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The nexus prevalent in nonlinear finance and growth in the presence of macroeconomic instability in Turkey: Does the stock market really matter?

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Abstract: The link between stock market and economic development has become a significant volatile issue over the past few years. Our major contribution in the debate concerning the nexus between finance and growth is to bring to the fore the asymmetric effects of stock market development on economic growth under macroeconomic instability. Hence, towards this purpose, the stock market development index and the macroeconomic instability index, which are both constructed by incorporating the exchange rate and unemployment rate, are built based on principal component analysis. Utilizing the nonlinear autoregressive distributed lag model (NARDL) within the framework of a time series approach, we provide evidence that there is an asymmetric relationship between economic growth and the development of the stock market in Turkey.

JEL Classifications: G1, O4

Keywords: Financial development, stock market, economic growth, macroeconomic instability, nonlinear ARDL model

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1. Introduction

The pioneering work of Schumpeter (1912) and the subsequent contributions by McKinnon (1973) and Shaw (1973) called attention to the importance of the relationship between the financial sector and economic development. A review of the literature reveals that while some evidence shows that stock market development (SMD) may have an unambiguous impact on economic development (Atje & Jovanovich, 1993; Demirguç-Kunt & Levine, 1996; Korajczyk, 1996; Levine & Zervos, 1996, 1998), neither could other studies establish any significant relationship between SMD and economic development as well (Bencivenga & Smith, 1991; Naceur & Ghazouani, 2007; Adjasi & Biekpe, 2006).

Developments in the stock market play an important role either in terms of global economy or finance (Adjasi ve Biekpe, 2006). Regardless of the nature of the financial system, SMD in countries plays a critical role in promoting sustainable growth (Rousseau & Wachtel 2000; Hondroyiannis et al. 2005).

It can be seen in the literature that studies concerning the relationship between finance and growth highlight the role of the banking system (Gazdar & Cherif, 2015). However, the importance of the stock market in developing countries where financial liberalization

has taken place seems to play a crucial role. In other words, it appears that the stock market has a significant role between economic activity and finance, because it not only allows companies to raise money from the market, but it also reduces the investment risk. The stock market may make a great contribution to economic growth by virtue of its possessing two important functions. First, according to Hou & Cheng (2010), it allows for financial portfolios belonging to an investor to be altered because of the low price paid to trade an asset, and makes financially traded assets less risky (Levine, 1991; Bencivenga et al. 1995); further, it brings into play an exit opportunities for both investors and founders. In this manner, the efficacy of financial intermediation is greatly enhanced (Rousseau & Wachtel, 2000; Arestis et al. 2001).

In the related literature, it has been suggested that the movement of the relationship between economic and financial development can be different throughout the development process. According to Patrick (1966), the supply-leading hypothesis is valid at the beginning of a country's development, while the demand-following hypothesis is valid at the end of a country's development. At the beginning of the development process, services provided by the financial system can yield to technological development while the economic growth rate increases. Economic growth increases the demand for financial instruments thus promoting financial development for as long as the development lasted.

In the literature, with the exception of the studies that support supply-leading or demand-following hypotheses, there are also those which present evidence that there is no relationship between economic and financial development. Lucas (1988) propounds that economic growth is not affected by monetary changes. As a result of this, there is no causality link between economic and financial growth.

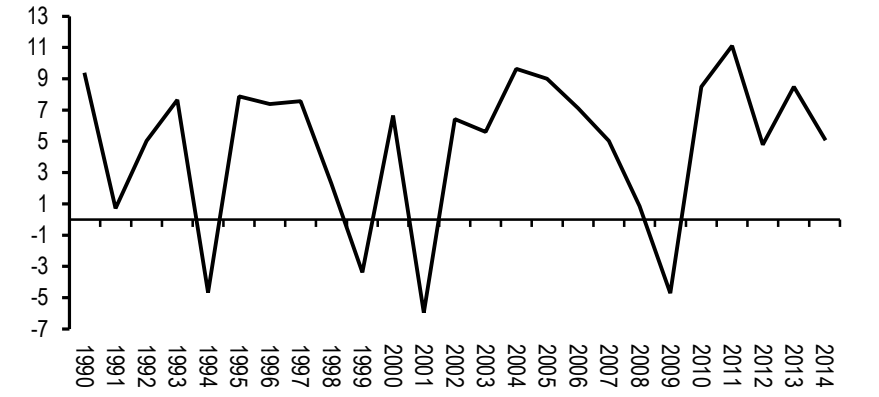
There is literature which shows that the nature of the relationships between economic and financial development differs from one country to another. In the light of this argument, the most efficient way is to analyze data on a country-by-country basis. In this study, the period of estimation is from 1998 to 2014, and the quarterly data is used in the investigation of the causal relationship between economic and financial growth by utilizing the cointegration and the causality analysis in Turkey. Our main concern is to assess whether there is an asymmetric relationship between economic and financial development which is composed of two components: a SMD index and the banking sector development; and then to find out how positive and negative shocks in a macroeconomic instability affect economic growth.

The rest of this paper is structured as follows. Section 2 gives an overview of the finance-growth nexus in Turkey. In Section 3, the measurements of macroeconomic instability are discussed. Section 4 describes the datasets. In Section 5, the methodologies, and the empirical results are presented. Section 6 discusses the limitations of the study. The concluding remarks are given in Section 7.

2. Finance-growth nexus in Turkey

In Turkey, the empirical results consequent to the link between economic and financial development are different from each other. The main reason why such a result was obtained is that Turkey has relentlessly been struggling with political and economic instabilities and crises for a long time. Although these challenges are very significant, the rate of economic growth has been on the increase in recent years (see in Figure 1).

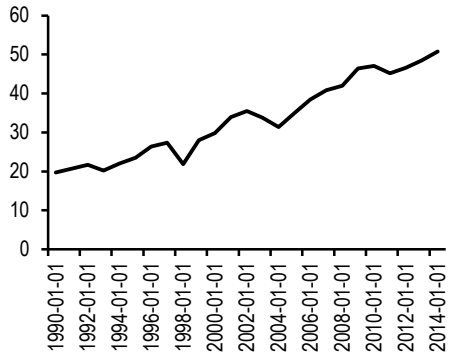
FIGURE 1. TURKEY GDP GROWTH RATE



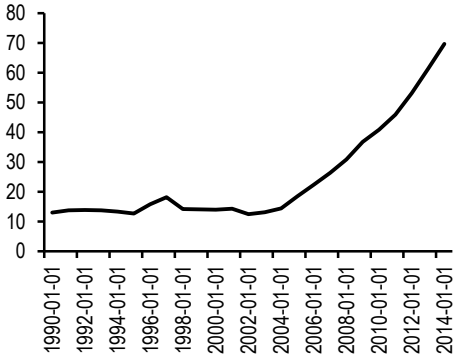
Source: World Bank

FIGURE 2. BANKING SECTOR DEVELOPMENT

a) M2 to GDP



b) Private credit by deposit money banks and other financial institutions to GDP



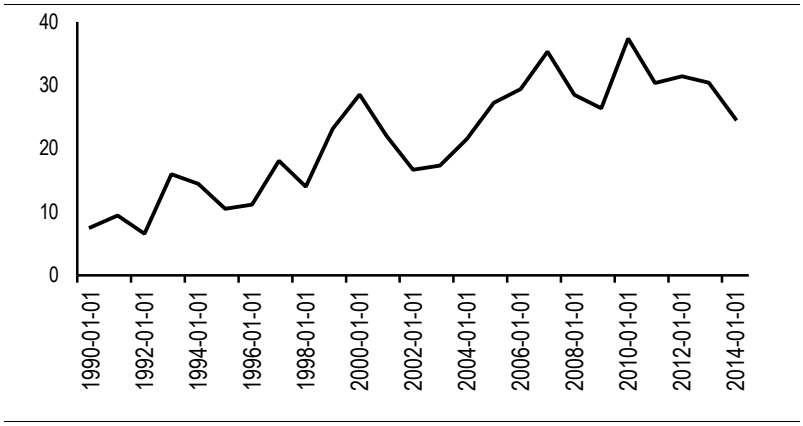
Source: a) World Bank, b) FRED-Economic Data.

It is also well known that the banking sector has an important role to play in economic development of Turkey. After the 2001 financial crisis that led to the restructuring of their banking sector, the financial health of Turkey became both more powerful and more assertive (see in Figure 2).

To empirically measure Turkey's financial growth and development, both the banking sector and SMD can be considered as the country's prime indicators of development (see in Figure 3). Specifically, SMD is measured by the stock market capitalization (SMC) to

Gross Domestic Product (GDP) ratio. It is a common phenomenon that the stock market allocates funds to the corporate sector, which leads to all-round economic growth. Even if the relationship of the development of the stock market with economic growth is a debatable issue in the literature, the development of the SMD seems to be vital in Turkey

FIGURE 3. STOCK MARKET CAPITALIZATION TO GDP



Source: Federal Reserve Economic Data.

The figures appearing above show the financial sector development and the resultant economic performance in Turkey changing over a period of time. It is a known fact that the Central Bank of the Republic of Turkey (CBRT) has been implementing a new approach to its monetary policy since 2010. After the global economic crisis in 2008, the financial threat led to greater distress. This is the reason why CBRT decided to change its traditional monetary policy to diminish the negative effects of an ambiguous and volatile economic environment. Scrutinizing Figures 2 and 3, it can be seen that the nontraditional approach to a monetary policy has been successful in terms of financial development.

3. Macroeconomic instability

The influence that macroeconomic instability has on economic growth and the performance of the financial sector has been the subject of a number of studies in most developing countries including Turkey. This is a country that has been suffering from wide fluctuations in inflation, determinants of interest rates, exchange rates and business activities. Therefore, the issue of macroeconomic instability has, for long, been the major concern of policy makers, but still there have been ongoing debates and extensive discussions on measuring the macroeconomic instability. Hence, the question of how macroeconomic instability can be measured has long been the bane of academicians and practitioners.

Some authors, such as Fischer (1991), Shigoka (1994), Ramey & Ramey (1994), Drugeon & Wignolle (1996), Azam (1997), Azam (1999), Yiheyis (2000), Caballero (2007), Iqbal & Nawaz (2010) and Shahbaz (2013), considered the inflation as a proxy variable to measure

an unobservable macroeconomic instability. Azam (1999) suggested an index that relied upon the inflation rate and the nominal exchange rate for measuring macroeconomic instability. Ali (2015) used several measures of macroeconomic instability which refer to economic indicators such as inflation, unemployment, budget deficit and trade deficit in Pakistan.

The purpose of this section is to explain the whole macroeconomic status of the Turkish economy so that it emanates from the above discussion. Employing a single measure, or combining two variables into a single index, will not be sufficient for understanding and interpreting macroeconomic instability. Ismihan (2003) explained the macroeconomic instability in Turkey by charting an index obtained from the inflation rate, the ratio of external debt to GNP, public deficit to GNP and the exchange rate. Sanchez and Robles (2006) also chose several macroeconomic variables such as inflation, public deficit and the ratio of different types of public expenditures to GNP to construct an index in Spain.

In this study, I choose four macroeconomic variables - inflation rate, trade deficit to GDP, unemployment rate and exchange rate - to explain macroeconomic instability. First, I obtain Z-scores from all variables in order to avoid measurement bias. Z-scores can be useful for determining macroeconomic volatility. The Z-score of a particular variable indicates how typical or atypical this movement is based on its previous performance. Second, some of the indicators are indeed correlated with each other. Ang & McKibben (2007) state that proxy variables which seem to contain common information may cause multicollinearity and the problem of over-parameterization. All the variables represent macroeconomic instability, but we cannot include all of them in the model simultaneously because of the multicollinearity. Therefore, I use principal component analysis to reduce the four measures in each group to one principal component. Since we have the group of macroeconomic instability indicators, this produces one macroeconomic instability index*.

TABLE 1. PRINCIPAL COMPONENT ANALYSIS OF MACROECONOMIC INSTABILITY INDICATORS

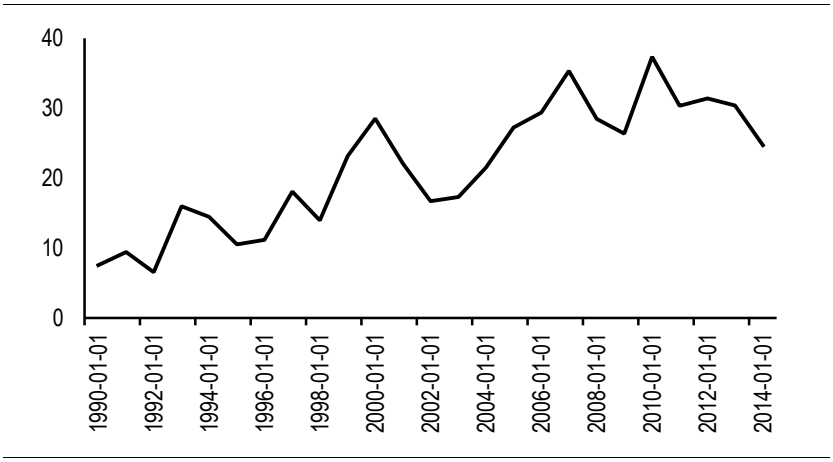
VARIABLE	FACTOR1	FACTOR2	COMMUNALITY
Inflation	-0.939	0.053	0.885
Trade deficit to GDP	-0.478	0.844	0.942
Unemployment rate	0.619	0.737	0.926
Exchange rate	0.894	-0.002	0.799
Variance	2.293	1.259	3.552
%VAR	0.573	0.314	0.887
WEIGHTS			
VARIABLE	FACTOR SCORES		
Unemployment rate	0.532		
Exchange rate	0.467		

* I also obtained a macroeconomic instability index using inflation rate and trade deficit to GDP. However, the coefficient of the index is insignificance in the model, so I prefer not giving the results based on this index. Also, the first component including exchange rate and unemployment rate has the largest possible variance which means that its contribution to explaining the variance is greater than the second component.

The first eigenvector reveals that some variables are positively correlated with the first coordinate which is called the first principal component. The individual contributions of the exchange rate and the unemployment rate, which are represented by the factor's scores to the standardized variance of the first principal component are 53.2 and 46.7%, respectively. I employ MEI to denote the index for macroeconomic instability.

Figure 4 shows that Turkey experienced several severe crises during the period of 1998 - 2014. During the 1998 Asian financial crisis and the 2000 - 2001 banking crisis, macroeconomic instability had greatly increased in Turkey. After the 2000 - 2001 crisis, the government laid down several structural reforms and proclaimed the macroeconoic control measures which refer to a slew of policies announced by the new Economic Programme launched in the spring of 2001. During this period, it was seen that macroeconomic instability had started to reduce until 2005. During the period 2005 - 2008, macroeconomic stability seemed to be under control. Especially, after the 2008 financial crisis, the macroeconomic instability index had increased after the third quarter of 2009. Starting from the early summer of 2009, the Turkish Government started to work on a comprehensive program. As a result of these efforts, the Turkish Government announced a medium-term program which included measures to cope with the consequences of the global crisis on the economy. It is evident from Figure 4 that the macroeconomic instability tended to decrease from 2009 to 2012.

FIGURE 4. MACROECONOMIC INSTABILITY INDEX



Note: The graph was obtained from author's calculation based on MEI.

4. Datasets

Banking development (BDV) is measured by the ratio of liquid liabilities as a percentage of GDP in terms of the financial intermediation activity. It represents financial depth and measures the size of the financial intermediary. As is well known, the banking system provides financial services, and the volume and significance of these services are represented by BDV. Liquid liabilities are known as money supply (M2). SMC is used as a proxy for the market value of domestic shares, i.e., the market capitalization of the stock

market is used as a indicator of SMD. Gross Domestic Product is used as a indicator of economic growth. Because of the extremely high inflation, the consumer price index (CPI) is used to deflate GDP. The logarithm of the real GDP which indicates economic growth is denoted by LGDP. Also, stock market total traded value (TTV) and stock market turnover ratio (TR) are selected for proxies of SMD.

The dataset comprises quarterly data over the period 1998 Q2 - 2014 Q4. The datasets employed in this study are obtained from the Federal Reserve Economic Database. When the indicators are taken as a ratio of a financial metric to GDP, we may have stock-flow problem. Strictly speaking, since financial metrics are calculated as instant at the turn of the year, they depict the conditions only at the the turn of the year. However, GDP is calculated throughout a year. It is assumed that the metrics change uniformly throughout a year. The average level of the financial metric over the period can then be estimated by using a simple average method combining the beginning and ending measures. Assuming that GDP does not undergo any fluctuation over the year, the stock-flow problem can be fixed by using the percentage of the average of the financial item relative to the GDP. Levine et al. (2000) recommend that the end-of-year financial items must be deflated by the end-of-year CPI. The variables used in the study are as follows (Hou & Cheng, 2010):

$$BDV = \left(\frac{M2_t}{GDP\_deflator_t} + \frac{M2_{t-1}}{GDP\_deflator_{t-1}} \right) \Big/ GDP_t , \quad (1)$$

$$SMD = \left(\frac{SMC_t}{GDP\_deflator_t} + \frac{SMC_{t-1}}{GDP\_deflator_{t-1}} \right) \Big/ GDP_t , \quad (2)$$

$$TTV = \left(\frac{TTV_t}{GDP\_deflator_t} + \frac{TTV_{t-1}}{GDP\_deflator_{t-1}} \right) \Big/ GDP_t , \quad (3)$$

Table 2 provides summary statistics for variables. In consideration of summary statistics, the results show that the average for the financial depth is smaller than the SMC. It is quite clear that the stock market can result in a more efficient and larger allocation of funds that can be invested. The standard deviations of the variables reveal that SMD represents a greater deviation than BDV. The reason for this result is because the costs of financial instruments are downward inflexible in the banking sector. It can be interpreted that the cost of a financial instrument held in a bank does not tend to decline to the extreme. On the contrary, there are fluctuations in the prices of capital market instruments and they can be affected by shocks.

In the above dataset, I choose three SMD indicators - SMC to GDP, stock market TTV to GDP and stock market TR - representing the financial development. These three indicators are correlated with each other. Therefore, principal component analysis is applied to reduce dimension and to construct an index representing the SMD.

TABLE 2. SUMMARY STATISTICS

VARIABLES	BDV	SMD	LGDP	TTV	TR
MEAN	0.0302	0.5256	26.1926	1.4760	158.2642
MEDIAN	0.0304	0.4393	26.2261	1.0119	152.9447
MAXIMUM	0.0408	1.2004	26.6259	4.3958	226.6974
MINIMUM	0.0178	0.2890	25.8406	0.6435	99.6074
MAXIMUM-MINIMUM	0.0230	0.9114	0.7853	3.7523	127.0900
STANDARD DEVIATION	0.0079	0.2371	0.2411	1.0186	28.5942

TABLE 3. PRINCIPAL COMPONENT ANALYSIS OF STOCK MARKET DEVELOPMENT INDICATORS

VARIABLE	FACTOR1	COMMUNALITY
SMD	0.915	0.836
TTV	0.912	0.832
TR	0.166	0.028
VARIANCE	1.697	1.697
%VAR	0.565	0.565
	WEIGHTS	
VARIABLE	FACTOR SCORES	
SMD	0.5	
TTV	0.5	

The factor scores show that the the contributions of each SMD and TTV to the standardized variance of the first principal component are each 50%. I employ SMI to denote the index for SMD*.

5. Empirical results

The time-series analysis that is employed in this study can be separated into two steps. The first step consists of unit root tests which determine the structural breaks. It is important to note that a unit root test is used to find out whether a time-series variable is nonstationary and possesses a unit root. Concerning these, the most common tests proposed by Dickey & Fuller (1979; 1981) (ADF), and Phillips-Peron (1988), (PP), are utilized to indicate properties of the data. Table 4 reports the results of the ADF and PP tests for the variables BDV, SMI and MEI.

The results, as can be seen in Table 4, strongly imply that the variables used in the study are nonstationary in their levels, but they become stationary after taking first differences. On the basis of Table 4, the variables, which become stationary at first difference are I(1)

[*] I also obtain Z-score form of all stock market development indicators because of avoiding measurement bias.

and have unit root. However, in the presence of a structural break in the series, the ADF and PP unit root tests lead to a biased decision towards rejection of a false unit root null hypothesis. To deal with this, I use the Zivot & Andrews (1992) unit root test that allows for the detection of one break point endogenously from the data. The results, presented in Table 4, provide the evidence for a structural break in the series.

TABLE 4. UNIT ROOT TEST RESULTS

VARIABLES		ADF TEST - LEVEL		ADF TEST-FIRST DIFFERENCE	
		Intercept	Intercept & Trend	Intercept	Intercept & Trend
BDV		-1.14(1)	-2.11(1)	-5.83(0)*	-5.80(0)*
SMI		-2.31(2)	-1.70(2)	-3.31(7)**	-4.27(7)*
MEI		-2.53(5)	-2.79(5)	-4.05(0)*	-4.03(0)*
Significance level	*1%	-3.632	-4.262	-3.473	-4.018
	**5%	-2.948	-3.552	-2.880	-3.439
	***10%	-2.612	-3.209	-2.576	-3.143

VARIABLES		PP TEST-LEVEL		PP TEST-FIRST DIFFERENCE	
		Intercept	Intercept & Trend	Intercept	Intercept & Trend
BDV		-1.04(0)	-1.70(1)	-5.68(4)*	-5.659(4)*
SMI		-1.42(4)	-1.45(4)	-2.86(7)***	-3.492(1)**
MEI		-2.05(3)	-2.05(3)	-4.19(3)*	-4.182(3)*
Significance level	*1%	-3.626	-4.234	-3.534	-4.105
	**5%	-2.945	-3.540	-2.900	-3.480
	***10%	-2.611	-3.202	-2.591	-3.168

TABLE 5. ZIVOT-ANDREWS UNIT ROOT TEST

VARIABLES	BREAK IN INTERCEPT		BREAK IN THE TREND		BREAK IN BOTH	
	YEAR/PERIOD	T-STATISTIC	YEAR/PERIOD	T-STATISTIC	YEAR/PERIOD	T-STATISTICS
BDV	2005Q2	-2.580	2002Q1	-1.854	2008Q1	-2.932
SMI	2002Q3	-3.986	2003Q2	-6.027*	2002Q3	-3.952
MEI	2009Q2	-2.789	2002Q1	-3.600	2002Q2	-3.328

Note: * - indicates that null hypothesis that the series has a unit root with structural break is rejected.

The results, as shown in Table 5, make it clear that all variables have unit roots with structural breaks. As is known, it was in September 2008 that the world's financial system was almost brought down. These results meet our expectations since the Turkish economy was adversely affected by the crisis which started in the United States in the last quarter of 2007 and quickly spread to the rest of the world. At the same time, as seen in the Financial Development Reports of 2008, 2010 and 2011 published by the World Economic Forum, banking financial services rankings such as the ratios of M2 to GDP showed a regression. It is also a fact that the economic difficulties have been the dominant issue in Turkey since the beginning of the 2000s. As a result of the economic and financial crisis that struck in November 2000 and February 2001, respectively, Turkish economy and its financial sector seem to have been negatively affected.

Before the second step, I applied the BDS test (Brock et al. 1996) to test whether there is a non-linearity. Table 6 summarizes the results. It follows from Table 6 that the test results of the BDS are greater than the critical values according to Wald test, hence, making it necessary to reject the null hypothesis that errors are independently and identically distributed. This result reveals that the time-series in this paper are nonlinearly dependent.

TABLE 6. RESULTS FROM BDS TEST

VARIABLES	EMBEDDING DIMENSION				
	2	3	4	5	6
LGDP	0.175978	0.2932	0.37374	0.42862	0.46903
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*
SMI	0.201885	0.34373	0.44318	0.51126	0.55664
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*
BDV	0.015283	0.0299	0.0521	0.05885	0.06422
	(0.136)	(0.069)***	(0.008)*	(0.0048)*	(0.001)*
MEI	0.190884	0.32328	0.41359	0.4714	0.5058
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*

Note: *, ** and *** - denote significant at the 1%, 5% and 10% levels, respectively. The numbers in parentheses indicate the p-values.

The second step is the nonlinear ARDL method proposed by Shin et al. (2014) to verify whether there is an asymmetric long-run relationship between economic and financial growth. In the literature, the standard cointegration techniques, such as error-correction modelling and Granger causality are used in order to examine the nature of finance-growth relations. These methods assume that there is a symmetric long-run relationship in the finance-growth nexus. They are not able to capture asymmetries in the relationship. I adopt this method for my purpose (Schorderet, 2003 and Shin et al., 2014),

$$LGDP_t = \alpha_0 + \alpha_1 SMI_t^+ + \alpha_2 SMI_t^- + \alpha_3 BDV_t^+ + \alpha_4 BDV_t^- + \alpha_5 MEI_t^+ + \alpha_6 MEI_t^- + D2002 + D2005 , \quad (4)$$

where $\alpha = (\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6)$ is a vector of long-run parameters to be estimated. In Equation (4), $SMI_t^+, SMI_t^-, BDV_t^+, BDV_t^-, MEI_t^+$ and MEI_t^- are the partial sum of positive and negative changes in SMI, bank development and macroeconomic instability index, respectively.

$$SMI_t^+ = \sum_{i=1}^{t} \Delta SMI_i^+ = \sum_{i=1}^{t} \max(\Delta SMI_i, 0) , \quad (5)$$

$$SMI_t^- = \sum_{i=1}^{t} \Delta SMI_i^- = \sum_{i=1}^{t} \min(\Delta SMI_i, 0), \quad (6)$$

$$BDV_t^+ = \sum_{i=1}^{t} \Delta BDV_i^+ = \sum_{i=1}^{t} \max(\Delta BDV_i, 0), \quad (7)$$

$$BDV_t^- = \sum_{i=1}^{t} \Delta BDV_i^- = \sum_{i=1}^{t} \min(\Delta BDV_i, 0), \quad (8)$$

$$MEI_t^+ = \sum_{i=1}^{t} \Delta MEI_i^+ = \sum_{i=1}^{t} \max(\Delta MEI_i, 0), \quad (9)$$

$$MEI_t^- = \sum_{i=1}^{t} \Delta MEI_i^- = \sum_{i=1}^{t} \min(\Delta MEI_i, 0), \quad (10)$$

On the basis of the above formulations, the long-run relationship between economic growth and stock market index representing financial development increases in α_1, which is expected to be positive. Meanwhile, α_2 captures the long-run relationship between economic growth and stock market index reduction. Therefore, they are expected to move in the reverse direction, and α_2 is expected to be negative. The long-run relationship between economic growth and BDV representing financial development increases in α_3, the sign of α_3 is expected to be positive. However, it is expected that the long-run relationship between economic growth and the decrease in bank development causes the negative sign of α_4. The relationship between economic growth and increases and decreases in macroeconomic instability index - α_5 and α_6 - are expected to be negative and positive, respectively.

Equation (4) can be written in an unrestricted error correction form as proposed by Pesaran et al. (2001) and Shin et al. (2014) as*:

$$\begin{aligned}\Delta LGDP_t = {} & \alpha_0 + \alpha_1 LGDP_{t-1} + \alpha_2 SMI_{t-1}^+ + \alpha_3 SMI_{t-1}^- + \alpha_4 BDV_{t-1}^+ + \alpha_5 BDV_{t-1}^- + \alpha_6 MEI_{t-1}^+ \\ & + \alpha_7 MEI_{t-1}^- + D2002 + D2005 + \sum_{i=1}^{q} \rho_{1i} \Delta LGDP_{t-i} + \sum_{i=0}^{p} \rho_{2i} \Delta SMI_{t-i}^+ \\ & + \sum_{i=0}^{k} \rho_{3i} \Delta SMI_{t-i}^- + \sum_{i=0}^{l} \rho_{4i} \Delta BDV_{t-i}^+ + \sum_{i=0}^{m} \rho_{5i} \Delta BDV_{t-i}^- + \sum_{i=0}^{n} \rho_{6i} \Delta MEI_{t-i}^+ \\ & + \sum_{i=0}^{s} \rho_{7i} \Delta MEI_{t-i}^- + \mu_t \end{aligned} \quad (11)$$

* For a more, the detail explanations for non-linear ARDL model see Shin et.al (2014).

Table 6 reports the results of the nonlinear ARDL estimations in terms of the relationships between economic growth and financial development. In the model estimation, the maximum lag is chosen as 5 because of the length of the dataset. The goal is to select the appropriate model specification with appropriate lags for the differenced regressors. I choose the Akaike information criterion (AIC) to determine appropriate lag. In addition to this, only significance coefficients are presented in the short-run model reported in Table 7.

TABLE 7. NONLINEAR ARDL ESTIMATION RESULTS

VARIABLE	COEFFICIENT	STD. ERROR	T-STATISTIC	PROB.
		LONG-RUN RESULTS		
CONSTANT	-8.770	1.301	-6.743	0.000
LGDP(-1)	0.346	0.050	6.878	0.000
SMI_P(-1)	-0.073	0.026	-2.849	0.008
SMI_N(-1)	0.002	0.009	0.236	0.815
MEI_P(-1)	0.028	0.009	3.008	0.006
MEI_N(-1)	0.010	0.011	0.953	0.349
BDV_P(-1)	2.409	1.743	1.382	0.178
BDV_N(-1)	24.277	4.502	5.392	0.000
KUK2002	0.108	0.014	7.757	0.000
KUK2005	-0.045	0.009	-4.907	0.000
		SORT-RUN RESULTS		
ΔLGDP(-2)	-0.692	0.089	-7.777	0.000
ΔLGDP(-3)	-0.644	0.096	-6.687	0.000
ΔLGDP(-4)	-0.523	0.088	-5.953	0.000
ΔLGDP(-5)	-0.338	0.062	-5.500	0.000
ΔSMI_P(-4)	-0.134	0.033	-4.009	0.000
ΔSMI_P(-5)	-0.286	0.039	-7.286	0.000
ΔSMI_N(-3)	0.144	0.025	5.687	0.000
ΔSMI_N(-4)	0.071	0.027	2.638	0.014
ΔBDV_P	-20.058	2.375	-8.447	0.000
ΔBDV_P(-2)	-19.141	3.100	-6.174	0.000
ΔBDV_P(-3)	-21.283	2.791	-7.625	0.000
ΔBDV_P(-4)	-17.670	2.678	-6.597	0.000
ΔBDV_P(-5)	5.497	2.203	2.495	0.019
ΔBDV_N	-17.012	3.193	-5.328	0.000
ΔBDV_N(-1)	-8.447	4.737	-1.783	0.085
ΔBDV_N(-3)	14.550	4.154	3.502	0.002
ΔMEI_P	0.029	0.014	2.073	0.048
ΔMEI_P(-2)	0.027	0.012	2.201	0.036
ΔMEI_P(-4)	0.095	0.016	5.889	0.000
ΔMEI_P(-5)	-0.106	0.013	-8.152	0.000
ΔMEI_N(-1)	-0.152	0.019	-8.043	0.000
ΔMEI_N(-4)	-0.052	0.016	-3.282	0.003
ΔMEI_N(-5)	-0.030	0.018	-1.717	0.097
R-squared	0.971	Akaike info criterion	-6.923	
Adjusted R-squared	0.939	F-statistic(Prob.)	30.349(0.000)	
S.E. of regression	0.006	Durbin-Watson stat	2.290	

Furthermore, on the basis of Table 8, which is the null hypothesis, there is no long-run relationship between economic growth and financial development, and this is rejected

when the F-statistic exceeds the upper bound critical value. This evidence shows that there is a strong evidence of cointegration between economic growth and financial development.

TABLE 8. THE EVIDENCE OF COINTEGRATION TEST

K	F-STATISTIC	5% SIGNIFICANCE LEVEL	
		LOWER BOUND	UPPER BOUND
3	14.89	4.29	5.61

Note: The relevant critical value bounds are taken from Pesaran et al. (2001) critical values Case III The null hypothesis of "No Long-Run Relationship is rejected. The value of K represents the number of independent variables.

The diagnostic test results of the model are presented in Table 9. The results in Table 9 show that the selected model for Turkey is correctly specified and the parameter estimates are not biased.

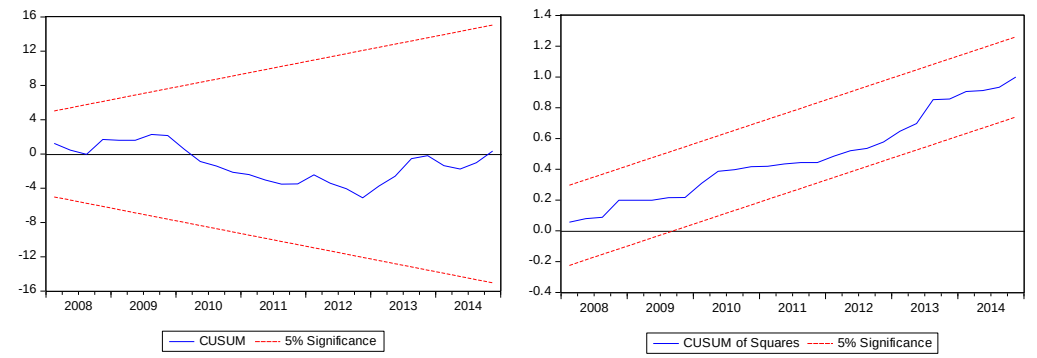
TABLE 9. DIAGNOSTIC TESTS OF NONLINEAR ARDL MODEL

	NORMALITY JB TEST	AUTOCORRELATION LM TEST	HETEROSCEDASTICITY WHITE TEST	SPECIFICATION RAMSEY TEST
TEST STATISTIC	1.066	2.163	0.693	0.279
PROB.	0.586*	0.135*	0.841*	0.601*

Note: *, **, *** - indicate significance at 1, 5 and 10 percent, respectively.

In order to test for long-run parameter stability, Pesaran & Pesaran (1997) suggested applying the Cumulative Sum of Recursive Residuals (CUSUM). The CUSUM graphs in Figure 5 show that there is stability, and it is identified in the coefficients at the 5% significance level over the study period.

FIGURE 5. THE PLOTS OF CUSUM AND CUSUMQ



Besides the CUSUM plot, the plot of CUSUMSQ stays within the critical 5% bounds that confirm the stability of coefficients. Regarding the results reported in Table 6, the long-run coefficients are shown in Equation 12. The long-run coefficients are estimated based on $-\alpha_i/\alpha_1$ $(i=2,3,...,7)$.

These long-run coefficients, which represent the positive and negative changes of the independent variables, reveal the relationship between these variables in the long-run equilibrium.

$$\begin{aligned} LGDP_t = {} & 25.34 + \underset{(0.003)}{0.21}SMI_t^+ - \underset{(0.810)}{0.005}SMI_t^- - \underset{(0.172)}{6.95}BDV_t^+ - \underset{(0.000)}{70.01}BDV_t^- \\ & - \underset{(0.000)}{0.08}MEI_t^+ - \underset{(0.343)}{0.03}MEI_t^- + \underset{(0.000)}{0.107}D2002 - \underset{(0.000)}{0.04}D2005 \end{aligned} \quad , \qquad (12)$$

Form Equation (12), several conclusions can be drawn. First, the one-point increase in the SMI index has a positive impact on economic growth in the long run. However, although a one-point decrease in the SMI index has no impact on economic growth, the sign of the coefficient is negative, as expected. Considering the short-run dynamics, a one-point increase in SMI has a negative short-run effect on economic growth. The reason for this result is considered to be that the financial institutions without full insurance can be exposed to credit volatility and low productivity to cover risk during financial crises in the short run. On the other hand, the financial institutions can become free from crises and can maintain stable growth in the long run (Wu et al., 2010). Furthermore, this result is consistent with that of Harris' (1997) finding for developing countries. Second, it seems that a 1% point increase in banking sector development has a negative impact on economic growth but the coefficient is not significant. This finding is in line with the finding of Altunbas et al. (2009) that there is no evidence supporting the theory that banking sector development led to economic growth. The important finding is that even if an increase in banking sector development does not affect the economic growth positively, a 1% point decrease in banking sector development affects the economic growth negatively. This finding is consistent with economic theory, and it is also in line with the work of Petkovski & Kjosevski (2014). In comparison with the long-run period, a 1% point increase in banking sector development can cause a negative effect on economic growth in the short run. This result is not surprising given the role of M2 in the economy. This situation relies on the fact that a greater part of the market participants is not in favor of longer maturity, and as a consequence, the government is more likely to issue more short-term debt instruments. This situation has significant influence on conducting proper monetary policy and other macroeconomic variables such as inflation, which makes predictions for the economy difficult. Third, a 1% point increase in the macroeconomic instability index appears to be negative, meaning that an increase in macroeconomic instability indicates a negative business climate and, therefore, lower growth rate. The study concludes that the long-run macroeconomic instability damages the relationship between economic growth and financial development. Moreover, a 1% point decrease in macroeconomic instability index does not seem significant. In the short-run period, a 1%

point increase in macroeconomic instability index has a positive impact on economic growth. It can be interpreted that some radical economic policies taken by the Turkish Government in response to the instability in the economy, begins to show its positive impact on economic growth. However, it should be expected that the positive impacts on growth which arise from developed resources allocation due to newly acquired price stability will diminish with time. Thus, the sign of the short-run coefficient turns negative with five lag periods as expected in the model. Therefore, it is very important to continue with macroeconomic reforms. One of the important findings that emerge from this study is that SMI and banking sector development are found to have an asymmetric impact on economic growth in both the short-run and long-run periods (see Tables 7 and 10).

Other variables, such as government policies, also have an impact on economic growth in Turkey, which is one of the emerging countries. There is one positive impact and one negative impact on Turkish economy and stock market, respectively. The first are reports that in response to the 2000/2001 crisis, the government laid down several structural reforms and proclaimed the macroeconoic control measures which refer to a slew of policies announced by the new Economic Programme launched in the spring of 2001. After all, real GDP started to rise from the second quarter of 2002. The second point in negative impact on Turkish stock market is that the terrorist attack was carried out in London in 2005. As is known, the effect of terrorist attacks on stock market returns can be crucial because of the risk factor for investors. In accordance with these arguments, we keep two breaks in the model. The dummy variable D2002 is positive and significant, while the dummy D2005 is negative, as expected. The result related to the terrorist attack supports the findings of the study of Eruygur & Omay (2014). Furthermore, Aksoy & Demiralay (2017) cocnluded that Turkish stock market is responsive to terrorist attacks occured in other countries.

TABLE 10. THE EVIDENCE OF ASYMMETRIC RELATIONSHIP IN THE LONG RUN

ASYMMETRIC RELATIONS BETWEEN VARIABLES	THE HYPOTHESES	WALD TEST RESULTS (T-STATISTIC)
Asymmetric relation between economic growth and stock market development index	$H_0 : -\alpha_2/\alpha_1 = -\alpha_3/\alpha_1$ $H_1 : -\alpha_2/\alpha_1 \neq -\alpha_3/\alpha_1$	2.120 (0.0429)
Asymmetric relation between economic growth and macroeconomic instability index	$H_0 : -\alpha_4/\alpha_1 = -\alpha_5/\alpha_1$ $H_1 : -\alpha_4/\alpha_1 \neq -\alpha_5/\alpha_1$	-1.106 (0.278)
Asymmetric relation between economic growth and banking sector development	$H_0 : -\alpha_6/\alpha_1 = -\alpha_7/\alpha_1$ $H_1 : -\alpha_6/\alpha_1 \neq -\alpha_7/\alpha_1$	5.180 (0.000)

Note: If the null hypothesis is rejected, it means that there is an asymmetric relationship between variables. The numbers in parentheses indicate the p-values.

Furthermore, for testing asymmetric relationships between variables, the Wald coefficient test is used based on the following Table 10.

The results reported in Table 10 show that there is an asymmetric relationship between economic growth and SMI index, and economic growth and banking sector development. However, according to Table 10, there is no evidence of the existence of an asymmetric

relationship between economic growth and macroeconomic instability index in the long-run period.

6. Limitations of the study

This study has several limitations which must be addressed. The first limitation is about the usage of PCA method. Apart from the fact that PAC is a non-parametric method, not only it does not consider a prior-knowledge, but also it handles the relationship between the variables. The second limitation is about the usage of the indicators for SMD. The study only focuses on several commonly used proxies for SMD. However, this study could be expanded by adding other financial metrics to measure SMD as well. The last limitation of the study is about the time span which strictly depends on data availability.

7. Conclusions

This paper makes its contribution towards the role of SMI on economic growth, and explains the important role that the stock market plays in stimulating economic growth. In this paper, I have examined the role of the stock market under macroeconomic instability in the finance-growth nexus during the period from 1998 Q2 to 2014 Q4. The nonlinear ARDL method is employed to investigate whether there is an asymmetric relationship between economic growth and financial development. The findings confirm the existence of both long-run and short-run asymmetry behavior of the finance-growth nexus. One of the major findings is that while the SMI increase tends to increase economic growth in the long run, SMI decrease tends to increase economic growth in the short-run period. However, in the long run, the banking sector development increase seems to be unrelated to economic growth, but it seems to be positively related to economic growth with five lag periods in the short run. First and foremost, the decrease in the development of the banking sector seems to be negatively related to economic growth in both the long-run and short-run periods.

Our empirical evidence reveals that financial development results in economic growth. That means that the development of the economy should be attracted to more enterprises that employ a large number of people. Turkey can be considered to have a well-developed financial system which promotes high economic expansion by providing technological changes, products and service innovation. In return, financial arrangements and services will have high demand. When these demands are met by banking institutions, the changes encountered in the financial system will lead to higher economic performance. Owing to this reason, economic growth and financial development are interdependent, and the link between the finance-growth nexus supports the supply-leading hypothesis which assumes that financial development is what resulted in economic growth in Turkey over the period of 1998 Q2 - 2014 Q4.

As a matter of fact, financial development is necessary in order to raise economic growth in Turkey. From a policy perspective, the well-developed stock market helps reduce investment risk by offering opportunities for extending the portfolio, productively allocate capital to efficient investments, and leads to an increase in economic growth. In the light of the findings, the evidence supports the view that the role of the stock market really matters for Turkey.

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