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The Causality between Financial Development and Economic Growth: The Case of Turkey

Ayşen Araç[1] and Süleyman Kutalmış Özcan[2]

In this study, we investigate the causal relationship between financial development and economic growth in Turkey for the 1987:1-2012:4 period. We use eight series to indicate financial development and employ Johansen's (1991) Cointegration Approach, Pesaran's (2001) Bounds Testing and Granger Causality Tests. The test results suggest that long-run relationships exist between economic growth and all financial development indicators. Moreover, our findings support both supply leading and demand following hypotheses. The direction of the short-run and long-run causal relationship between economic growth and financial development depends on which financial development indicator is used. Particularly, improvements in financial development indicators related to the resource allocation function of the financial system lead to economic growth whereas economic growth causes financial development through increasing banks' assets in the long run.

1. Introduction

The relationship between financial development and economic growth has been one of the most investigated subjects in economic literature for a long time. According to Schumpeter (1911), who was one of the first economists to discuss the effects of financial system on economic growth, banks enable resources to be allocated to innovative and productive fields by providing credits to firms. Thus, banks play an important role in economic development by enabling technological innovations. This view, which is based on Schumpeter (1911), is called as "supply leading hypothesis" by Patrick (1966).

[1]Hacettepe University, Faculty of Economics and Administrative Sciences, Department of Economics, Beytepe, Ankara, Turkey, e-mail: aysens@hacettepe.edu.tr
[2]Central Bank of The Republic of Turkey, Ulus, Ankara, Turkey,
e-mail: suleyman.ozcan@tcmb.gov.tr

In economic literature, another view, which has been led by Robinson (1952), argues a causal relationship from economic growth to financial development. According to this view, as the economy grows, demand for financial institutions and tools will increase, and therefore economic growth will cause development of the financial system. This view is termed "demand following hypothesis" by Patrick (1966), which proposes a causal relationship from economic growth to financial development.

Until the beginning of 1990s, "Financial Repression School" suggested explanations to the effects of financial development on economic growth. According to McKinnon (1973) and Shaw (1973), the pioneers of Financial Repression School, policy implementations such as interest rate ceilings and keeping required reserve ratio at high levels restrain financial development and hence the economic growth. However, opposite implementations that liberalize financial system are expected to result in higher level of savings and productive investments, which increase the ratio of economic growth.

In the beginning of 1990s, the causal relationship from financial development to economic growth is started to be explained in the literature of the endogenous growth models. According to the endogenous growth models, the services provided by financial markets and instruments are assumed as endogenous variables. Financial development leads to economic growth through two channels. First, financial system provides funds for investments through mobilizing of savings, which leads to capital accumulation. Second, financial system monitors the investment projects, which help the spillover of information possessed by economic units and enhance total factor productivity. Capital accumulations and enhancing total factor productivity cause economic growth (Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; King and Levine, 1993b; Pagano, 1993; Greenwood and Smith, 1997).

In the related literature, it has been put forward that the causal relationship between financial development and economic growth can change its direction throughout the development process. According to this view argued by Patrick (1966), supply leading hypothesis is valid for the earlier stages of a country's development, while demand following hypothesis is valid for the latter stages. In earlier stages of

development, services provided by the financial system accelerate technological development and the rate of economic growth increases. As development proceeds, economic growth increases demand for financial instruments and lead to development of financial system.

In the literature, besides the studies that support supply leading and demand following hypotheses, there are also those which support that there is no causal relationship between financial development and economic growth. For example, Lucas (1988) argues that monetary changes do not have any effect on economic growth, and therefore there is no causal relationship between financial development and economic growth.

The purpose of our study is to investigate the existence and the direction of the long run and short run causal relationships between financial development and economic growth in the 1987:1-2012:4 period in Turkish economy. Our study aims to contribute to the literature, in which there are many different views, with new evidence.

The selection of the variables indicating the level of financial development in an economy is one of the major problems encountered in the applied studies investigating the relationship between financial development and economic growth (Levine. 1997). Since there might be many financial events that are not recorded in economies, the variables that are used to proxy the level of financial development may be insufficient. This problem is encountered more frequently in countries with a weak financial infrastructure such as Turkey. This problem is tried to be solved in the applied literature by using many different variables as indicators of financial development. However, using many different financial development indicators in one model also arise econometric problems such as serial correlations. In our study, in order to circumvent aforementioned problems encountered in applied literature, eight different series are used to indicate financial developments and for every financial development indicator we form separate models.

In this study, we apply Johansen (1991) Cointegration and Peseran (2001) Bound Testing approaches in order to analyze the existence of the long run relationship between financial development and economic growth. The error correction models with the variables that are found to

be cointegrated are tested for causal relationships by using Granger Causality Test. Our findings suggest that the directions of the short-run and long-run causal relationships between economic growth and financial development indicators depend on the financial development indicators that are used. Thus, our findings support both supply leading and demand following hypotheses.

The paper consists of 6 sections including introduction and is organized as follows. The second section reviews the applied literature. In the third section, important developments in the near history of Turkish financial system are mentioned. The fourth section sets out the data set and econometric methodology. The empirical results are presented in the fifth section. The conclusion section offers the evaluation of the results.

2. Literature Review

The theoretical approaches mentioned above which explain the relationship between financial development and economic growth predict four different types of causality relationships. The direction of the causal relationship between financial development and economic growth may be from financial development to economic growth or from economic growth to financial development. The former of these relationships puts forward the validity of the supply leading hypothesis, while the latter validates the demand following hypothesis. In addition to these, while there may exist a bidirectional causal relationship between financial development and economic growth, it is also possible to have no causal relationships between them. Many applied studies have provided evidences with regards to the direction of the causal relationship. Some of these studies are summarized in Table 1.

It can be seen from the Table 1 that cross sections were used in many of the applied studies until 2000s because of the insufficiency of length of time series (Demetriades and Hussein, 1996). The studies shown by the Table 1 reach the conclusion that there is a positive relationship between financial development and economic growth, but there is no consensus on the direction of the relationship. While Jung (1986), Kar and Pentecost (2000) and Kandır et.al. (2007) supported the demand following hyphothesis, the results of Goldsmith (1969), Gupta (1984), Rousseau and Watchel (1998), Neusser and Kugler (1998), Xu (2000) and Arestis et.al. (2001), Aslan and Küçükaksoy (2006), Acaravcı et.al.

(2007) and İnce (2011) are consistent with the supply leading hyphothesis. Luintel and Kahn (1999), Ünalmış (2002) and Demirhan et.al. (2011) provided evidences for bidirectional causal relationships between financial development and economic growth.

Table 1: The Relationship between Financial Development and Economic Growth, Applied Literature

Study	Period	Countries	Financial Development Indicators	Method	Result
Goldsmith (1969)	1949-1963 (annual data)	35 countries	The Ratio of The Value of Financial Assets to GNP	Graphical Analysis	A positive relationship is found where the ratio of size of financial instruments to the total production increases as the level of development increases.
Gupta (1984)	1961-1980 (quarterly data)	14 developing countries	M2	VAR and Granger Causality Tests	Supply leading hypothesis
Jung (1986)	For at least 15 years depending on the countries (annual data)	56 countries	1-M1/GDP 2-M2/GDP	VAR and Granger Causality Tests	In less developed countries, the causal relationship is from finance to economic growth. In developed countries, the causality is reversed.
King and Levine (1993a)	1960-1989 (annual data)	80 countries	1 - M3/GDP 2 – The Ratio of the Total Assets of the Banking Sector to the Total Assets of Central Bank and Banking Sector 3 – Ratio of the Private Sector Credit to the Total Domestic Credit 4 – Ratio of the Volume of Private Sector Credit to GDP	OLS	A positive relation between financial development and economic growth is found.
Demetriades and Hussein (1996)	For at least 27 years depending on the countries (annual data)	16 developing countries	1-The Ratio of Total Deposits to GDP 2- Ratio of the Volume of Private Sector Credit to GDP	VAR, VECM, Johansen Cointegration Technique and Granger Causality Tests	The direction of the causal relationship between financial development and economic growth could not be clearly determined.
Neusser and Kugler (1998)	1970-1991 (annual data)	13 OECD countries	Financial sector's GDP	VAR, Johansen Cointegration Technique and Granger Causality Tests	GDPs of financial sector and manufacturing sector are cointegrated in half of the countries that are examined. (Supply Leading Hypothesis)

Table 1 (Continued): The Relationship between Financial Development and Economic Growth, Applied Literature

Study	Period	Countries	Financial Development Indicators	Method	Result
Levine and Zervos 1998)	1976-1993 (annual data)	47 countries	1-Capitilization of stock market 2-Turnover ratio of stock market 3-Value traded in the stock market divided by GDP 4-Volatility of stock returns 5-Bank credit to private sector divided by GDP	OLS	A strong positive relationship is found between financial development and economic growth.
Rousseau and Watchel (1998)	1870-1929 (annual data)	5 developed countries	1-Assets of commercial banks 2-The combined assets of commercial banks and saving institutions 3-Assets of commercial banks, savings institutions, insurance companies, credit cooperatives, and pension funds 4-The difference between the stock of money and the base	VAR, VECM, Johansen Cointegration Technique and Granger Causality Tests	Supply Leading Hypothesis
Luintel and Kahn (1999)	For at least 36 years depending on the countries (annual data)	10 developing countries	The Ratio of Total Deposits to GDP	VAR, VECM, Johansen Cointegration Technique and Granger Causality Tests	Bidirectional causal relationship is found between financial development and economic growth in all countries.
Xu (2000)	1960-1993 (annual data)	41 countries	The Ratio of Total Deposits to GDP	VAR and Impulse-Response Analysis	Supply Leading Hypothesis
Arestis, Demetriades and Luintel (2001)	1972-1998 (quarterly data)	5 developed countries	1-The ratio of stock market value to GDP 2-The ratio of domestic bank credit to GDP 3-Stock market volatility	VECM, Johansen Cointegration Technique and weak exogenity test	Developments both in banking and stock exchange market affect economic growth positively.

Table 2: The Relationship between Financial Development and Economic Growth, In Case of Turkey

Study	Period	Financial Development Indicators	Result
Kar and Pentecost (2000)	1963-1995 (annual data)	1-M2/GDP 2-The Ratio of Total Deposits to GDP 3-The Ratio of Credits to GDP 4- Ratio of the Private Sector Credit to GDP 5- Ratio of the Private Sector Credit to the Total Credit	The direction of the causal relationship between financial development and economic growth depends on the indicators. However, overall tendency is from economic growth towards financial development.
Ünalmış (2002)	1970-2001 (annual data)	1-M2/GDP 2- The Ratio of Total Deposits to GDP 3- The Ratio of Credits to GDP 4- Ratio of the Private Sector Credit to GDP 5- Ratio of the Private Sector Credit to the Total Credit	In the short run, the direction of the causal relationship is from financial development towards economic growth. In the long run, causal relationship is bidirectional.
Aslan and Küçükaksoy (2006)	1970-2004 (annual data)	The volume of private sector credits	Supply Leading Hypothesis
Aslan and Korap (2006)	1987-2004 (quarterly data)	1-M2Y/GDP 2- Ratio of the Volume of Private Sector Credit to GDP	A long run relationship exists between financial development and economic growth. The direction of the causal relationship depends on the indicators of financial development that are being used.
Kandır et.al. (2007)	1988-2004 (quarterly data)	1-The ratio of the transactions in stock market to the capitalization of stock market 2- Ratio of the Private Sector Credit to GDP 3- The transections in stock market divided by GDP 4-Capitilization of stock market divided by GDP	Demand Following Hypothesis
Acaravcı et.al. (2007)	1986-2006 (quarterly data)	The Ratio of Total Deposits to GDP	Supply Leading Hypothesis in the short run
İnce (2011)	1980-2010 (annual data)	1-M2/GDP 2- Ratio of the Total Credit to GDP 3- Ratio of the Private Sector Credit to GDP 4-Ratio of the Deposits to GDP 5- Capitilization of stock market	Supply Leading Hypothesis in the short run
Demirhan et.al. (2011)	1987-2006 (quarterly data)	1- Ratio of the Private Sector Credit to GDP 2- Capitilization of stock market divided by GDP	Bidirectional causal relationship

The causal relationship between financial development and economic growth for Turkey is intensively investigated in 2000s. Table 2 summarizes some of these studies. Kar and Pentecost (2000) used five indicators of financial development for the 1963-1995 period and applied Granger Causality Tests. Their study revealed that the direction of the causal relationship between financial development and economic growth depends on the financial development indicator. According to the results of the study, financial development causes economic growth when the ratio of the money to the GDP indicates financial development, while economic growth causes financial development when the ratios of bank deposit, private credit and domestic credit to GDP are used as the indicators of financial development. Ünalmış (2002) used the same indicators of financial development as Kar and Pentescot's for the 1970-2001 period and applied Granger causality method. She found a causal relationship from financial development to economic growth in the short run and a bidirectional causal relationship for the long run. Aslan and Küçükaksoy (2006), using Granger causality test for the 1970-2004 period, concluded that financial development leads to economic growth. They utilized an increase in the volume of private sector credits as financial development indicator. Aslan and Korap (2006) applied Granger causality test and Johansen cointegration technique for the 1987-2004 period. According to their results, although a long run relationship is found between financial development and economic growth, the direction of the causal relationship depends on the indicators of financial development that is used. Kandır et. al. (2007) used four different indicators of financial development, three of which are related to stock exchange market and one related to the credit allocation of the banks. They applied Johansen cointegration technique and causality tests for the 1988-2004 period, and concluded that economic growth results in financial development. Acaravcı et. al. (2007) employed cointegration tests and VAR analysis on quarterly data from 1986-2006 period. In this study, using the increase in the ratio of total credit to GDP as financial development, they concluded that a long run relationship does not exist between financial development and economic growth. However, they also found that financial development causes economic growth in the short run. Using causality tests for the 1980-2010 period, İnce (2011) revealed that a long run relationship between financial development and economic growth does not exist, while financial development causes economic growth in the short run. For the 1987-2006 period, Demirhan et. al. (2011) applied error

correction model and impulse response analysis and found a bidirectional causal relationship between financial development and economic growth. Bank credits provided to the private sector and total value of the stock exchange market are used as indicators of financial development in the study, and the tests results show that the banking sector contributes more to the economic growth than the capital markets. It is observed that the studies for Turkey have different results so that more evidence is needed to reach a conclusion. Unlike the previous studies, our study uses a longer period and more variables to indicate financial development, which is the contribution of our study to the literature.

3. Recent Developments in Turkish Financial System

There were radical changes in the structure of the financial system in Turkey in the 1980s. During the 1980s, financial development process was based on practices of financial liberalization. The primary practice of financial liberalization was liberalization of term deposit accounts and credit interest rates[3]. Required reserve ratios were gradually decreased from high rates such as 25% to 15% with decisions taken in 1985 and 1986. Banks foreign currency activities were liberalized with the Law no. 30 in 1984. This practice became the first step of the liberalization of the foreign exchange regime. As the second step of liberalization of the foreign exchange regime, Interbank Foreign Exchange and Effective Market were established within the Central Bank of Turkey in 1988. Foreign exchange regime was liberalized even more with the Law no. 32 in 1989. Controls on capital movement were lifted to a major extent with the same law.

In the post-1980 period, financial development gained new momentum with new financial markets joining to the financial system. After the new regulations that were made in Capital Markets' Law in 1982, Istanbul Stock Exchange (İMKB, henceforth ISE) has reopened in 1985. Interbank Money Market was established in 1986. Market for Gold in Exchange for Foreign Currency was established in 1989, under the authority of Central Bank of Turkey to import gold. In 1995, Istanbul

[3] After the economic crisis in 1994, Central Bank of Turkey interfered with the interest rates, however deregulated interest rates again in January 1995 (Yülek 1998).

Gold Exchange was opened, and the authority to import gold was transferred to market participants.

Since the 2000s, financial depth process in Turkey has speeded up with new financial institutions and instruments being incorporated into the financial system. In 2007, the bonds indexed to the Consumer Price Index started to be issued by Undersecretaries of Treasury. Mortgage and Private Pension System are other new financial tools that came into effect in this period.

First practice related to derivatives markets in Turkey was İstanbul Gold Exchange Derivatives Exchange, which was started as derivatives market in 1997. Another example of derivatives market, İstanbul Stock Exchange General Directorate of Futures, put TL/USD futures contracts into operation in 2001 and TL/EURO futures in 2003. İstanbul Gold Exchange Derivatives Exchange and ISE General Directorate of Futures were terminated operation of futures in 2005, and Turkey's first market for derivative transactions, Turkish Derivatives Exchange (VOB) was established. Traded value of VOB, which was 3 billion TL when it was established in 2005, reached 404 billion TL in 2012 (VOB, 2012).

It can be argued that the role of banks in economy has changed within the period of analysis. Since the first half of 1990s, the public deficit increased and public sector's demand for resources was met through Treasury's usage of short term credit from the Central Bank and Government Debt Securities that were supplied to the market. During this period, banks have become the primary financial components that financed the public deficit. Against this, first step that aimed to restructure the banking sector was the Baking Law dated June 18, 1999 and numbered 4389. It was set forth as a precondition by the International Monetary Fund (IMF), before the stabilization program started in 2000. Other important regulation made in the 2000s was the obligation to establish a committee on risk management and internal audit. In parallel to the decreasing inflation in 2000s, there was an increase in the amount of consumer credits and commercial credits that the banks have supplied. Especially as the result of the increase in commercial credits, banks' credit portfolio reached a size bigger than state bond portfolio. Along with this, the amount of increase in the banking credit portfolio, which reached a level of 35% in 2010, was assessed as the reason of the high current account deficit by the Central

Bank. As the result of precautions that were taken and the developments taking place in the world, the risk appetite decreased, and caused this rate to regress to level of %25 in 2011.

4. Data and Econometric Methodology

4.1. Data

In this study, we use quarterly data for the 1987-2012 period in Turkey. Data on Gross Domestic Product (GDP), which are used as the indicator of economic growth, are obtained from Turkish Statistical Institute, all of the data that are used as indicators of financial development are acquired from Central Bank of Turkey. Information on the variables used in the analysis is given in Table 3.

Tablo 3: Descriptions of Variables

	Variable	**Descriptions**
1.	BAC	The Ratio of the Total Assets of the Banking Sector to the Total Assets of Central Bank and Banking Sector
2.	BAY	Ratio of the Total Assets of the Banking Sector to GDP
3.	CPD	Ratio of the Private Sector Credits to the Total Domestic Credits
4.	CPY	Ratio of the Volume of Private Sector Credits to GDP
5.	DCY	Ratio of the Volume of Total Domestic Credits to GDP
6.	DEPY	Ratio of the Total Banks' Deposits to GDP
7.	M2Y	Ratio of M2Y to GDP
8.	STY	Ratio of Total Volume of İstanbul Stock Exchange (ISE) to GDP
9.	Y	GDP with Fixed (1998) Prices (Thousand TL)

Eight series are used to indicate financial development. First indicators of financial development are the ratios of broad money supply (M2Y) and bank deposits to GDP (DEPY), which are frequently used to

measure the level of financial development in the literature. Another indicator of financial development is the ratio of the volume of total domestic credits to GDP (DCY), since domestic credits are the major component of the total assets of the financial sector. Considering that the credits provided to the private sector is more productive than those provided to the public sector, and in order to have a more direct criterion of the financial intermediation, the variable of ratio of the private sector credits to GDP (CPY) is used as an indicator of financial development. It is claimed that as the private sector's share in credits increases, banking sector allocates resources more efficiently (Kar and Pentecost 2000). For this reason, the ratio of the private sector credits to total domestic credits (CPD) is used as another indicator of financial development. Another indicator of financial development is the ratio of the total assets of the banking sector to the total of the assets of the central bank and the banking sector (BAC). According to King and Levine (1993 a,b), financial development is expected to accelerate while this ratio rises, since the banking sector is more successful in financial services than the central banks. Another indicator of financial development is the ratio of the total assets of the banking sector to GDP (BAY). Similar to the DEPY variable, in the literature an increase in the banking sector assets is used as an indicator of financial development. Eighth financial development indicator in the study is the ratio of the total volume of ISE to GDP, which measures the development of capital markets (STY).

The series used in the analysis are seasonally adjusted through Census X-12 method.

4.2. Econometric Methodology

Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables. To determine whether a group of non-stationary series are cointegrated or not, we use Johansen (1991) cointegration technique and Pesaren's (2001) Bounds Tests.

Johansen (1991) cointegration method depends on VAR model that contains the differences and levels of non-stationary series. VAR model with p-dimensions as a basis for Johansen Cointegration analysis is given in the equation below:

$$X_t = A_1 X_{t-1} + \cdots + A_k X_{t-p} + \Phi D_t + \varepsilon_t, \quad \mathrm{t} = 1, \ldots, \mathrm{T} \qquad (1)$$

In equation number (1) $X_0, \ldots, X_{t-p}$ denote vectors of the variables of integrated of order one I(1); A_t denotes coefficient vectors; D_t denotes the vector of deterministic variables (linear trend, dummy variables, constant term) and ε_t denotes the error term called white noise which has a mean value of zero and constant variance. The equation number (1) can be expressed as follows after some algebraic operations:

$$\Delta X_t = \Pi X_{t-1} + \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_{k-1} \Delta X_{t-p+1} + \Phi D_t + \varepsilon_t, \quad \mathrm{t} = 1, \ldots, \mathrm{T} \qquad (2)$$

The Π and Γ terms in equation number (2) are presented below:

$$\Pi = \sum_{i=1}^{p} A_i - I_p \text{ ve } \Gamma_i = -\sum_{j=i+1}^{p} A_j \qquad (3)$$

The rank of matrix of Π coefficient in equation number (2) is equal to the number of cointegrating vectors. On the other hand, Γ is the coefficient matrix related to the variables denoting the lags of the first difference of X_t vector.

Johansen cointegration method depends on finding the rank of Π coefficient matrix. If the rank of the Π matrix is zero ($r = 0$), this indicates that the variables constituting X_t vector are not cointegrated. If the rank of Π matrix is 1, this indicates that there exists one cointegrating vector for the series constituting X_t vector. In other terms, these series may be expected to move so that they do not drift too far apart in the long run.

Johansen (1991) proposes two different tests to determine the rank of Π matrix or the number of cointegrating vectors. These tests are "Trace Statistics" and "Maximum Eigenvalue" tests. Trace Statistics Test

investigates the rank of Π matrix, and tests the null hypothesis that the rank equals to r or is smaller than r. Trace statistics can be summarized as stated below:

$$\mathrm{TR(r)} = -\mathrm{T}\sum_{j=r+1}^{m} \ln(1-\hat{\lambda}_j) \qquad (4)$$

Here, $\hat{\lambda}_1, \hat{\lambda}_2, \ldots \hat{\lambda}_m$ denote the estimated eigenvalues which are ranked in decreasing order, and T denotes the number of observations used. Maximum Eigenvalue statistics tests the null hypothesis of the existence of r number of independent cointegrating vectors against the alternative hypothesis $r+1$ number of cointegrating vectors, and is expressed as given below:

$$\mathrm{MX(r)} = -\mathrm{T}\ln(1-\hat{\lambda}_{r+1}) \qquad (5)$$

If the statistics calculated in each tests are larger than the critical values at a given significance level, the null hypothesis will be rejected, and it will not be rejected if otherwise.

If the series are cointegrated, Vector Error Correction (VEC) Mechanism can be used to model the series. The VEC has cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The VEC is given as below:

$$D_t = \mu_1 + \sum_{i=1}^{p-1} \lambda_{1,i}\Delta \mathrm{I}\,\mathrm{B}_{t-i} + \sum_{i=1}^{p-1} \delta_{1,i}\Delta \mathrm{F}\,\mathrm{D}_{t-i} + \alpha_1(\mathrm{IB}_{t-1} - \beta_1 \mathrm{FD}_{t-1}) + \mathrm{e}_{1,t} \qquad (6a)$$

$$\mathrm{B}_t = \mu_2 + \sum_{i=1}^{p-1} \lambda_{2,i}\Delta \mathrm{I}\,\mathrm{B}_{t-i} + \sum_{i=1}^{p-1} \delta_{2,i}\Delta \mathrm{F}\,\mathrm{D}_{t-i} + \alpha_2(\mathrm{IB}_{t-1} - \beta_2 \mathrm{FD}_{t-1}) + \mathrm{e}_{2,t} \qquad (6b)$$

IB stands for the logarithm of economic growth. FD represents the logarithm of financial development indicator. β_i $(i = 1,2)$ denotes the coefficient of the cointegrating vector. α_i $(i = 1,2)$, the coefficient of the lagged error correction term, measures the speed of adjustment of the i-th endogenous variable towards the equilibrium.

As explained above, the presence of a cointegrating relation forms the basis of the VEC specification. The error correction terms of VEC may be used to estimate the direction of long run causality. In this case, the fact that α_1 coefficient is significant in the equation number (6a) indicates that IB is the cause of FD in the long run, and the fact that α_2 coefficient is significant in the equation number (6b) indicates that FD is the cause of IB in the long run. In order to determine the short run causality relation, Wald tests may be applied. In this respect, for the equation number (6a), if the $\lambda_{1,i}$ coefficients related to the lagged values of IB variable are found to be significant as a whole, it can be stated that IB variable is the Granger cause of FD variable in the short run. Similarly, if the significance of $\delta_{2,\mathrm{i}}$ coefficients related to the lagged values of FD variable in equation (6b) cannot be rejected, it can be expressed that FD variable is the Granger cause of IB variable in the short run.

If the series are not the first-difference stationary, Johansen cointegration methods cannot be used to determine the long run relations between the variables. The Bounds Testing Approach, developed by Pesaran et al. (2001), allows for testing of cointegration relation, even though there is no precise information on whether the regressors are $I(0)$ or $I(1)$. Bounds test is based on the following dynamic error correction models ECM:

$$\Delta \mathrm{F}D_{\mathrm{t}} = \mu_1 + \alpha_1 \mathrm{IB}_{\mathrm{t-1}} + \beta_1 \mathrm{FD}_{\mathrm{t-1}} + \sum_{\mathrm{i=1}}^{\mathrm{p-1}} \lambda_{1,\mathrm{i}} \Delta \mathrm{I\,B}_{\mathrm{t-i}} + \sum_{\mathrm{i=1}}^{\mathrm{p-1}} \delta_{1,\mathrm{i}} \Delta \mathrm{F\,D}_{\mathrm{t-i}} + \omega_1 \Delta \mathrm{IB}_{\mathrm{t}} + \mathrm{e}_{1,\mathrm{t}} \quad (7a)$$

$$\Delta \mathrm{IB}_{\mathrm{t}} = \mu_2 + \alpha_2 \mathrm{IB}_{\mathrm{t-1}} + \beta_2 \mathrm{FD}_{\mathrm{t-1}} + \sum_{\mathrm{i=1}}^{\mathrm{p-1}} \lambda_{2,\mathrm{i}} \Delta \mathrm{I\,B}_{\mathrm{t-i}} + \sum_{\mathrm{i=1}}^{\mathrm{p-1}} \delta_{2,\mathrm{i}} \Delta \mathrm{F\,D}_{\mathrm{t-i}} + \omega_2 \Delta \mathrm{F}D_{\mathrm{t}} + \mathrm{e}_{2,\mathrm{t}} \quad (7b)$$

Pesaran et al. (2001) propose applying the familiar F-test with new critical values that they tabulate. Therefore, null of no cointegration, i.e. $H_0^{\alpha_i}: \alpha_i = 0, H_0^{\beta_i}: \beta_i = 0$ for $i = 1,2$ is tested against the alternative of $H_0^{\alpha_i}: \alpha_i \neq 0, H_0^{\beta_i}: \beta_i \neq 0$ for $i = 1,2$. The critical values that are tabulated consist of an upper bound on the assumption that all variables are integrated of order one and a lower bound on the assumption that all variables are integrated of order zero. If the computed F statistics exceed the upper bound, the conclusive decision can be made in favor of the cointegration.

If the series are cointegrated, error correction models (ECM) given in (6a) and (6b) equations can be used to determine the causal relationship between the economic growth and financial development. The F-statistics on the lagged explanatory variables of the ECM indicates the significance of the short-run causal effects. The t-statistics on the coefficients of the lagged error-correction term indicates the significance of the long-run causal effect.

5. Estimation Results

Johansen Cointegration Technique and ECM described in the previous section relies on the assumption that both the financial development (FD) and economic growth (IB) series are I(1) processes. Therefore, prior to estimation of the ECMs, we test stationarity of the variables concerned. Table 4 presents the conventional ADF test results. As can be seen from the Table 4, the ADF tests suggest that both economic growth series and financial development indicators contain a unit root except for STY.

In order to check if there is a cointegration relationship between the variables, we employed Johansen (1991) cointegration tests. However, since STY variable is not first difference stationary, Johansen Cointegration method cannot be used to determine the long-run relationship between STY and economic growth. In order to indicate if economic growth and STY are cointegrated, Bound Test developed by Pesaran et al (2001) is used.

Table 4: Unit Root Test Results (ADF)

Variables		Intercept only	Intercept and Time Trend	Result
BAC	Level	-1,869	-2,450	I(1)
	1st Difference	-7,739*	-7,748*	I(0)
BAY	Level	0,572	-2,278	I(1)
	1st Difference	-8,272*	-8,385*	I(0)
CPD	Level	-2,172	-2,166	I(1)
	1st Difference	-9,748*	-9,774*	I(0)
CPY	Level	0,240	-1,954	I(1)
	1st Difference	-4,359*	-7,089*	I(0)
DCY	Level	0,137	-1,891	I(1)
	1st Difference	-4,161*	-4,542*	I(0)
DEPY	Level	0,183	-2,504	I(1)
	1st Difference	-8,708*	-8,732*	I(0)
M2Y	Level	-0,744	-2,074	I(1)
	1st Difference	-4,419*	-4,338*	I(0)
STY	Level	-5,080*	-4,297*	I(0)
	1st Difference	-8,687*	-7,787*	---
Y	Level	-0,567	-3,004	I(1)
	1st Difference	-9,681*	-9,632*	I(0)

Table 5 shows the results of the Bounds Test. According to the test results, when STY financial indicator is the explanatory variable, there is no cointegration relationship between economic growth and STY financial development variables. In the case when economic growth is the explanatory variable, we can accept the existence of a long run relationship with 2.5% level of confidence. According to the test results, financial development has an explanatory power of economic growth in the long-run.

Tablo 5: Bounds Testing Results for a Level Relationship between STY and Y

Dependent Variable	Lag of Order (p)	F- statistics (Unrestricted Intercepts, No trends)
STY	5	0.428630
Y	5	7.127406*

Note: The lag lengths of each variable in each equation were selected by applying conventional Akaike Information Criterion (AIC). The critical value of the F-statistic for upper bound and the lower bound with one regressor are 5.77 and 6.68 respectively at the 2.5% level of significance The critical values are provided in Pesaran et al. (2001; p. 300). * denotes significance at 2.5% level.

The financial development indicators other than STY are stationary in the first difference. Therefore, it is possible to use Johansen cointegration method. Results of the Johansen Cointegration test are sensitive to lag structure of the variables. The lag lengths of each variable in each equation were selected by applying conventional Akaike Information Criterion (AIC), and then the resultant model was tested against autocorrelation of residuals. Accordingly, the most suitable lag numbers are selected as 1, and 2, 6, 5, 5 and 1 for the first, second, third and the other models in a row, respectively. We add dummy variables (DUM94, DUM01 and DUM08) in order to take into account of the impacts of the 1994, 2001 and 2008 crises in the Turkish economy. It is observed that each of these dummy variables is significant in explaining the independent variables.

The results of the Johansen Cointegration Test are provided in Table 6. Test results suggest that there are cointegration relationships between financial development indicators and economic growth. According to the test results, it is possible to claim that a long-run relationship exists between economic growth and all financial development indicators that are used.

Table 6: The Results of Johansen Cointegration Tests

Models		**Ho:**	**Eigenv.**	**Trace Statistics**	**Critical V.(0.05)**	**Prob.**
1st Model	Y-BAC	$r = 0$	0.190397	26.09*	25.87	0.0470
		$r \leq 1$	0.043581	4.55	12.52	0.6625
2nd Model	Y-BAY	$r = 0$	0.170234	19.50*	15.49	0.0118
		$r \leq 1$	0.006449	0.65	3.84	0.4189
3rd Model	Y-CPD	$r = 0$	0.361256	43.82*	15.49	0.0000
		$r \leq 1$	0.003537	0.34	3.84	0.5577
4th Model	Y-CPY	$r = 0$	0.213804	27.05*	25.87	0.0356
		$r \leq 1$	0.034851	3.48	12.52	0.8158
5th Model	Y-DCY	$r = 0$	0.185896	24.76*	25.87	0.0682
		$r \leq 1$	0.045942	4.61	12.52	0.6531
6th Model	Y-DEPY	$r = 0$	0.166737	19.22*	15.49	0.0131
		$r \leq 1$	0.005964	0.61	3.84	0.4347
7th Model	Y-M2Y	$r = 0$	0.220268	25.76*	15.49	0.0010
		$r \leq 1$	0.003761	0.38	3.84	0.5353
Models		**Ho:**	**Eigenv.**	**Max-Eigen Statistics**	**Critical V.(0.05)**	**Prob.**
1st Model	Y-BAC	$r = 0$	0.190397	21.54*	19.39	0.0239
		$r \leq 1$	0.043581	4.55	12.52	0.6625
2nd Model	Y-BAY	$r = 0$	0.170234	18.85*	14.26	0.0088
		$r \leq 1$	0.006449	0.65	3.84	0.4189
3rd Model	Y-CPD	$r = 0$	0.361256	43.48*	14.26	0.0000
		$r \leq 1$	0.003537	0.34	3.84	0.5577
4th Model	Y-CPY	$r = 0$	0.213804	23.57*	19.39	0.0116
		$r \leq 1$	0.034851	3.48	12.52	0.8158
5th Model	Y-DCY	$r = 0$	0.185896	20.16*	19.39	0.0386
		$r \leq 1$	0.045942	4.61	12.52	0.6531
6th Model	Y-DEPY	$r = 0$	0.166737	18.61*	14.26	0.0097
		$r \leq 1$	0.005964	0.61	3.84	0.4347
7th Model	Y-M2Y	$r = 0$	0.220268	25.38*	14.26	0.0006
		$r \leq 1$	0.003761	0.38	3.84	0.5353

Note: * denotes that H_0 can be rejected at 5% significance level.

In order to identify the existence and direction of the causality relationships between economic growth and financial development indicators, Vector Error Correction Mechanisms (VECM) are formed. VECM results are presented in Table 7.

Table 7: VECM Estimation Results

Models	α_1	α_2	**Cointegration Equation**
1st Model BAC-Y	0.000597 [0.31626]	0.016056 [5.06699]	BAC = 15.8790*Y - 0.1534 *trend - 257.3092
2nd Model BAY- Y	-0.036167 [-4.76064]	0.014397 [3.26023]	BAY = 11.7586*Y - 0.1013 *trend - 190.4080
3rd Model CPD- Y	0.003916 [0.61283]	0.051118 [5.02331]	CPD = 4.9199*Y -0.0464 *trend – 79.7806
4th Model CPY-Y	-0.008837 [-1.02579]	0.017535 [4.62992]	CPY = 18.4393*Y - 0.1612 * trend - 299.9305
5th Model DCY-Y	-0.335006 [-4.73074]	0.004518 [0.02732]	Y = 0.01445*DCY + 0.00923 *trend + 16.2183
6th Model DEPY-Y	-0.238141 [-4.92795]	0.004992 [1.05271]	Y = 0.0287*DEPY + 0.0093 *trend + 16.2055
7th Model M2Y-Y	-0.179870 [-4.56929]	0.274744 [4.48790]	Y = 0.1911*M2Y + 0.0071 *trend + 16.3233

Note: t values of parameter estimates are provided in square parenthesis [].

As the Tablo 7 reveals, α_2 in the 1st, 3rd and 4th models, α_1 in the 5th and 6th model and both in the other models are statistically significant. The significance of those coefficients imply that there are long-run relationships between economic growth and financial development indicators. Accordingly, BAC, CPD and CPY financial indicators are the long-run Granger causes of economic growth while economic growth is the long-run Granger cause of the ratios of volume of domestic credits and the total banks' deposits to GDP. In addition, while BAY and M2Y are long-run Granger causes of economic growth, economic growth is the long-run Granger cause of financial development indicators of BAY and M2Y as well.

A cointegrating equation may be interpreted as a long-run equilibrium relationship among the variables. Since we use logarithms of the variables, the coefficients in the cointegration equations that are presented in Table 7 are elasticities. In consistence with supply leading and demand following hypotheses, the estimated elasticities are all positive. The estimated coefficients imply that for example %1 increase in GDP leads to an increase by 4.9199% in the ratio of the private sector credits to total domestic credits, and an increase by 18.4393% in the

ratio of volume of the private sector credits to GDP. Increase by 1% in the ratios of the volume of total domestic credits (DCY), general deposits (DEPY) and M2Y to GDP lead GDP to increase by %0.01445, 0.0287 and 0.1911, respectively.

We use Wald tests in order to determine short run causal relationships between the variables. The test results are provided in Table 8. Since the most suitable lag number for the VAR models that 1st, 6th and 7th models are based on is 1, Wald tests cannot be applied to these VEC models. The 8th model in the table is an ECM model, which is based on the equation number (6b). D, shows the first difference of the series.

In the Table 8 the low probability values indicate that the null hypothesis that the lagged explanatory variables of the VEC and EC models are equal to zero is strongly rejected. Therefore, there are short-run causal relationships between CPD, CPY, DCY and STY and economic growth. In the short-run, economic growth increases the ratio of the private sector credits to the total domestic credits (CPD) and the ratio of ISE total traded value to GDP (STY). The direction of the short-run causal relationships between economic growth with the ratio of volume of private sector credits to GDP (CPY) and ratio of volume of total domestic credits to GDP (DCY) are bidirectional.

Table 8: The Results of VEC Granger Causality/Block Exogeneity Wald Tests and Wald Test

Models	Dependent Var.	Chi-sq	Df	Prob.
2nd Model	D(BAY)	1.027986	1	0.3106
	D(Y)	2.522023	1	0.1123
3rd Model	D(CPD)	0.893804	1	0.3444
	D(Y)	3.349607	1	0.0672
4th Model	D(CPY)	7.914672	2	0.0191
	D(Y)	6.552581	2	0.0378
5th Model	D(DCY)	15.25060	4	0.0042
	D(Y)	14.34739	4	0.0063
8th Model	D(Y)	20.22677	8	0.0095

The directions of short-run and long-run causalities obtained in the analysis are summarized in Table 9 with arrows.

Table 9: Short and Long Run Directions of Causalities

Variables	Directions of Causalities	
	Short Run	**Long Run**
Y - BAC	-	BAC → Y
Y - BAY	No causality	BAY ↔ Y
Y - CPD	Y → CPD	CPD → Y
Y - CPY	CPY ↔ Y	CPY → Y
Y - DCY	DCY ↔ Y	Y → DCY
Y - DEPY	-	Y → DEPY
Y - M2Y	-	Y ↔ M2Y
Y - STY	Y → STY	STY → Y

Note: "- " stands for no report. The reason for no report is that since the most suitable lag number for the VAR models that Y – BAC, Y - DEPY and Y - M2Y models are based on is 1, Wald tests cannot be applied to these VEC models.

6. Conclusion

In this study, we examine the causal relationship between financial development and economic growth in Turkey for the 1987:1-2012:2 period. We use eight different variables to indicate financial development. Johansen (1991) Cointegration Technique and Pesaran's (2001) Bounds Testing Approaches are employed to investigate long-run causal relationships between financial development indicators and economic growth series. The test results suggest that long-run relationships exist between economic growth and all financial development indicators that are used. We use Granger causality tests based on error correction mechanisms to examine the short and long run directions of the causality between economic growth and financial development indicators. We find that the directions of the short-run and long-run causal relationships between economic growth and financial development indicators depend on the financial development indicators that are used. Thus, our findings support both supply leading and demand following hypotheses.

Our findings can be summarized as follows. First, an increase in total assets of the banking sector and an increase in the share of the banks' assets in total assets of the Central Bank and banking sector lead to

economic growth in the long-run. Moreover, the increase in the ratio of volume of private sector credits to GDP and an increase in the share of private sector credits in domestic credits have positive effects on long-run economic growth rates. These results are consistent with the supply leading hypothesis. It is a known fact that the financial system makes possible the savings to be collected in one big pool and the high-return investment projects that can only be realized by major funds to be financed. These findings imply that as a result of an increase in funds in the banks and bigger amounts of funds being used as credits, more high-return investment projects may be financed, and therefore increasing saving and credit usage lead to economic growth.

Second, the economic growth causes financial development as increases in the ratios of total assets of banking sectors, total deposits and M2Y on GDP, as well as the ratio of the volume of total domestic credit to GDP in the long-run. These results are consistent with the demand following hypothesis. Those financial development indicators are related to banks' assets. Therefore, the results suggest that the banks' assets and financing demands of the real sector increase as economy grows.

Third, the long run relationship between economic growth and the ratio of the (Ratio of Total Volume of İstanbul Stock Exchange) ISE total traded value to the GDP is positive. Economic growth increases the volume of ISE's total traded value in the short run.

Our findings regarding short run are as follows. Economic growth increases the volume of total credits, the volume of private sector credits and the share of the volume of private sector credits within total domestic credits. This is consistent with demand following hypothesis. This result implies that as a result of economic growth, credit usage, especially by the private sector increases in the short run. Conversely, the increase in the volume of the total domestic credits and private sector credits have positive impact on the rate of economic growth, which are consistent with supply leading hypothesis. On the other hand, the ratio of the total assets of the banking sector to GDP is not in a causal relationship with economic growth in the short run. These findings are interpreted that total assets of the banking sector and economic growth increase in the same magnitude so as to leave the ratio unchanged in the short run since the results also reveals that an increase in banks' assets lead to economic growth in the long run.

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