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THE CASE OF TURKEY IN SEARCH OF THE NEW ASPECTS OF FINANCIAL DEVELOPMENT: ECONOMIC GROWTH RELATIONSHIP

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ABSTRACT

This study was conducted to determine the relationship between economic growth and financial development in Turkey for the period 1998:Q1 to 2021:Q1. For this purpose, following traditional practices, economic growth is monitored using the real gross domestic products' changes. Financial development(FD) of Turkey's monitored by using two aspects of financial development that are found equally important. These aspects are 'financial institutions development'(FID) and 'financial markets development'(FMD). Within the scope of the study, which is designed as a time series study, unit root and stationarity process tests were performed. Finding the series stationary, vector autoregressive model (VAR) is proposed. After lag length selection with the stable model, impulse response(IR) analyses were performed. After the IR analyses variance decomposition was performed using the Cholesky method. Both the economic development and financial development are considered to be important for Turkey and they have a relationship. The variables used in the study were found to be representative but not enough to conduct political or financial decisions. With the digital transformation, new variables should also be searched to represent the financial development and economic growth.

Keywords: Financial Markets, Economic Development, Economic Growth, Financial Institutions and Services.

JEL Codes: G1, O16, O47, G2

1. Introduction

Financial markets development is a matter of interest in finance studies because it is closely related to the overall development of an economy. In this study, Turkey's financial systems' well-functioning was investigated. Transaction costs may be lowered, resource allocation may be improved and economic growth may be boosted if information in the financial system is good and easily accessible to all market participants. As a desired action, poverty reduction due to economic growth may be enhanced by financial development.

Sources of financial development may be listed as the banking system and stock markets of a country. If the banks are dominant in the financial system, then the level of economic development and financial development of that system is considered to be at low levels. In order to reach higher levels, stock markets should become more active.

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In the literature, some of the prerequisites of a developed financial system are listed as sound and transparent – communicating – economy management, well-functioning justice system with shareholder protections. Such an environment would attract capital to the market from abroad and from domestic channels, which will lead to financial market development.

It must be noted that increasing communication with the technological development resulted in international transactions of funds. In the near future, the gap between the levels' of economic development of countries may widen further. In addition, the competitive advantages of developed markets may result in the crowding-out effect.

There is a great amount of discussion and literature on the relationship between financial development and economic growth both theoretically and empirically. Just for a helicopter view on the economic theory about these, one may visit the studies of Dornbusch & Fischer (1994); Levine (2005); Mankiw (1989), (2019); Mishkin & Eakins (2012), and else.

Study of King & Levine, (1993) draws a special attention with its 'financial development may affect economic growth' proposition. Because in the neoclassical growth theories, there is no role attributed to the financial development(Çeştepe & Yıldırım, 2016, p. 13).

Financial development and economic growth relationships can be considered in various perspectives. Four main perspectives are listed as, Schumpeter hypothesis, Robinson hypothesis, Patric hypothesis, and Lucas hypothesis. The purpose of this study is not to argue the economic theory; therefore, it is sufficient to mention these main perspectives. For further details, curious researchers may visit Goodwin & Robinson, (1952); King & Levine, (1993); Lucas,(1988); Patrick, (1966); Schumpeter, (1934), or if you are not interested in the details visit the studies of Çeştepe & Yıldırım, (2016) for a brief discussion on the topic. The research question of this study is given in topic numbered 2.3. In short, the relationship between the financial development and the economic growth was considered.

This study consists of five main parts and it is arranged as follows: In the first part, the introduction, background of the research question and the reasons lying beneath that are given. The aspects of the topic are introduced here. In the second part, the information, documents and related materials such as law, statue and communiqués are collected in accordance with the purpose of the study were handled together and the material of the research was created. Literature search is presented in this part with the research question and expectations during the study. In particular of Turkey, the material used can be summarized as, the regulations of BASEL and Banking Regulation and Supervision Agency of Turkey(BRSA), the data used in the banking and finance literature, data gathered from the Central Bank of the Republic of Turkey(CBRT) database also data from the Bank for International Settlements(BIS) database, and other related documents. The methods that may be suitable for the study and the results that may be encountered were evaluated together to propose the research question and the expectations. In the third chapter, the results and findings of the implemented methods are presented. Finally, in the discussion section, a general review is presented.

2. Methodology

2.1. Material In Use

When data availability is stressful, sometimes it is best to replicate an article in a wide sense. Assumption of wide sense replication is having a successful narrow sense replication. Narrow sense replication assumes that the data of the primary source and the data of previous

study are consistent and accurate if applicable. Taking the replication to a wider sense includes changing the period, the country or region, etc. that the main study focuses. It is preferred to study with an other program to also test for standard errors.

This study was not a replication. However, following the path of Demir, Öztürk, & Albeni, (2007), financial development and economic growth of Turkey is studied using similar magnitudes. As of 2021, the data mentioned in their study was not reachable.

In order to bypass similar issues, in this article four foundational principles— Findability, Accessibility, Interoperability, and Reusability— known as FAIR principles are being accepted and conducted throughout the study.

The real GDP value, which is the main explainer of growth, is used as output in the study by Demir et al., (2007). Updated data set of CBRT is used to represent a similar magnitude in this study. As stated in the metadata file of the GDP series, in order to interpret the monthly/periodical and annual changes in short-term indicators in a healthy way, adjustments for seasonal and calendar effects are made according to the previous month/period. It will be more meaningful to use indicators and to use calendar adjusted indicators in comparisons according to the same month/period of the previous year.

As a policy review, the unadjusted data of the Current Gross Domestic Product and chained volume indices were revised until the 1998 data in the second quarter of 2020. Therefore, another revision can be observed in the data of "adjusted for calendar effects", "adjusted for seasonal effects" and "adjusted for seasonal and calendar effects" for the same periods.

After evaluations “TP.GSYIH26.HY.ZH (Gross Domestic Product (Thousand TL)-Level GDP-Chained Volume by Expenditure Method (TURKSTAT)(Thousand TL))” and “TP.GSYIH26.HY.CF (Gross Domestic Product (Thousand TL)-Level GDP-Expenditure Method-At Current Prices (TURKSTAT)(Thousand TL))” series are found to be suitable for the purpose of the study(TCMB, 2021c). In order to maintain replicability, and follow the literature only one of the series is taken in to account which is “TP.GSYIH26.HY.ZH” and the dataset used in the study is given in the APPENDIX. It is noteworthy that, with chained volume indices, in order to better measure the change in production, GDP calculation is made by adjusting for the effect of inflation. This measure represents real GDP.

The next step is to decide on a value to represent the market and make evaluations. The World Bank releases “Global Financial Development Database” and also “World Development Indicators”. One may think of extracting data from these datasets but if the study is quarterly, annual data of these datasets should not be used for analyses.

“Market capitalization of listed domestic companies (current US$) – Turkey” may be used for Market capitalization but it is taught to be not a good fit for this research. The ID code of the series is “CM.MKT.LCAP.CD” under the World Bank data series. First of all, it is reported as annual timeseries data. Second important point to notice is the Standart&Poor(S&P)’s source was used until April the 2013. At that time S&P decided to discontinue their database of “Global Stock Markets Fact Book” and in December of 2015, World Bank replaced their timeseries data with the World Federation of Exchanges data and updated it(The World Bank, 2021). Definitions of S&P and World Federation of Exchanges may be different therefore trying to reach annual data from the first source which is Borsa Istanbul would be best if applicable.

Due to changes in Borsa Istanbul, the name and system of markets also changed. After the trade day, 30.11.2015 BISTECH revisions are made. The market known as the national market of Turkey's stock exchange no longer exists after this period. The most suitable market for the analysis purposes is filling the series with the BIST main market. Stock market trade volume of Turkey is therefore a combination of series. National market trade volume and BIST main trade volume(Borsa İstanbul A.Ş., 2021). CBRT reports BIST Index and Daily Trading Volume series. The source of the series is Borsa Istanbul. "TP.MK.ISL.HC" is the Total Transaction Volume (Thousand TL)-Level, and the other important one is "TP.MK.ISL.MK" which represents Total Transaction Amount (Thousand)-Level(TCMB, 2021c). Data is gathered from the CBRT database.

As it is stated, "the development indicator of the banking system is the total bank loans variable (TBK), defined as the percentage of the total commercial bank loans given to the private sector in GDP."(Demir et al., 2007, p. 447). Within the article, it is not easy to identify which data set is used. As of 2021 formal name for the defined data series is known as "Total Credit to the Non-Financial Sector under the heading BIS Comparative Country Statistic" released under the CBRT Data Governance and Statistics Department. "TP.BISTOPKREDI.QTR3" is the quote that represents Turkey. The available data starts with 2008:Q2 from the CBRT sources(TCMB, 2021b). The most recent data available is 2020:Q4. BIS abbreviation is used for the Bank for International Settlements which is the oldest international financial institution. It would be suitable to search also from BIS. The BIS also releases the "Total Credit to the Non-Financial Sector" data. The data under BIS_TC2 set with the code "Q:TR:C:A:M:770:A" is the statistics being monitored for this purpose. For Turkey, "Credit to Non financial sector from All sectors" at market value is calculated as the percentage of GDP which is adjusted for breaks is the data reported quarterly. The beginning of the series is 31.03.1986. The most recent data available at the time of study is 31.12.2020 which represents Q4 of 2020. This series is known as the long series on total credit and domestic bank credit to the private non-financial sector. Listed under credit statistics with the short name "Credit to the non-financial sector (whole data set)"(BIS, 2021a). "TP.BISTOPKREDI.QTR3" equals to "Q:TR:C:A:M:770:A" data so the original series of BIS is preferred.

There exists another series for consideration which is: "TP.BISKREDIGSYIH.QTR1" Turkey - Credit/GDP ratios (current data) - Total credit utilization of the non-financial private sector-Level (TCMB, 2021a). This series is also listed under the credit statistics of BIS, but its preference of use is being a guide for the banking crises in the literature. An evaluation of the "Credit-to-GDP gaps and underlying input series" of the BIS is presented by Drehmann & Tsatsaronis, (2014). Their criticism is given as follows:

> "*Basel III uses the gap between the credit-to-GDP ratio and its long-term trend as a guide for setting countercyclical capital buffers. Criticism of this choice centres on three areas: (i) the suitability of the guide given the objective of the buffer; (ii) the early warning indicator properties of the guide for banking crises (especially for emerging market economies); and (iii) practical measurement problems. "*(Drehmann & Tsatsaronis, 2014, p. 55)

Credit-to-GDP ratios (actual data) - Turkey - Credit from All sectors to Private non-financial sector - Percentage of GDP (Units) is "Q:TR:P:A:A" series and it is available from Q1 of 1986. Credit-to-GDP gaps (actual-trend) - Turkey - Credit from All sectors to Private non-financial sector - Percentage of GDP (Units) is "Q:TR:P:A:C" series and it is available from Q1 of 1996(BIS, 2021b). What can be deducted from these data is, after ten years long

term trend calculation started. “TP.BISKREDIGSYIH.QTR1” equals to “Q:TR:P:A:A” data so the original series of BIS is preferred.

In this study, financial development is calculated by equally weighting the financial market depth and financial institutions depth. Assumption lying beneath equal weighting is both ratios are considered equally important for the assessment of financial development.

The result of “TP.MK.ISL.HC” divided by “TP.GSYIH26.HY.ZH” is a calculated ratio used to assess financial market depth. “Q:TR:C:A:M:770:A” and “Q:TR:P:A:A” series are used equally weighted to represent and assess the financial institutions depth.

In this study access and efficiency aspects of financial development are not considered following the literature. These aspects may be used for another study.

2.2. Literature Review

Various studies inspect the relationship between the economic growth and financial development(Ağazade & Karakaya, 2019; Aimer, 2021; Aslan & Levent Korap, 2006; Demir et al., 2007; Kandır, Yılmaz, & Önal, 2007; Kar & Pentecost, 2000; Levine, 1997; Mike & Alper, 2021; Sahay et al., 2015; Svirydzenka, 2016; Ünalmiş, 2002; Vurur, 2020; Yayla, Felek, & Çağlar, 2018). Methodologies used in these studies come in various formats. Some of them try to implement reactive actions where some of them are in search of proactive ways. Whether the way they chose, these studies mainly focus on the wealth of nations. If a researcher can identify the relationship between financial development and economic growth, it would be used for the wellness of nations. Also, politicians may use these findings in their campaigns. This study is mainly driven with this emphasis, focusing on Turkey. Perhaps there are other drives, but emphasizing the most important ones is thought to be enough.

Some theories are searching for answers to this main question and they are still evolving to find a suitable answer.

When the study is evaluated in parallel with the literature, Nyasha and Odhiambo (2014) examine a situation where finance leads to economic growth, a situation where economic growth leads financial growth, and lastly, a two-way interaction situation with triple classification (Nyasha & Odhiambo, 2014). A fourth condition should be considered. The proposed unrelated condition is observed in different studies (Akyol, 2019; Apergis, Filippidis, & Economidou, 2007). It should not be considered as a new contribution, as there are studies in which an unrelated situation is also presented.

One of the most recent studies in Turkey, for the period 2014:01 to 2020:12, it was determined that the view of impartiality between economic activity and finance was dominant within the framework of the examined series which were, the capacity utilization rate of manufacturing industry and bank credits(Daver, 2021). Changing the series may result in a different condition. And for a broader consideration, financial development should be observed with a combination of data series. These data series should be fair enough to assess the financial development and easily reachable to researchers. The most challenging part of the study is believed to be the data gathering part in an emerging market such as Turkey, so this process is given in detail in the methodology part of this article.

As mentioned before there is a vast amount of literature. Some of these studies are grouped according to sample countries and listed in Table 1 as follows:

Table 1. Literature at a glance

Author(s)	**Sample**	**Period**	**Methodology**	**Key Findings**
Ak et al. (2016)	Turkey	1989-2011	Toda-Yamamoto causality	Economic growth affects financial development in one direction
Akkay (2010)	Turkey	1989-2010	Granger causality	Economic growth is the cause of financial development.
Altunç (2008)	Turkey		Granger causality analysis	It has been concluded that the long-term relationship differs according to the variable expressing financial development
Aslan & Korap (2006)	Turkey		Granger causality analysis	It has been concluded that the long-term relationship differs according to the variable expressing financial development
Aslan & Küçükaksoy (2006)	Turkey		Granger causality analysis	It has been concluded that there is a causal relationship from financial development to economic growth
Aslan & Yılmaz (2015)	Turkey	1980-2010	Johansen cointegration	It has been determined that there is a long-term relationship between financial development and growth
Atamtürk (2003)	Turkey	1975-2003	Granger causality analysis	The causality relationship is unidirectional and runs from financial development to economic growth
Atgür (2019)	Turkey	2004-2007	Gregory-Hansen cointegration	No cointegration
Ceylan & Durkaya (2012)	Turkey	1998-2008	EG cointegration & Granger causality	Economic growth affects financial development
Contuk & Güngör (2016)	Turkey	1998Q1-2014Q4	Granger causality & asymmetric causality analysis	According to the results of the causality analysis, it was found that there is a two-way causality between financial development and growth
Çeştepe & Yıldırım (2016)	Turkey	1986-2015	Johansen & Toda-Yamamoto	There is bidirectional causality
Demir et al. (2007)	Turkey		Granger causality analysis	It has been concluded that there is a causal relationship from financial development to economic growth
Ergeç (2004)	Turkey	1988Q1-	Granger causality analysis	He stated that there is causality from growth to financial development in the

Author(s)	**Sample**	**Period**	**Methodology**	**Key Findings**
		2001Q4		short run and from financial development to growth in the long run
Güneş (2013)	Turkey	1988-2009	VAR	no relationship
Işık & Bilgin (2016)	Turkey	2003-2015	Hacker & Hatemi-J	Financial developments trigger economic growth
İnce (2011)	Turkey		Granger causality analysis	It has been concluded that there is no long-term relationship between financial development and economic growth
Kandır et al. (2007)	Turkey	1988-2004	ECM	Economic growth affects financial development
Kar & Pentecost (2000)	Turkey	1963-1995	VECM Model	Economic growth is the cause of financial development
Kar & Pentecost (2000)	Turkey		Granger causality & VECM	He concluded that the direction of causality differs according to the variable used to express financial development
Karamelikli & Kesgingöz (2017)	Turkey	1998-2014	Granger causality	no relationship
Kılıç (2019)	Turkey	1968-2017	Johansen cointegration	There is cointegration
Küçükaksoy & Aslan (2006)	Turkey	1970-2004	Granger causality	Financial development is the cause of growth.
Mutlugün (2014)	Turkey	1988Q1-2012Q4	VAR & Granger causality analysis	A causal relationship was found from economic growth to financial development
Onur (2005)	Turkey		Granger causality analysis	Results supporting the demand-following hypothesis
Ozcan & Ari (2011)	Turkey	1988-2009	VAR analysis & Granger causality	Economic growth is the cause of financial development.
Pata & Alperen (2018)	Turkey	1982-2016	ARDL Bound Test & Granger causality	Development affects growth in both the long and short run

Author(s)	**Sample**	**Period**	**Methodology**	**Key Findings**
Soytaş & Küçükkaya (2011)	Turkey		Granger causality analysis	They investigated the relationship between financial development and economic growth by creating a financial development index with six different financial development variables
Ünalmış (2002)	Turkey	1970-2001	VECM	There is bidirectional causality
Yapraklı (2007)	Turkey		VAR & Granger causality analysis	Two-way causality was found between trade and financial openness and economic growth
Hou & Cheng (2010)	Taiwan	1971-2007	VECM	There is bidirectional causality
Osinubi & Amaghionyeo di we (2003)	Nigeria	1980-2000	OLS	no relationship
Ang & Mckibbin (2007)	Malesia	1960-2001	Granger causality	Economic growth is the cause of financial development.
Rousseau (1999)	Japan	1880-1913	VAR Analysis Model	The increase in financial assets is the cause of economic growth
Katircioglu et al. (2007)	India	1965-2004	Granger causality	There is bidirectional causality
Ndako (2010)	South Africa	1961-2007	VECM	There is bidirectional causality
Jung (1986)	Developin g countries		Granger causality analysis	A two-way causality relationship has been determined between financial development and economic growth
Kandil et al. (2017)	China & India	1970-2013	VECM	Financial development affects economic growth in both countries
Guru & Yadav (2019)	BRICS countries	1993-2014	Panel data analysis	The development makes a positive contribution to economic growth
Thanga&lu & James (2004)	Australia	1960-2001	VAR	Economic growth is the cause of financial development.
King & Levine (1993)	80 country	1960-1989	Panel data analysis	The financial sector influences economic growth.

Author(s)	**Sample**	**Period**	**Methodology**	**Key Findings**
Arestis, Demetriades & Luinted (2001)	5 developed country		Cointegration & ECM methodology	Financial development affects economic growth, banks are more efficient than capital markets
Levine & Zervos (1998)	47 country	1976-1993	Panel data analysis	Financial development affects growth positively
Xu (2000)	41 country		VAR analysis	It has been concluded that there is a causal relationship from financial development to economic growth
Al-Yousif (2002)	30 country	1970-1999	Granger causality	There is bidirectional causality
Asteriou & Spanos (2019)	26 EU country	1990-2016	Panel data analysis	Financial developments trigger economic growth
Müslümov & Aras (2002)	22 OECD countries	1982-2000	Granger causality	Developments in capital markets are the cause of economic growth.
Shan & Morris (2002)	19 OECD countries & China	1985-1998	Granger causality	no relationship
Demetriades & Hussein (1996)	16 country		Granger causality	Bidirectional causality (2 countries)
Bozoklu & Yılancı (2013)	14 country	1988-2011	Dumitrescu-Hurlin panel causality	Financial development is the cause of growth.
Calderon & Liu (2003)	109 country	1960-1994	Granger causality	There is bidirectional causality
Gregorio & Guidotti (1995)	100 country	1950-1985	Panel data analysis	Financial development affects economic growth.
Gazel (2016)	10 country	1990-2014	Panel data analysis	no relationship
Luitel & Khan (1999)	10 country		VAR	a two-way relationship
Shan (2005)	10 OECD Counties & China		VAR	For most of the country examples considered, financial development leads to economic growth

Reference: Authors' compilation from Demez, Kizilkaya, & Dag, (2019); Eyüboğlu & Akan, (2020); Işık & Bilgin, (2016); Öztürk, Kılıç Darıcı, & Kesikoğlu, (2011) studies

2.3. Research Question and Expectation

This study searches for an answer on the relationship of economic growth and financial development of the Turkish economy by using quarterly data starting from the first quarter of 1998 till the beginning of 2021.

Acknowledging the data in use may yield different results, a similar rationale in line with the literature is followed. As a contribution Turkey is considered as a transition economy from a low level of development to a high level of development therefore equal weight is given to financial markets and financial institutions in the study. Financial development is considered as an equally weighted equation of financial institutions' development and financial markets development. Using the reel GDP data series enables us to measure economic development regardless of the inflation in Turkey. Data series used for calculations are given in the APPENDIX in order to ensure replicability. By doing so, updates on the main series will not affect the findings. Equations for transformation are given as follows:

$$\mathbf{FD} = \mathbf{0,5} * \mathbf{FID} + \mathbf{0,5} * \mathbf{FMD} \quad \textbf{(1)}$$

$$\mathbf{FID} = \mathbf{0,5} * \text{"Q:TR:C:A:M:770:A"} + \mathbf{0,5} * \text{"}\boldsymbol{Q}:\boldsymbol{TR}:\boldsymbol{P}:\boldsymbol{A}:\boldsymbol{A}\text{"} \quad \textbf{(2)}$$

$$\mathbf{FMD} = \frac{\text{"}\boldsymbol{TP.MK.ISL.HC}\text{"}}{\text{"}\boldsymbol{TP.GSYIH26.HY.ZH}\text{"}} \quad \textbf{(3)}$$

To point out the abbreviations used in the equations, the materials in use part of this study should be visited. In short, FD represents financial development, FID represents financial institutions development and FMD represents financial markets development. Financial development is a function of financial markets development and financial institutions development.

The expectation of this study is there should be a strict relationship between financial development and economic development but it may not be proved by just these variables.

3. Results and Findings

In this study, the relationship of Turkey's economic and financial development is searched using the variables given in APPENDIX. Quarterly series starting from 1998 Q1 to 2021 Q1 is used in the study. Formulation and data choosing process details are given in the methodology section of the study. Series in use are the most recent series at the time of the study. For both the narrow sense replication and wide sense replication processes, details and data in use are presented for academic purposes. Analyses were conducted using the Eviews 9 program.

3.1. Unit Root Tests

Before starting time series analysis, the data set should always be read and the stationarity of the data should be tested with appropriate methods. The stationary process of a time series can be explained as the current or past probability distribution remains unchanged for a certain period of time.

As a result of the analyzes made in the presence of non-stationary series, it is possible to encounter problems such as spurious regression(Enders, 2010:196). In the case of spurious regression, an undesirable situation of high explanatory power of values that do not make economic sense can be observed(Granger ve Newbold, 1974). A stationary series can be defined as a series with a constant mean, constant variance, and fixed autocovariances for each lag.

(Brooks, 2014:353). Estimation with a regression equation on non-stationary series is meaningless(Enders, 2014:199).

In 1976 Fuller and in 1979 Dickey & Fuller were the ones who searched for the stationary processes (Brooks, 2008:327, 2014:361). One of the most well-known tests for stationary is the Augmented Dickey-Fuller (ADF) (Dickey ve Fuller, 1981) test. As years passed new methods and models were proposed to the literature for improvements (Enders ve Granger, 1998). With the use of ADF optimal lag decision is a matter. Information criteria and frequency of series can be used to identify the optimal lag (Brooks, 2008:363). Another most commonly used method for the testing of series condition of stationarity is the PP test, which takes into account the structural break and trend, which is highly likely to occur in time series. (Phillips ve Perron, 1988). Phillips and Perron generalized the Dickey – Fuller procedure in their 1998 study.. They changed the Dickey – Fuller t statistics(Enders, 2014). Also there exists another well known test which is KPSS . With the technologic development and the common use of statistical packages many other methods can be observed..

In this study, ADF & PP methods are used to identify unit root in order to reach a decision about the process whether it is stationary or not. T statistics is compared to the critical value and the final decision is given (Enders, 1995, 2014).

Table 2. Results of ADF and PP unit root tests.

Variable	ADF			PP		
	With Constant	With Constant & Trend	Without Constant & Trend	With Constant	With Constant & Trend	Without Constant & Trend
LNED	-4.3122 ***	-4.2672 ***	-3.0844 ***	-18.5230 ***	-18.5339 ***	-12.9586 ***
LNFD	-7.9838 ***	-8.0005 ***	-7.7352 ***	-7.9838 ***	-8.0005 ***	-7.7176 ***
ADF & PP Tests: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant MacKinnon (1996) one-sided p-values.						

As it can be observed from Table 2, both of the tests (ADF &PP) shows the series are stationary at level. We do not need to take the difference or make any transformation on the data. We can make our VAR model with the series and test whether the model is appropriate or not.

3.2. Impulse – Response Functions

After determining the lag length of the VAR system, the movements of the variables within a specified period can be examined with impulse response analysis. With the help of this analysis, one can examine the timing and direction of which variable reacts to shocks or innovation(Tarı, 2010, pp. 465–468).

Brooks explains impulse – response briefly as “an examination of the impact of a unit shock to one variable on the other variables in a vector autoregressive (VAR) system” (Brooks, 2014, p. 687). But why one needs to inspect this relationship? The answer to this question is

explained in Enders, (2014) study. Writing a vector autoregression function in the form of vector moving average form is also possible just as the moving average representation of an autoregression function (Enders, 2014, p. 294). It is known that the presentation in the form of vector moving averages is the basis for monitoring the response of shocks in the VAR model over time(Sims, 1980, 1986, 1992). In order to eliminate the unit of measurement, it is a common practice to treat it as a standard deviation shock rather than a one-unit shock(Hill, E. Griffiths, & Lim, 2018, p. 604).

Table 3. Lag Length Selection Decision

Lag	LogL	LR	FPE	AIC	SC	HQ
0	195.7766	NA	3.78e-05	-4.506432	-4.449354	-4.48346
1	198.1859	4.650600	3.93e-05	-4.46944	-4.298206	-4.400526
2	228.5905	57.27374	2.13e-05	-5.0835	-4.79811	-4.968644
3	271.9798	79.71531	8.51e-06	-5.999531	-5.599986	-5.838733
4	297.9084	46.43029*	5.11e-06*	-6.509498*	-5.995798*	-6.302758*
5	299.9111	3.492961	5.36e-06	-6.463048	-5.835192	-6.210365
Note: * indicates lag order selected by the criterion.						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

According to the information criteria, four lags will be proper for the VAR model. By using least squares for four lags, mathematical expression and substituted coefficients are given as equations.

VAR Model mathematical expression:

$$LNED = C(1,1)*LNED(-1) + C(1,2)*LNED(-2) + C(1,3)*LNED(-3) + C(1,4)*LNED(-4) + C(1,5) + C(1,6)*LNFD(-1) + C(1,7)*LNFD(-2) + C(1,8)*LNFD(-3) + C(1,9)*LNFD(-4) + C(2,9)$$

$$LNFD = C(2,1)*LNED(-1) + C(2,2)*LNED(-2) + C(2,3)*LNED(-3) + C(2,4)*LNED(-4) + C(2,5) + C(2,6)*LNFD(-1) + C(2,7)*LNFD(-2) + C(2,8)*LNFD(-3) + C(2,9)*LNFD(-4) + C(2,9)$$

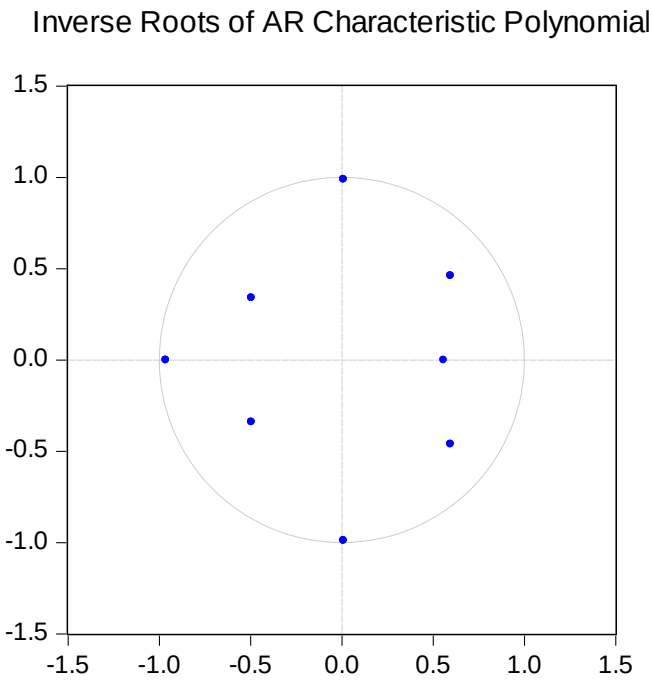
VAR Model outputs and coefficients:

$$LNED = -0.267707957391*LNED(-1) - 0.321800176542*LNED(-2) - 0.285093180098*LNED(-3) + 0.650554221984*LNED(-4) - 0.16627894335*LNFD(-1) + 0.0390121320745 + LNFD(-2) - 0.03832937936*LNFD(-3) - 0.100545172364*LNFD(-4) + 0.0176154858892$$

$$LNFD = 0.197412772085*LNED(-1) + 0.218274742949*LNED(-2) + 0.295600811646*LNED(-3) + 0.246381096481*LNED(-4) + 0.082751385093*LNFD(-1) + 0.228599710916 + LNFD(-2) - 0.12886007081*LNFD(-3) - 0.203718621591*LNFD(-4) + 0.00278232299696$$

For further examination, the stability of the VAR model should be done. For this purpose graphical investigation is presented in Figure 1.

Figure 1 Root Observation in Unit Circle



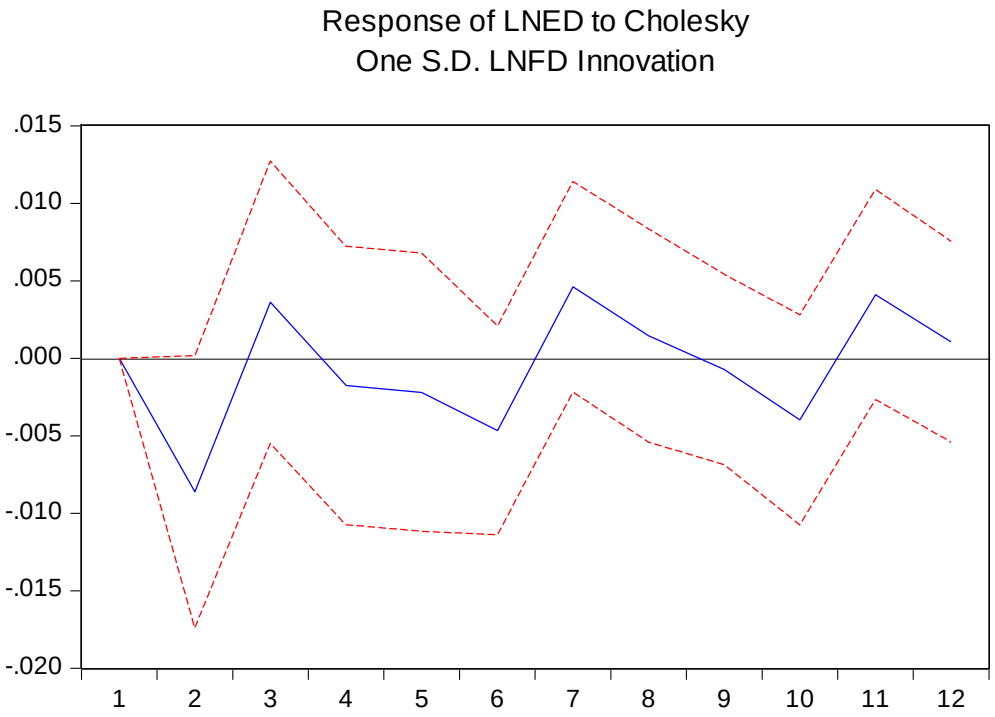
All the roots lie in the unit circle but as some of them are observed as tangents, it would be better to also check scores in a table. Results are given in Table 4.

Table 4 Roots of Characteristic Polynomial

Root	Modulus
0.008938 - 0.989145i	0.989185
0.008938 + 0.989145i	0.989185
-0.964206	0.964206
0.596210 - 0.461721i	0.754091
0.596210 + 0.461721i	0.754091
-0.494430 - 0.340012i	0.600058
-0.494430 + 0.340012i	0.600058
0.557814	0.557814

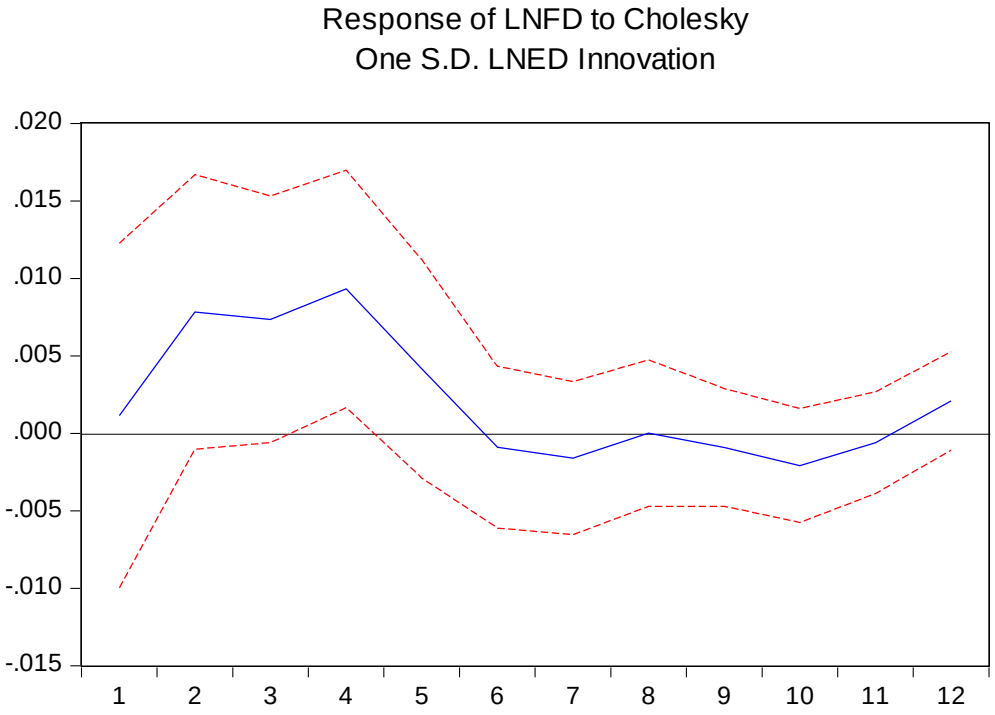
LNED and LNFD are endogenous variables where constant is the exogenous variable for 1 – 4 lags. No root lies outside the unit circle then the VAR is accepted to satisfy the stability condition. Under this condition, there is no problem to observe impulse – response graphs given in Figure 2 and Figure 3. Dotted lines given in red color are the standard error bands. As they widen deviation increases.

Figure 2 Impulse FD – Response ED



The study is done using quarterly data so impulse response functions are observed using twelve periods to capture three years period. A shock given to financial development does not affect economic development at first quarter, in the second quarter following this it has a negative effect but in the third quarter, it turns to zero and positive.

Figure 3 Impulse ED – Response FD



In Figure 3 an innovation to economic development has a positive effect on financial development. Positive effects last about one and a half years.

As these impulse – response functions of linear VAR model is its moving average representation, they are also named as the forecast error impulse response (FEIR) functions. A disadvantage of FEIRs is that they cannot be used to assess contemporaneous reactions of variables. In order to overcome this caveat, the shocks of a VAR model is identified using an orthogonal impulse response approach. For overcoming the identification problem variance decomposition using Cholesky decomposition is used.

3.3. Variance Decomposition

The variance decomposition gives the ratio of the movements of the dependent variable depending on the shocks of other variables against its own shocks in examining the VAR system dynamics (Brooks, 2014, p. 337). In this way, with variance decomposition, information can be obtained about the relative importance of each shock (innovation or random innovation) in influencing the variables in the VAR model.

It investigates how much of the change in a variable is proportionally due to itself and how much of it is due to other variables. Variance decomposition focuses on the interaction of the variances of the variables and is also used to help define the variables as internal or external variables(Tarı, 2010, p. 468,469).

The results of variance decomposition using Cholesky method is given in Table 5.

Table 5 Results of Cholesky Variance Decomposition

Variance Decomposition of:				
Period	**Financial Development**		**Economic Development**	
(Quarter)	**LNED**	**LNFD**	**LNED**	**LNFD**
1	0,000000	100,0000	99,95131	0,048687
2	2,158757	97,84124	95,40615	4,593848
3	3,765229	96,23477	95,12530	4,874697
4	6,540031	93,45997	95,03022	4,969778
5	6,852619	93,14738	96,69798	3,302017
6	6,781832	93,21817	96,08420	3,915795
Cholesky Ordering: LNFD LNED				

Table 5 lists the variance decomposition of economic development and financial development variables shocks. When financial development shock is under investigation in the first quarter change in the variance completely explained by itself. After a year in the fourth quarter, nearly 7% of the variance is explained by economic development variable. Similarly, decomposing economic development in to its variance components only 5% of the variance is explained by financial development changes.

4. Discussion and Concluding Remarks

This study is done for Turkey using Eviews 9 statistical package program modified with the all unit root tests add in. 91 quarterly data used after logarithmic transformation. Coverage of the data is long enough to conclude valuable information on economic development and financial development. This study shows that the length of the data series does not make sense all the time. Low levels of explanation in both variables help us to conclude that representing economic development and financial development with only the variables used in the study

does not give enough information to develop economic or financial policies. Even the series used in this study are consistent with the literature and the frequency of the series is proper for the analyses, they are not solely enough to reach a conclusion about economic development and financial development. At this point, study of the IMF staff covering financial development in more aspects makes sense. Assessment and the coverage of the financial development in Turkey should have more aspects than the data used in this study. This is one of the most important findings of this study. But this finding should not mean this study makes no sense at all. When it comes to decision making being more precise is the situation that is desired. This study does not satisfy a high level of explanatory power with the series in use. For solid decisions, findings must be backed with more powerful supporting data and/or methods.

As the economic development change and financial development change series are found to be stationary, these series are found not to be cointegrated in the long term. ADF unit root test and PP unit root test concluded the same results. Proposed VAR model including 4 lags found to be stable. Further investigations to determine what happens when a shock is given to the VAR system, and the decomposition of variance showed that there is a relationship between variables but it is risky to give important political or economic decisions by just using these variables. A shock given to financial development has no effect on economic development at first quarter but just after that it has a negative impact and as time goes by the direction of the effect changes. Given the shock to economic development has a long-lasting positive effect on financial development about one and a half years. This study is in line with the other studies stating there is a relationship between financial development and economic development, and rejects irrelevance studies. This study is against others that offer no relationship between financial development and economic development, with the variables used. Also, it is believed that changing the variables representing financial development and economic development may yield different results, which is in line with the literature.

One of the biggest contributions of this study is implementing FAIR data principles and making both the data and methodology available to those in interest. By doing so, visiting researchers will not consume their valuable time on trying to identify which data were in use in this study. This will help the researcher to put on new aspects and will make it possible to seek new aspects.

As seen from the literature, the relationship between the development of an economy and financial markets can be measured in various ways. Against calculations between countries, the measure used in the study may produce a different ranking of countries. When only one country is in account, one may think that the statement of a relationship between the financial development and the economic growth may yield different due to data used in the calculations. This study totally agrees with these risks and takes an action with this consciousness. In this study Turkey is considered as a transition economy from low levels to high levels of economic development, therefore both the banking system and stock markets are given equal importance. The author(s) believes that there is a role of financial development on economic growth, but using the variables of the study this idea was not proved. The results of this study encouraged the author(s) to work with different variables and to define the framework of the financial development concept differently.

In a decade author(s) believes that there will be an innovation in the methodology of observing the financial development and the economic growth relationship. Prior to the anticipated digital age, the relationship between the financial markets and real markets are taken in to consideration within this study. The connectedness of these two important aspects of

economy is a well-known topic, but there are different findings in the literature where some of them are conflicting. Within line with the digital transformation, tools used to assess financial development are changing. While transformation in the financial sector and assessments related to it can be observed relatively easily, the same statement can not be made for the economic growth calculation area. One of the most used economic growth indicators' is still yearly GDP change which is calculated with constant prices. In contrast, various aspects such as depth, access and efficiency of both the financial institutions and financial markets can be observed when financial development is taken into consideration. Furthermore, the multidimensional nature of financial development may be omitted. Realization of this dimension brought out the IMF Financial Development Index Database. But also IMF's financial development index concept needs to be reviewed as taking an action to digitalization.

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APPENDIX

Period	ED(TL)	FD	Period	ED(TL)	FD	Period	ED(TL)	FD
1998: Q1	158124477531.02	13.60	2005: Q4	252260394535.80	12.90	2013: Q3	374208704267.72	30.25
1998: Q2	172112469039.81	13.90	2006: Q1	217704207436.85	13.83	2013: Q4	367884904190.94	30.88
1998: Q3	195309243855.53	12.43	2006: Q2	247725192414.77	15.88	2014: Q1	324293719824.01	30.76
1998: Q4	185211147696.38	12.60	2006: Q3	265247450312.62	15.65	2014: Q2	348057962435.58	31.20
1999: Q1	148678773408.45	12.63	2006: Q4	267788428084.41	15.80	2014: Q3	387015837885.47	32.10
1999: Q2	168577548199.07	12.45	2007: Q1	235561771501.15	15.48	2014: Q4	388164802386.12	32.63
1999: Q3	187045948414.76	12.55	2007: Q2	255717728384.75	16.08	2015: Q1	335783418823.29	33.88
1999: Q4	183261859145.02	12.53	2007: Q3	274898003874.41	16.80	2015: Q2	373025438552.52	35.08
2000: Q1	155100667334.39	12.13	2007: Q4	282645449922.16	17.58	2015: Q3	409166153696.98	36.40
2000: Q2	180644470562.66	12.05	2008: Q1	252641378407.22	19.45	2015: Q4	417632225998.66	35.30
2000: Q3	202867168220.17	12.28	2008: Q2	261477623881.74	19.85	2016: Q1	352382460128.97	34.86
2000: Q4	196622292274.85	12.05	2008: Q3	277626966593.17	20.18	2016: Q2	391687809337.63	35.28
2001: Q1	159220615073.43	14.10	2008: Q4	265625149578.91	20.73	2016: Q3	406428166640.17	35.83
2001: Q2	168096159440.29	14.15	2009: Q1	215905011358.02	20.58	2016: Q4	436138322563.49	37.93
2001: Q3	188445338652.51	15.35	2009: Q2	243673488708.14	20.10	2017: Q1	371026461242.74	37.98
2001: Q4	177196447608.95	13.55	2009: Q3	273267188234.50	20.63	2017: Q2	412454631609.39	37.91
2002: Q1	157598957355.83	11.80	2009: Q4	273526793304.80	21.00	2017: Q3	454346282409.83	37.26
2002: Q2	181341802343.57	11.30	2010: Q1	230846455350.98	21.46	2017: Q4	467838833276.05	37.76
2002: Q3	201727765312.24	11.10	2010: Q2	263356954683.31	22.65	2018: Q1	398784231232.60	37.98
2002: Q4	196970077700.87	10.70	2010: Q3	297000514711.27	22.66	2018: Q2	436501267820.24	39.31
2003: Q1	168157392204.23	10.83	2010: Q4	299976615762.09	23.93	2018: Q3	465530108494.13	42.96
2003: Q2	187847512515.33	9.20	2011: Q1	258090805568.74	24.73	2018: Q4	455320696524.99	37.70

Period	ED(TL)	FD	Period	ED(TL)	FD	Period	ED(TL)	FD
2003: Q3	213698705094.39	9.20	2011: Q2	293758318344.41	26.20	2019: Q1	388555533436.12	38.26
2003: Q4	210446625619.16	9.40	2011: Q3	331501189049.85	26.65	2019: Q2	429006666186.53	37.56
2004: Q1	186597362908.46	9.68	2011: Q4	330043654738.81	26.30	2019: Q3	470380302788.39	36.16
2004: Q2	209927266645.46	10.85	2012: Q1	275488237751.97	26.00	2019: Q4	484289401974.11	36.21
2004: Q3	231618404523.22	10.60	2012: Q2	308565025092.94	26.50	2020: Q1	405903869533.60	37.87
2004: Q4	228430222104.82	10.00	2012: Q3	343583345258.52	26.35	2020: Q2	384799623151.61	41.57
2005: Q1	204512731671.68	10.00	2012: Q4	343860641277.74	26.78	2020: Q3	499945003848.80	43.06
2005: Q2	226509016619.51	10.33	2013: Q1	298685483077.82	27.20	2020: Q4	512715333128.41	40.46
2005: Q3	250316792618.80	10.53	2013: Q2	338615087608.45	29.21	2020: Q4	512715333128.41	40.46

ED: Economic Development (TRY)

FD: Financial Development (unit)