suggest that there is uni-directional causality from stock market development to investment amount. Moreover, empirical findings present that there is uni-directional causality from investment amount to banking sector development and bi-directional causality between banking sector development and stock market development.

Keywords: Financial development, Capital stock, Toda-Yamamoto method, Investment, Banking sector, Causality.

JEL Classification: O16, O40, C32.

Received: 4 November 2015/ **Revised:** 13 January 2016/ **Accepted:** 8 February 2016/ **Published:** 24 February 2016

Contribution/ Originality

This study contributes in the existing literature by analyzing the causal relationship between development in the both banking sector and stock market and investment amount in Turkey by using Toda-Yamamoto method.

1. INTRODUCTION

Although there are many studies about the relationship between financial development and economic growth in the empirical literature, it has been less focused on the role of investment, the driving factor of economic growth. If the financial development affects investment, economic growth is sustainable, and thus it will be possible to increase employment levels. Therefore, the effectiveness of the effect of financial development on economic growth requires investigating its impact on investment. In the economic theory, Harrod (1939) and Domar (1946) argue that an increase in capital stock is essential for economic growth. In the framework of Neo-Classical economic growth theory, Solow (1956) argues that labor and technology should be included in growth model as the determinants of economic growth. In fact, investment is affected by many factors such as the economic, social and cultural. Financial development affects these factors in directly or indirectly. In the economic theory, the impact of financial development on investment arises through it affects supply side of the economy by increasing the production level of a country, called as supply-leading growth approach. According to this approach, financial development contributes to economic growth by increasing investment amount.

DOI: 10.18488/journal.aefr/2016.6.3/102.3.127.134
ISSN(e): 2222-6737/ISSN(p): 2305-2147

In the economic theory Schumpeter (1954); Goldsmith (1969) and Patrick (1966) put forward that financial development contributes to economic growth. With the financial development, it is possible to eliminate the financial constraints. In this context, the Mackinnon-Shaw approach argues that the financial constraints such as interest rate controls that repress real interest rates may hamper the financial system and reduce the incentives to save. Therefore, According to McKinnon (1973) and Shaw (1973) the development of financial system incentives savings and thus leads to higher investment levels and rapid economic growth rates.

The aim of this study is to investigate the relationship between financial development and investment in Turkey. For this purpose, we use the method of Toda and Yamamoto (1995). There are many studies investigating the relationship between financial development and economic growth in the empirical literature. In these studies, the methods of panel data and cross-section are used for the various groups of countries and time-series methods are mainly used for single countries, some of which include Turkey. Kar and Pentecost (2000); Ünalmış (2002); Altunç (2008); Kandır *et al.* (2007); Güneş (2013) and Ege *et al.* (2008) are some examples of these studies.

The rest of the paper is organized as follows: In section 2 we present theoretical underpinnings on the relationship between financial development and investment amount. In section 3 we outline the model specification, data, and econometric methodology. In section 4 we present empirical results, and finally we provide conclusions in the last section.

2. THEORETICAL UNDERPINNINGS

In general, stronger and better financial system contributes to economic growth through transferring the resources to the areas they are used efficiently. The Strong financial system increases savings and investment and thus accelerates the accumulation of physical capital. Moreover, financial development strengthens the competitiveness and incentives the innovative activities in the economy. Eventually, these effects contribute to economic growth (Estrada *et al.*, 2010). The effect of financial development on investment is analyzed by considering supply-leading growth or finance-leading growth in the economic theory, proposed by Patrick (1966). According to this hypothesis, it is possible to use the resources more efficiently with the better financial system. The effect of financial development on investment can be analyzed in the framework of the hypothesis of Schumpeter (1912) based on the thought that well-operating financial system leads to technology improvements and innovation. In this context, the developments in the financial system increase the technology investments. In some models such as Romer (1986); Lucas (1988) and Rebello (1991) financial development has an effect on steady-state economic growth by affecting capital formation. Financial system also affects capital accumulation by changing saving rate or allocating them to various technologic areas. In these models, financial system affects steady-state economic growth by technology. At this point, Levine (1997) provides us important information on how channels play a role in the effects of financial development on economic growth. Levine (1997) argues that the effect of financial development on economic growth occurs with the channels such as an increase in capital accumulation and an improvement in technology. These channels arise with the functions of the financial system, which includes mobilizing savings, allocating resources, exerting corporate control, facilitating risk management, and facilitating the exchange of goods and services.

The analyzing the relationship between financial development and investment can be made by using De Gregorio and Guidotti (1995)'s study. In case the output is only based on capital stock, the production function can be formedby equation 1.

$$y_t = f(k_t) \qquad (1)$$

Where y_t and k_t indicate output and capital stock at time t, respectively. Once totally differentiating equation (1) and showing the output growth rate by $\hat{y}$ the savings rate dk/dy by s, and the marginal productivity of capital by ϕ, we have equation 2.

$$\hat{y}_t = \frac{dk_t}{y_t} f'(k_t) = s_t \phi_t \qquad (2)$$

Equation 2 shows economic growth rate depend on savings rate and the marginal productivity of capital. Diminishing the marginal productivity of capital implies that ϕ_t goes to zero as k_t grows over time. In this context, financial development has a dual effect on economic growth by enhancing the efficiency (increasing ϕ_t) and contributing to increasing the savings rate and, thus, the investment rate (increasing s_t). According to De Gregorio and Guidotti (1995) the former effect is first emphasized by Goldsmith (1969) finding that financial development encourages to use of the capital stock more efficiently and arguing that economic growth leads to financial development. McKinnon (1973) and Shaw (1973)besides its positive effect on productivity, the financial development also increases savings rate and, thus, investment volume, which is unlike Goldsmith (1969)where growth and financial intermediation are both thought of as endogenous. Similarly, we can use the analysis used by Lynch (1995) implying that the production function can be written in per capita terms to simply of key model relationships, including capital (K) and Labor (L) as inputs. Production (y=Y/L) is demonstrated as a function of productivity of capital (ρ) and the quantity of per capita capital (k= K/L), which is shown in equation 3.

$$y = f(\rho, k) \qquad (3)$$

$$dy = \left(\frac{\delta y}{\delta k}\right) dk + \left(\frac{\delta y}{\delta \rho}\right) d\rho \qquad (4)$$

Output growth can be showed in equation 4, implying that output growth is determined by changes in the quantity of capital or productivity. In equation 4, the first term on the right-hand side denotes output growth from a change in the quantity of capital and the second term represents output growth from productivity changes.

Thiel (2001) using AK model to reveal the effect of financial development on investment, demonstrates that financial system can affect the investment in three ways. First, financial development reduces the loss of resources, implying that more savings can be used for productive investments. Second, financial development may lead to more favorable return-risk combinations for savers, inducing an increase in saving ratio, and, thus investment. It is worth noting that due to the expectations on higher returns, savings may decrease because the same future consumption can be accomplished with higher present consumption, lowering current savings. Third, the financial development leads to increase in the productivity of capital. After analyzing the effect of financial development on investment, we stress the impact of the investment on economic growth in macroeconomic model briefly.

3. MODEL SPECIFICATION, DATA AND ECONOMETRIC METHODOLOGY

The specification of the model denoting the relationship between financial development and economic growth is made as equation (5).

$$y_t = a_0 + a_1 fd_t + u_t \qquad (5)$$

Wherey_t is real investment amount; fd_t is the measure of financial development, and u_t is the error term. In this study, we use two variables as a measurement of financial development: stock market capitalization ratio, defined as the ratio of stock market value to GDP and banking sector development, defined as the domestic bank credit to nominal GDP. In this paper, we prefer credit-based measure for financial development because it is assumed that this proxy exhibits a stable long-run relationship with output than deposit-based measurement as suggested by Arestis and Demetriades (1996). This measure was used in some studies such as Demetriades and

Hussein (1996) and Levine *et al.* (2000). Performing econometric analysis, we use quarterly data from 1998:01 to 2015:02. The reason of selecting this period is that all data can be obtained in tandem in this period. The data are obtained from the Central Bank of Turkish Republic. All data are seasonally adjusted and are used in their natural logarithmic form. To investigate the relationship between financial development and investment, we determine the stationary properties of the series. For this purpose, Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) Phillips-Perron (PP) (Phillips, 1987; Phillips and Perron, 1988) and Kwiatkowski *et al.* (1992) unit root tests are applied. While the null hypothesis for the KPSS test is that the data series is stationary, that for the ADF and PP tests is that the data series have a unit root. After applying unit root tests, if all variables are integrated of order one, then cointegration tests are applied to detect whether long-run relationship between variables. In applying cointegration tests, we use Johansen multivariate cointegration technique, proposed by Johansen (1988) and Johansen and Juselius (1990). Following Engle and Granger (1987) and Granger (1988) arguing that cointegration relationship between two time-series variables denotes, at least, one-directional Granger-causation relationship, we apply Granger causality tests. At this point, we exert Vector Error Correction Model to apply Granger causality tests. On the other hand, it is possible to be found that the variables are integrated in different orders. In this situation, we Toda-Yamamoto (TY) method proposed by Toda and Yamamoto (1995) to investigate the causality relationship between financial development and investment amount. By using TY method, it is minimized the risk of misspecification of the integration order of the series. Applying TY method, we should firstly determine the VAR order, *k*, and the maximum order of integration of the variables, *dmax* in the VAR system. The lag length of the level VAR system is determined by minimizing Schwarz Bayesian Criterion (SBC). The sum of k and dmax (*k*+*dmax*) is the total order of VAR system [equation(6)-(8)], implying augmented VAR order, *k*, artificially by the maximal order of integration, *dmax*. In this context, (*k*+*dmax*)th order of VAR is estimated and then modified Wald test (MWALD) is applied to the first *k*th order of VAR, implying that the coefficients of the last lagged*dmax* vector are ignored. Testing for causality in a multivariate system involves the estimation of the following augmented VAR of order (*k*+*dmax*):

$$INV_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} INV_{t-i} + \sum_{j=k+1}^{dmax} \alpha_{2j} INV_{t-j} + \sum_{i=1}^{k} \alpha_{3i} CAP_{t-i} + \sum_{j=k+1}^{dmax} \alpha_{4j} CAP_{t-j} + \sum_{i=1}^{k} \alpha_{5i} CRE_{t-i} + \sum_{j=k+1}^{dmax} \alpha_{6j} CRE_{t-j} + \varepsilon_{1t} \quad (6)$$

$$CAP_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} CAP_{t-i} + \sum_{j=k+1}^{dmax} \beta_{2j} CAP_{t-j} + \sum_{i=1}^{k} \beta_{3i} INV_{t-i} + \sum_{j=k+1}^{dmax} \beta_{4j} INV_{t-j} + \sum_{i=1}^{k} \beta_{5i} CRE_{t-i} + \sum_{j=k+1}^{dmax} \beta_{6j} CRE_{t-j} + \varepsilon_{2t} \quad (7)$$

$$CRE_t = \lambda_0 + \sum_{i=1}^{k} \lambda_{1i} CRE_{t-i} + \sum_{j=k+1}^{dmax} \lambda_{2j} CRE_{t-j} + \sum_{i=1}^{k} \lambda_{3i} INV_{t-i} + \sum_{j=k+1}^{dmax} \lambda_{4j} INV_{t-j} + \sum_{i=1}^{k} \lambda_{5i} CAP_{t-i} + \sum_{j=k+1}^{dmax} \lambda_{6j} CAP_{t-j} + \varepsilon_{3t} \quad (8)$$

If the null hypothesis of α_{3i}=0 and α_{5i}=0 is rejected, then it is concluded that stock market development and banking sector development are Granger cause of economic growth, respectively. On the other hand, the rejection of the null hypothesis of λ_{3i}=0 implies that there is Granger causality from investment to banking sector development. Moreover, if the null hypothesis of β_{3i}=0 is rejected, then it is concluded that there is Granger causality from investment to stock market development. Finally, the rejection of the null hypothesis of β_{5i}=0 denotes that banking sector development causes stock market development, and that of λ_{5i}=0 implies that stock market development causes banking sector development. In this study, generalized impulse functions (GIRF) are used to determine the dynamic relationships between government revenue and government expenditure. These functions are proposed by Koop *et al.* (1996) and Pesaran and Shin (1998). Impulse responses show the impact of one standard deviation shock or innovation of one variable on the current and future values of another variable. Generally speaking, the impulse responses indicate how a variable initially responds to a shock in the other variable and the length of the respond. The results of standard impulse response function analyzes varies according to the ordering of the variables in Cholesky decomposition. Therefore, in this study, GIRF analysis is used to obtain unique impulse response functions. According to Runkle (1987) standard errors or confidence intervals should be reported. Therefore, in examining the generalized impulse responses from the VAR model, ±2 standard errors of the responses are taken considered to investigate whether the responses are statistically significant.

4. EMPIRICAL RESULTS

To apply Granger causality tests, we determine the stationary properties of the series. For this purpose, we apply ADF, PP, and KPSS tests. The lag orders are selected by using SBC Unit root test results presented in Table 1 indicate that *CAP* and *CRE* are stationary at the level, I(0), but that *INV* is non-stationary at the level, stationary at the first differences, I(1), for ADF and KPSS tests. PP test results, unlike ADF test, indicate that *CAP* is I(0), but *INV* and *CRE* both are integrated in order one, I(1), which is similar to the results obtained from KPSS and ADF tests.

Table-1. Unit root tests

Series	ADF	PP	KPSS
INV	-1.20(1)	-0.90	0.87 (6)***
	-4.90(0)***	-4.89(2)***	0.08 (3)
CAP	-4.39(0)***	-4.39(0)***	0.55(5)**
	-11.14(0)***	-13.51(7)***	0.13(15)
CRE	0.49(1)	0.47(4)	0.97(6)***
	-5.83(0)***	-5.89(3)***	0.34(4)

Source: Author's calculations

Notes: *** and ** indicate rejection of the null hypothesis at the 1% and 5% levels, respectively.

For KPSS and PP tests, the bandwidth is chosen using Newey–West method and spectral estimation uses Bartlett kernel, representing in parenthesis. The 1%, 5%, and 10% critical value for the ADF and PP tests is -3,52, -2,90, and -2,59 respectively. The 1%, 5%, and 10% critical value for the KPSS test are 0,74, 0,46, and 0,35 respectively. The critical values were from MacKinnon (1991)

The unit root test results indicate that the series are not integrated in the same order, implying that TY method can be applied to examine the Granger causality relationship between financial development indicators and investment. Before applying TY method, we determine the optimal lag length of the VAR by using SBC. In this context, the optimal lag length of VAR, *k*, is 1 and 2, respectively. The next step is to estimate $k + dmax$th order VAR models at levels. Then MWALD test (modified Wald test) is employed to the first *k*th order of VAR, i.e. the coefficients of the last lagged *dmax* vector are ignored. The results of Granger causality tests are presented in Table 2.

Table-2. Granger causality test results

Dependent Variable	$d_{max}$and VAR (k)	INV	CAP	CRE
INV	(1,5)	-	11.07**	2.38
CAP	(1,5)	4.12	-	19.04***
CRE	(1,5)	30.32***	14.67**	-

Source: Author's calculations

Notes:*** and ** indicate significance at the 1% and 5% levels, respectively. *k* is the lag length used in the system, and *dmax* is the maximum order of integration (1).

The empirical results reported in Table 2 demonstrated that the null hypothesis of α_{3i}=0 is rejected at the 1% level, implying that *CAP* is Granger cause of *INV*, i.e., there is uni-directional causality from stock market development to investment amount. On the other hand, the null hypothesis of α_{5i}=0 is not rejected, implying that *CRE* is not Granger cause of *INV*. According to this result, banking sector development has no directly effect on investment amount. From empirical results, the null hypothesis of λ_{3i}=0 is rejected at 1% level. This result shows that there is Granger causality from *INV* to *CRE*, meaning that increase in investment amount leads to bank credit increases. Finally, the rejection of null hypotheses of β_{5i}=0 and λ_{5i}=0 denote that there is a bi-directional causal relationship between banking sector development and stock market development. Moreover, when including the dummy variable for the economic crisis of the first quarter of 2001 to measure the impact of the crisis, we do not detect any change in the direction of the causality between the variables.

In addition to Granger causality test results, we analyze the impact of innovations by using GIRFs to find out the dynamic interactions of the variables. Figure 1 shows the response of selected variables to some variables in the VAR(6), [*k*+*dmax*]th-order level VAR, system to one standard deviation shock of each variable in the system. The significance of the impulse response of each variable is specified by confidence intervals representing plus/minus two standard deviations and dashed lines indicate two standard error bands representing a 95% confidence region. When the confidence bands straddle the line at zero, the impulse response is considered to be statistically different from zero at the 5% level of significance. We only give the impulse response functions that are significant to save space.

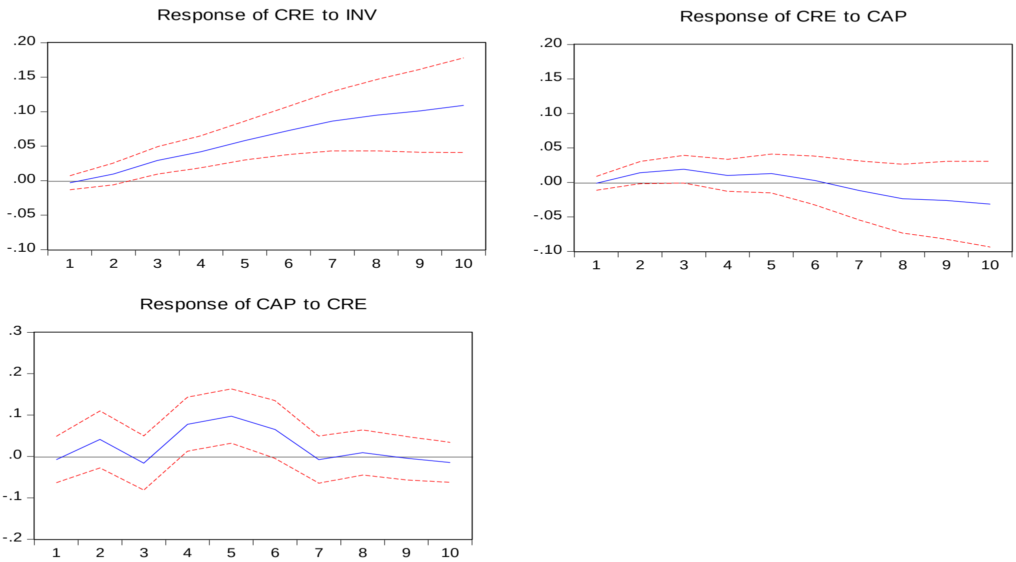

Figure-1. Generalized impulse response functions

Source: Author's calculations

Notes: Generalized impulse response functions: response to generalized one standard deviation innovations ±2 standard errors. The vertical axis measures the magnitude of the response to the impulse. Confidence bands, used to determine the statistical significance of an impulse response, are shown as dashed (– – – –) lines and represent ±2 standard errors.

According to Figure 1, banking sector development responds positively to a shock to one standard deviation shock to the investment amount. Banking sector development responds positively to a shock to stock market development only in the second and third period. Moreover, stock market development responds to banking sector development positively between the period of 4 and 6. In general, according to GIRF results, it is concluded that the government revenue has a positive impact on the government expenditure. These results support the results obtained from TY procedure.

5. CONCLUSION

In this study, we used quarterly data over the period 1998-2015 for Turkey to investigate the causality relationship between financial development and investment amount. We used two measure of financial development, which are bank-based one and stock market-based one. Toda-Yamamoto method is applied in the econometric analysis. The empirical results indicate that financial development causes investment amount if stock market development is taken as a proxy for financial development. This result means that stock market development is crucial importance in increasing investment amount in Turkey, and thus economic policies should be implemented towards the development of the stockmarket. Another empirical finding is that there is a uni-directional causality from investment amount to banking sector development. This result implies that changes in investment amount have an effect on bank credits to the private sector, leading to the development of banking sector. The impulse response functions also support this finding. Moreover, according to empirical findings, there is a bi-directional causal relationship between banking sector development and stock market development, which is supported by impulse response function analysis. This finding denotes that there is indirectly causality from banking sector development to investment amount. These results support the approach argued by McKinnon (1973) and Shaw (1973)which the development of financial system incentives to savings and thus leads to higher investment levels and rapid economic growth rates.

Funding: This study received no specific financial support.

Competing Interests: The author declare that there are no conflict of interests regarding the publication of this paper.

REFERENCES

Altunç, Ö.F., 2008. Türkiye'de finansal gelişme ve iktisadi büyüme arasındaki nedenselliğin ampirik analizi. Eskişehir Osmangazi Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 3(2): 113-127.

Arestis, P. and P.O. Demetriades, 1996. Finance and growth: Institutional considerations and causality. Paper Presented at the Royal Economic Society Annual Conference, University of Wales Swansea, 1-4 April, 1996.

De Gregorio, J. and P.E. Guidotti, 1995. Financial development and economic growth. World Development, 23(3): 433-448.

Demetriades, P.O. and K.A. Hussein, 1996. Does financial development cause economic growth? Time-series evidence from sixteen countries. Journal of Development Economics, 51(2): 387-411.

Dickey, D.A. and W.A. Fuller, 1979. Distribution of the estimators for autoregressive time series with unit root. Journal of the American Statistical Society, 74(366): 427-431.

Domar, E., 1946. Capital expansion, rate of growth, and employment. Econometrica, 14(2): 137-147.

Ege, İ., Ş. Nazlıoğlu and A. Bayrakdaroğlu, 2008. Financial development and economic growth: Cointegration and causality analysis for the case of Turkey. Marc Working Paper Series, No. 2008-4.

Engle, R.F. and C.W.J. Granger, 1987. Cointegration and error correction: Representation, estimation and testing. Econometrica, 55(2): 251-276.

Estrada, G., D. Park and A. Ramayandi, 2010. Financial development and economic growth in developing Asia. Asian Development Bank Economics Working Paper Series. No. 233.

Goldsmith, R.W., 1969. Financial structure and development. New Haven, CN: Yale University Press.

Granger, C.W.J., 1988. Some recent developments in the concept of causality. Journal of Econometrics, 39(1-2): 199-211.

Güneş, S., 2013. Finansal gelişmişlik ve büyüme arasındaki nedensellik testi: Türkiye örneği. Doğuş Üniversitesi Dergisi, 14(1): 73-85.

Harrod, R., 1939. An essay in dynamic theory. Economic Journal, 49(193): 14-33.

Johansen, S., 1988. Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12(2-3): 231-254.

Johansen, S. and K. Juselius, 1990. Maximum likelihood estimation and inference on cointegration- with applications to the demand for money. Oxford Bulletin of Economics and Statistics, 52(2): 169-210.

Kandır, S.Y., Ö. İskenderoğlu and Y.B. Önal, 2007. Finansal gelişme ve ekonomik büyüme arasındaki ilişkinin araştırılması. Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 16(2): 311-326.

Kar, M. and E.J. Pentecost, 2000. Financial development and economic growth in Turkey: Further evidence on the causality issue. Loughborough University Economic Research Paper No:00/27.

Koop, G., M.H. Pesaran and S.M. Potter, 1996. Impulse response analysis in nonlinear multivariate models. Journal of Econometrics, 74(1): 119-147.

Kwiatkowski, D., P.C.B. Phillips, P. Schmidt and Y. Shin, 1992. Testing the null hypothesis of stationary against the alternative of a unit root. Journal of Econometrics, 54(1-3): 159-178.

Levine, R., 1997. Financial development and economic growth: Views and agenda. Journal of Economic Literature, 35(2): 688-726.

Levine, R., N. Loayza and T. Beck, 2000. Financial intermediation and growth: Causality and causes. Journal of Monetary Economics, 46(1): 31-77.

Lucas, R.E., 1988. On the mechanics of economic development. Journal of Monetary Economics, 22(1): 3-42.

Lynch, D., 1995. Does financial sector development matter to investment? Savings and Development, 19(1): 29-60.

MacKinnon, J.G., 1991. Critical values for cointegration tests. In Engle, R.F. and Granger, C.W.J., Eds., Long-run equilibrium relationships: Readings in cointegration. Oxford: Oxford University Press. pp: 267-276.

McKinnon, R.I., 1973. Money and capital in economic development. Washington, DC: Brookings Institution.

Patrick, H.T., 1966. Financial development and economic growth in underdeveloped countries. Economic Development and Cultural Change, 14(2): 174-189.

Pesaran, M.H. and Y. Shin, 1998. Generalized impulse response analysis in linear multivariate models. Economics Letters, 58(1): 17-29.

Phillips, P., 1987. Time series regression with unit roots. Econometrica, 55(2): 277-301.

Phillips, P.C.B. and P. Perron, 1988. Testing for a unit root in time series regressions. Biometrica, 75(2): 335-346.

Rebello, S., 1991. Long-run policy analysis and long-run growth. Journal of Political Economy, 99(3): 500-521.

Romer, P.M., 1986. Increasing returns and long-run growth. Journal of Political Economy, 94(5): 1002-1037.

Runkle, D.E., 1987. Vector autoregressive and reality. Journal of Business and Economics Statistics, 5(4): 437-442.

Schumpeter, J.A., 1912. A theory of economic development. Cambridge, MA: Harvard University Press.

Schumpeter, J.A., 1954. History of economic analysis. London: George Allen and Unwin Ltd.

Shaw, E.S., 1973. Financial deepening in economic development. New York: Oxford University Press.

Solow, R., 1956. A contribution to the theory of economic growth. Quarterly Journal of Economics, 30(1): 65-94.

Thiel, M., 2001. Finance and economic growth-a review of theory and the available evidence. European Commission Economic Papers No. 158.

Toda, H.Y. and T. Yamamoto, 1995. Statistical inference in vector autoregressions with possibly integrated processes. Journal of Econometrics, 66(1-2): 225-250.

Ünalmış, D., 2002. The causality between financial development and economic growth: The case of Turkey. The Central Bank of the Turkish Republic, Research Department Working Paper, No: 3.