FINANCE GROWTH NEXUS FOLLOWING THE 2001 CRISIS IN TURKEY

A Master's Thesis

by

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ABSTRACT

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January 2012

Diverse economic growth rates of countries have engaged the attention of economists. Recently, researchers have studied the role of financial development to explain the cross-country differences in growth. In particular, the direction of causality between financial sector development and economic growth has been analyzed in the context of two conflicting hypotheses. According to supply-leading hypothesis financial development leads to economic growth, however demand-following hypothesis claims that the direction of the relationship runs from economic growth to financial development. Beside these two competing hypotheses, bi-causality between economic growth and financial development has been argued in the literature as well. This paper examines the causal relationship between financial development and economic growth in Turkey for the period 2002:1-2011:2, using the technique of Granger causality. Our model reveals that there is a bidirectional long run relationship between the economic growth and banking sector development. On the other hand, the long run causality between the

stock market development and economic growth is from stock market development to economic growth.

Key words: economic growth, financial development, Granger causality, Turkey

ÖZET

2001 KRİZİ SONRASINDA TÜRKİYE'DE FİNANSAL GELİŞME EKONOMİK BÜYÜME İLİŞKİSİ

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Ülkelerin kaydettiği farklı büyüme oranları ekonomistlerin iigisini çekmiştir. Yakın zamanlarda, araştırmacılar ülkeler arasındaki ekonomik büyüme farkılıklarını izah edebilmek için finansal gelişmenin rolü üzerinde durmaktadırlar. Özellikle birbiriyle çelişen iki hipotez çerçevesinde ekonomik büyüme ve finansal gelişme arasındaki nedensellik ilişkisi çözümlenmektedir. Arz öncüllü hipoteze göre finansal gelişme ekonomik büyümeye önderlik ederken, talep takipli hipotez ilişkinin yönünün finansal gelişmeden ekonomik büyümeye doğru olduğunu iddia etmektedir. Bu iki çelişen hipotezin yanısıra, ekonomik büyüme ilem finansal gelişme arasında çift yönlü nedensellik ilişkisi olduğu da ekonomi yazınında tartışılmaktadır. Bu makalede, Türkiye'de 2001:1-2011:2 dönemindeki finansal gelişme ve ekonomik büyüme arasındaki nedensellik ilişkisi, Granger nedensellik yöntemi kullanılarak incelenmiştir. Modelimiz ekonomik büyüme ile bankacılık sektörü gelişmesi arasında çift yönlü ve uzun vadeli bir ilşiki olduğunu ortaya koymaktadır. Diğer yandan, hisse

senedi piyasası gelişmesi ile ekonomik büyüme arasındaki uzun vadeli nedensellik ilişkisinin hisse senedi piyasası gelişmesinden ekonomik büyümeye doğru olduğu görülmektedir.

Anahtar kelimeler: ekonomik büyüme, finansal gelişme, Granger nedensellik, Türkiye

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CHAPTER 1

INTRODUCTION

Diverse economic growth rates of countries have engaged the attention of economists. Clearly, economic growth is a complex interaction of numerous factors such as factor accumulation, resource endowments, the quality of governance, human capital, institutional development, legal system effectiveness, and ethnic and religious diversity.

Recently, researchers have studied the role of financial development to explain the cross-country differences in growth. In particular, the direction of causality between financial sector development and economic growth has been analyzed in the context of two conflicting hypotheses.

According to supply-leading hypothesis financial development leads to economic growth, however demand-following hypothesis claims that the direction of the relationship runs from economic growth to financial development. Beside these two competing hypotheses, bi-causality between economic growth and financial development has been argued in the literature as well.

As an emerging market, Turkish economy has experienced a wide-ranging structural transformation after it had suffered from a disruptive economic crisis in 2001.

Financial sector fragility was one of the main causes of the 2001 crisis. Following the economic crisis, an IMF-supported economic program was put into practice in 2001. The fundamental objective of the program was to correct the instability after the crisis and to form a framework for sustainable growth by decreasing inflation and reforming the banking sector in short-term. In order to restore the banking sector, Banking Sector Restructuring Program (BSRP) was announced on May 15, 2001. Priorities of the BSRP were identified as recovering the deterioration caused by the 2001 crisis in the banking sector and building a strong financial intermediation base that supports the economic activity. After the 2001 crisis Turkish economy experienced an average of 6.8 percent economic growth in the period of 2002-2007. Though it suffered from global economic crises in the years of 2008 and 2009, it made a strong response in 2010 and grew at a rate of 8.9 percent.

On the other hand, there has been a rapid increase in banking sector total assets and the ratio of banking sector total credits to total assets starting from the year of 2002. The private credits to GDP ratio climbed from 13.6 percent in 2001 to 40.7 percent in 2010. Similarly, stock market capitalization to GDP ratio reached 42.8 percent in 2010 whereas it was 16.1 percent as of 2002.

In this context, my thesis will examine the causal relationship between financial development and economic growth in Turkey for the period 2002:1-2011:2, using the technique of Granger causality, a kind of time series econometric analysis. Since, recent empirical researches have shown strong evidence that financial development and economic growth relationship is country-specific (Ghali, 1999), I prefer to use time series econometric analysis for the Turkish economy in my thesis.

CHAPTER 2

LITERATURE REVIEW

2.1. General Literature

Though the correlation between financial development and economic growth has been more or less recognized, the direction of causality between them is a controversial issue. Does financial development cause economic growth or does economic growth cause financial development? Patrick (1966) entitled the possible directions of causality as the supply-leading and the demand-following hypothesis.

Supply-leading financial development hypothesis has been supported by many works like McKinnon (1973), Shaw (1973), and King and Levine (1993). This hypothesis asserts that financial development leads economic growth exogenously. It implies a pro-active creation of financial institutions and markets will advance real growth by increasing the supply of financial services. As a result of this, financial development affects the economic growth positively. In a cross section study, King and Levine (1993) show that the countries that have less developed financial systems grow slower than the countries that have more developed financial systems. In a very noteworthy paper, Rajan and Zingales (1998) conclude that industries which are more dependent on financial sector grow at higher rates in

countries with well-developed financial systems. This result indicates the fact that causality goes from financial development to economic growth.

On the other hand, the demand-following hypothesis assumes a causal relationship from economic growth to financial development. It implies an increase in economic growth enhances the demand for financial services. As a consequence of this, financial development leads the economic growth. Robinson (1952) and Goldsmith (1969) are the papers that support the demand-following hypothesis.

Beside these two competing hypotheses, bi-causality between economic growth and financial development has been argued in the literature as well. Greenwood and Jovanovic (1990) develop a macro model in which both financial development and economic growth are treated as endogenous. Their empirical results indicate that there exists a positive two-way causal relationship between economic growth and financial development. Economic growth stimulates the creation and expansion of financial institutions and the financial development allow investment projects to be chosen more efficiently by collecting and analyzing information from potential investors. Several empirical studies find this bi-causality, mainly using Granger causality methodology. For instance, Apergis et al. (2007) use dynamic panel data integration and cointegration analysis for 15 OECD countries over the period 1975 to 2000. The main finding of the paper is a long-run two way causal relationship between financial development and economic growth.

On the other hand, there are also conflicting theoretical predictions regarding the specific role of stock markets and banks in the economic development. Stiglitz (1985) has reached the conclusion that banking sector performs a better role in promoting economic growth than stock markets. Singh (1997) underlined the fact

that stock markets do not lead to long-run economic growth due to macroeconomic instability, volatility and arbitrariness of pricing process. Contrary to the Singh (1997), Japillo and Pagano (1994) and Atje and Jovanovich (1993) have shown that stock markets contribute positively in economic growth. However, Boyd and Smith (1998) and Blackburn et al (2005) have both indicated that both stock market and banks are necessary in stimulating economic growth.

Recently the role of stock markets in both developed and developing countries has increased. Therefore, many empirical works have been modeling simultaneously stock markets, banks and economic growth. Levine and Zervos (1998), Arestis et al (2001), Beck and Levine (2004) and Dritsaki et al (2005) have all employed models containing stock markets and banking sector jointly with economic growth. Beck and Levine (2004) have emphasized the fact that any examination of stock market effects on growth should simultaneously consider the impact of growing sophistication in the intermediating sector.

The early studies in the literature are generally cross-country studies that have some drawbacks. The primary drawback is that cross-country studies assume the relationship between the economic growth and financial development is homogenous for all countries. However, grouping all countries in the same sample may lead to the wrong conclusions. For example, De Gregorio and Guidotti (1995) employ a sample of 98 countries from 1960 to 1985. They merged their sample into three groups regarding their initial income level and found that the correlations are more significant for the poor countries.

Gupta (1984) is the first time series investigation that studies the financial development and economic growth relationship for 14 developing countries. After

then time series studies became widespread in the literature. The results of the Gupta paper indicate that causality runs from financial development to economic growth which underlines the role of the financial development in the process of economic growth. Demetriades and Hussein (1996) and Arestis and Demetriades (1997) evaluate the financial development and economic growth relationship in developing and developed economies, respectively. Their results reveal considerable variation across the countries in the sample even when the same variables and estimation methods are employed. As a result they put emphasis on the limitations of cross-country studies for treating different economies as a homogeneous entity. Arestis and Demetriades (1996) argue several reasons for the direction of causality findings from country to country. The first reason is that different financial systems may have different institutional structures and certain institutional structures may contribute more to economic growth. The second reason is that financial sector policies play a crucial role in determining whether financial development supports economic growth. The third reason is that two countries with identical financial systems and financial sector policies may still differ due to the effectiveness of those institutions that design and implement the policies.

2.2. Literature on Turkish Data

Kar and Pentecost (2000) study the causal relationship between financial development and economic growth in Turkey. The annual data is employed for the Turkish economy for the period 1963-1995. Five alternative proxies for financial development are developed and Granger causality tests applied using the

cointegration and vector error correction methodology (VECM). The empirical results of the study show that the direction of causality between financial development and economic growth in Turkey is sensitive to the choice of proxy used for financial development. For example, when financial development is measured by the money to income ratio the direction of causality runs from financial development to economic growth, but when the bank deposits, private credit and domestic credit ratios are alternatively used to proxy financial development, growth is found to lead financial development. On balance, however, for Turkey, growth seems to lead financial sector development, supporting the demand-following hypothesis.

Aslan and Kücükaksoy (2006) examine the financial development and economic growth relationship for Turkey over the period of 1970-2004 by using annual data. Granger causality test results of the study show that financial development leads to economic growth and support the supply-leading hypothesis for Turkey.

Unalmis (2002) used annual time series starting from 1970 to 2001 and private credit to GDP ratio as a proxy for the financial development. Granger non-causality test is applied using the cointegration and the vector error correction methodology (VECM). The empirical results of the study show that financial development significantly causes economic growth in the short-run, and in the long-run, there is a bidirectional relationship between financial development and economic growth. In other words, the Turkish case supports the supply-leading phenomena in the short-run and both the supply-leading and the demand-following cases in the long-run.

Halicioglu (2007) investigates the validity of the supply-leading and the demand-following hypotheses using annual data from 1968 to 2005. The bounds testing

approach to cointegration is conducted to establish the existence of a long-run relationship between financial development and economic growth. An augmented form of Granger causality analysis is implemented to identify the direction of causality among the variables both in the short-run and the long-run. The empirical findings suggest unidirectional causation from financial development to economic growth, which supports the supply-leading hypothesis.

Belke (2007) studies the role of financial development in economic growth for the period of 1970–2006, by using Granger causality technique in Turkey. The results of cointegration test show that there is no long-run relation between financial development and economic growth. However, conclusion of Granger causality test is obtained as supportive evidence to hypothesis of both short-run supply-leading and demand-following in financial development and economic growth relationship. The results of causality test exhibit clearly that causal relation between financial development and economic growth may change according to financial development indicator.

Ari and Ozcan (2011) study the relationship between financial development and economic growth for Turkey by estimating a VAR Model over the 1998-2009 periods. According to Granger causality test, there is a uni-directional relationship between financial development and economic growth in Turkey. The direction of this relationship is from economic growth to financial development that supports the demand-following hypothesis.

Aydemir et al (2011) investigate the causality relationship between financial development and economic growth using available data from 1987:1 to 2006:04 about Turkey. They take total bank credit to private sector and total market

capitalization as proxies for financial development and GDP as proxy for economic growth. Their study uses a tri-variate Vector Error Correction Model and Impulse Response Functions to explain possible casual relationships between variables. They reach the conclusion that there is a bidirectional causality relationship between variables.

Our thesis mainly differs from these studies in terms of the data and methodology. All these studies apart from the Aydemir et al (2011) employ bi-variate Granger causality tests, whereas we perform a multi-variate Granger causality test. Since our aim is to see and decouple the effect of banking sector development and stock market development on economic growth together in one model, we prefer to perform a multi-variate Granger causality test based on Vector Autoregression (VAR) and Vector Error Correction (VEC) models. On the other hand, apart from the Ari and Ozcan (2011) and Aydemir et al (2011), other studies use annual time series data, whereas we prefer to use quarterly time series data. Our principal concern for using quarterly data is to extend the sample so as to reach sufficient data points for running Granger causality tests.

CHAPTER 3

DATA AND METHODOLOGY

3.1. Data

In order to analyze the relationship between the stock markets, banking sector and economic growth in Turkey the following function is used:

EG=f(SMD,BSD,INV)

EG=Economic Growth

SMD=Stock Market Development

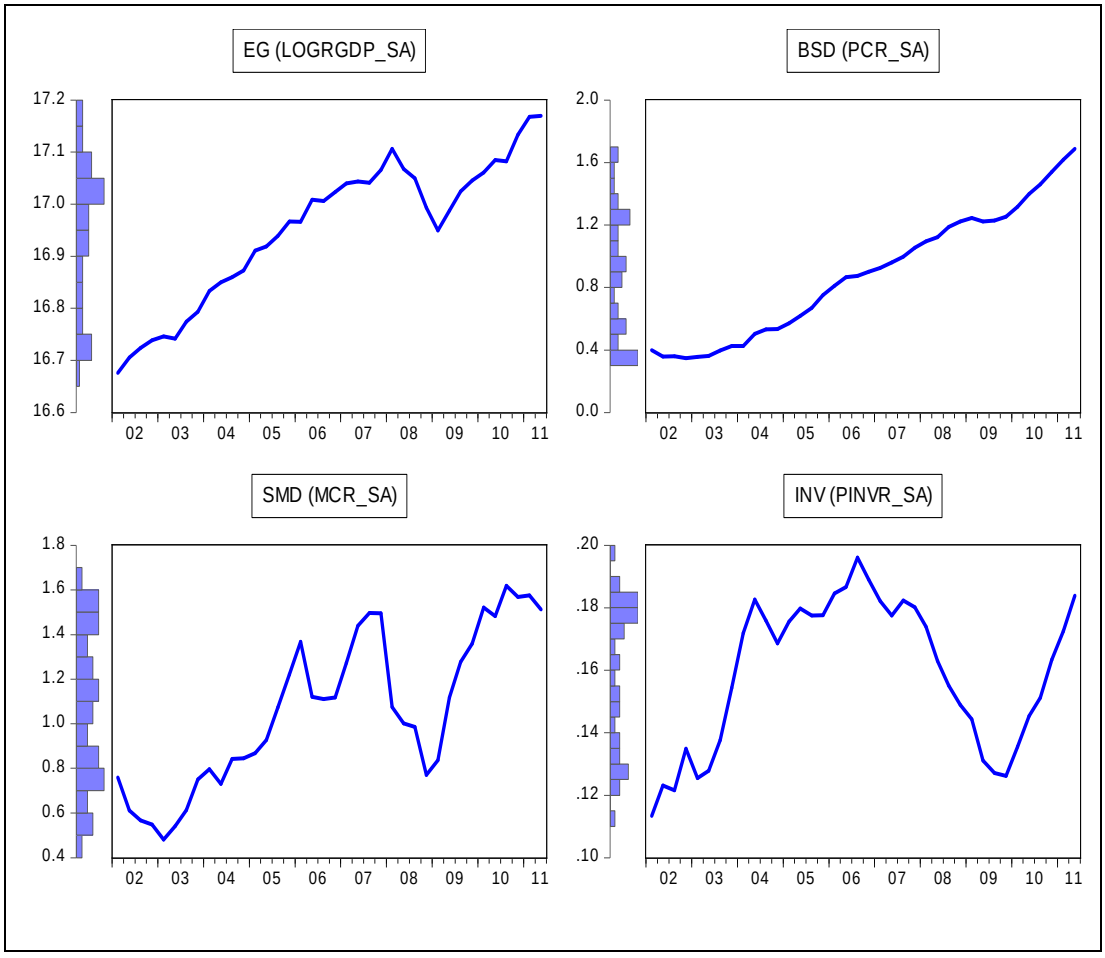
BSD=Banking Sector Development

INV=Investment

The quarterly data of the Turkish economy for the period 2002Q1-2010Q2 is used for the empirical analysis. Economic growth (EG) is measured with natural logarithm of quarterly real gross domestic product (GDP at 1998 constant prices), which is also used in many empirical studies. Banking sector domestic private credit extended by the private banks to the GDP ratio and stock market capitalization to the GDP ratio will be used as the main proxies for the banking sector development (BSD) and stock market development respectively (SMD). Private sector gross fixed capital formation to the GDP ratio (INV) will be used as the proxy for investment. We

included investment to our VAR model concerning the fact that investment provides a positive link to economic growth. GDP and investment series are seasonally adjusted, since we observed strong seasonality in these series. The corresponding data is collected from the Central Bank of Turkey Electronic Data Delivery System and Istanbul Stock Exchange Stock Market Data. Afterwards, compiled dataset is employed to develop a relevant Vector Auto Regressive model in E-views econometric program.

Figure 1- Economic Growth, Financial Development and Investment Proxies



Before starting to explain the methodology, we analyzed the behavior and the descriptive statistics of the time series data. Figure 1 indicates the graphs of the 4 variables. In the graph of economic growth (EG), as though there is an increasing

trend in the whole period, there is an economic contraction year, 2009. Ratio of private sector credit to GDP (BSD) has displayed a sharp increasing trend for the whole period. Ratio of stock market capitalization to GDP (SMD) increased up to the year of 2008. After it had decreased sharply during the crisis, it has responded strongly starting from the year of 2009 and reached its maximum in the third quarter of 2010. Investment ratio (INV) started to increase starting from the beginning of the sample and reached its maximum in the third quarter of 2006. Afterwards, it decreased up to the end of 2009. However, it has entered into an increasing trend since then.

Table 1- Descriptive Statistics of the Proxies

	Economic Growth	Banking Sector Development	Stock Market Development	Investment
	EG	SMD	BSD	INV
Mean	16.95176	0.883913	1.060422	0.159148
Median	16.99020	0.887956	1.073938	0.165953
Maximum	17.16951	1.686999	1.617528	0.196047
Minimum	16.67624	0.346588	0.480098	0.113374
Std. Dev.	0.138139	0.408510	0.346336	0.023857
Skewness	-0.466971	0.206838	0.038665	-0.361323
Kurtosis	2.104804	1.849402	1.757768	1.716925
Jarque-Bera	2.649907	2.367089	2.452775	3.433454
Probability	0.265815	0.306192	0.293350	0.179653
Sum	644.1669	33.58868	40.29605	6.047620
Sum Sq. Dev.	0.706045	6.174565	4.438101	0.021058
Observations	38	38	38	38

Descriptive statistics of the economic growth and financial development indicators are shown in Table 1. As seen from the Table 1, while economic growth and investment proxies are left skewed, stock market development and banking sector development proxies are right skewed. All series have low kurtosis relative to the

kurtosis of the normal distribution. As a result, all series don't have normal distribution.

Table 2 displays that the correlation between the economic growth proxy and the banking sector development proxy is positive and the correlation coefficient is equal to 0.91.

Table 2- Correlation Matrix of the Proxies

	EG	BSD	SMD	INV
EG	1.000000	0.914109	0.875338	0.484881
BSD	0.914109	1.000000	0.815054	0.160452
SMD	0.875338	0.815054	1.000000	0.391560
INV	0.484881	0.160452	0.391560	1.000000

Similarly, the correlation between the economic growth proxy and the stock market development proxy is positive and the correlation coefficient is equal to 0.88. Moreover, the correlation coefficient between the economic growth proxy and the investment ratio is 0.48 that reveals positive relationship as well. It can be seen from the table that that all the proxies are positively related to each other.

3.2. Methodology

In order to analyze the relationship between economic growth, banking sector development, stock market development and investment ratio Granger causality test is employed under the models of Vector Autoregression (VAR) and Vector Error Correction (VEC). In an effort to estimate a simple Vector Auto Regressive (VAR) model, two proxies for financial development, one proxy for the economic growth and one proxy for investment is applied.

The VAR model to be used in our analysis in matrix form is,

$$\begin{bmatrix} EG_t \\ SMD_t \\ BSD_t \\ INV_t \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{bmatrix} + \begin{bmatrix} a_{11}^1 a_{12}^1 a_{13}^1 \\ a_{21}^1 a_{22}^1 a_{23}^1 \\ a_{31}^1 a_{32}^1 a_{33}^1 \\ a_{41}^1 a_{42}^1 a_{43}^1 \end{bmatrix} \begin{bmatrix} EG_{t-1} \\ SMD_{t-1} \\ BSD_{t-1} \\ INV_{t-1} \end{bmatrix} + \cdots + \begin{bmatrix} a_{11}^p a_{12}^p a_{13}^p \\ a_{21}^p a_{22}^p a_{23}^p \\ a_{31}^p a_{32}^p a_{33}^p \\ a_{41}^p a_{42}^p a_{43}^p \end{bmatrix} \begin{bmatrix} EG_{t-p} \\ SMD_{t-p} \\ BSD_{t-p} \\ INV_{t-p} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix}$$

where p is the order of the VAR and c is the constant term. EG denotes economic growth, SMD denotes stock market development, BSD denotes banking sector development and INV denotes investment ratio.

Since non-stationarity invalidates many standard empirical results, the first step to develop an appropriate VAR model is to determine the stationary properties of the relevant series. Unit root tests are the main instruments for studying the stationarity properties of the series. In my thesis, Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) unit root tests and Philips-Perron (PP) (Philips and Perron, 1988) unit root tests are applied for this purpose.

In order to apply the ADF test we need to estimate the following regression:

$$\Delta Z_t = \alpha_0 + \theta Z_{t-1} + \gamma t + \alpha_1 Z_{t-1} + \alpha_2 Z_{t-2} + \cdots + \alpha_p Z_{t-p} + \varepsilon_t$$

Δ: First difference operator

Z_t: Relevant series (EG, SMD, BSD)

t: Index of time $(t = 1, \ldots, T)$

p: number of lags, determined based on information criteria

The null and the alternative hypothesis for the existence of unit root in variable Zt is:

$$H_0: \theta = 0 \qquad H_1: \theta < 0$$

Dickey-Fuller t-statistic is associated with the ordinary least squares estimate of θ.

The Phillips-Perron (PP) unit root tests differ from the ADF tests mainly in how they deal with serial correlation and heteroskedasticity in the errors. In particular, where

the ADF tests use a parametric autoregression to approximate the Auto Regressive-MovingAverage (ARMA) structure of the errors in the test regression, the PP tests ignore any serial correlation in the test regression. The PP tests correct for any serial correlation and heteroskedasticity in the errors out of the test regression by directly modifying the test statistics.

After examining the stationary properties of variables, if all variables are found out to be non-stationary, i.e. integrated of order 1, a possible cointegrating relationship between these variables should be searched. The cointegration test has a crucial role in deciding the model used in detecting the relationship between financial development and economic growth. We employ the Johansen multivariate cointegration technique, proposed by Johansen (1988) and Johansen and Juselius (1990), in order to apply the cointegration test. This technique provides two different likelihood ratio tests based upon trace statistics and maximum eigenvalue statistics.

After obtaining cointegration test results, we apply a Granger causality test. Granger (1988) implies that if two time-series variables are cointegrated, then at least one-directional Granger-causation exists. Therefore, the existence of a stable long-run relationship (cointegrating relationship) between financial development and economic growth implies that the three variables are causally related at least in one direction.

A vector error correction (VEC) model is a restricted VAR designed for use with nonstationary series that are known to be cointegrated. 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.

If there is no cointegrating relationship, we make the variables stationary by first differencing and test for causality in a VAR context. Finally, for non-stationary variables and a cointegrated relationship, we estimate a vector error correction model and again test for Granger causality in this context.

CHAPTER 4

EMPIRICAL ANALYSIS

4.1. Stationary Properties of the Variables

As it is emphasized before, integration order of each proxy should be determined in order to apply VAR and VECM methodologies. Both Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used in the stationarity analysis.

Table 3- Unit Root Based on Augmented Dickey Fuller (ADF) Test

	None (T_n)	Intercept (T_i)	Intercept and Trend (T_t)	Lag Length
EG	3.597771	-1.721005	-1.954357	0
BSD	2.980730	1.503629	-3.008979	1
SMD	0.099086	-1.160066	-3.261819	1
INV	0.757894	-2.363956	-2.247144	1
ΔEG	-4.200515	-5.271296	-5.322307	0
ΔBSD	-1.792233	-3.021067	-3.813708	0
ΔSMD	-5.503912	-5.448087	-5.442108	0
ΔINV	-3.718483	-3.869752	-3.877448	0

Notes: T_n is the t-statistic for testing the significance of θ when a constant and time trend is not included to the ADF test equation. T_i is t-statistic for testing the significance of θ when a constant is included to the ADF test equation. T_t is the t-statistic for testing the significance of θ when a constant and time trend is included to the ADF test equation.
The critical values at 1, 5, and 10% are -2.63, -1.95 and -1.61 for T_n, -3.62, -2.94 and -2.61 for T_i and -4.22, -3.53 and -3.20 for T_t respectively.
The proper lag order of ADF test is chosen automatically by E-Views program based upon Schwarz Information Criteria.

Lag lengths are decided by evaluating Schwarz Information Criterion (SIC). The Econometrics program (E-Views 7.0) gives appropriate lag length automatically, according to the criteria set by the user.

Table 3 and table 4 indicate ADF and PP results of each proxy at levels and at first differences. From these results we can conclude that each series has unit root at levels and it is stationary when first difference is taken. It can be said that all variables are integrated of order 1, I(1).

Table 4- Unit Root Based on Philips-Perron (PP) Test

	None (T_n)	Intercept (T_i)	Intercept and Trend (T_t)	Bandwidth
EG	3.597771	-1.721005	-1.954357	0
BSD	2.980730	1.503629	-3.008979	1
SMD	0.099086	-1.160066	-3.261819	1
INV	0.757894	-2.363956	-2.247144	1
ΔEG	-4.200515	-5.271296	-5.322307	0
ΔBSD	-1.792233	-3.021067	-3.813708	0
ΔSMD	-5.503912	-5.448087	-5.442108	0
ΔINV	-3.718483	-3.869752	-3.877448	0

Notes: T_n is the t-statistic for testing the significance of θ when a constant and time trend is not included to the PP test equation. T_i is t-statistic for testing the significance of θ when a constant is included to the PP test equation. T_t is the t-statistic for testing the significance of θ when a constant and time trend is included to the PP test equation.
The critical values at 1, 5, and 10% are -2.63, -1.95 and -1.61 for T_n, -3.62, -2.94 and -2.61 for T_i and -4.22, -3.53 and -3.20 for T_t respectively.
The proper bandwidth of PP test is chosen automatically by E-Views program using Newey-West method and Bartlett kernel method is used for spectral estimation.

4.2. VAR Model and Cointegration Test

For the purpose of searching for the cointegrating relationship among the 4 variables, an unrestricted VAR model[1] is estimated. In order to apply cointegration test, lag length in the VAR model needs to be determined. Lag length selection is

[1] VAR estimation results can be seen in the Appendix A.

carried out by evaluating 6 different lag length selection criteria and determined as 2 for the unstable VAR, estimated at levels.

Table 5 reports the trace and max-eigenvalue statistics for determining the number of cointegrating vectors (r) using Johansen's maximum likelihood approach. Lag length is determined by using Schwarz Information Criteria as 1. In trace and max-eigenvalue statistics, the null hypotheses are tested. According to test results, since trace and max-eigenvalue statistics are above the 95 percent critical value of 47.86 and 27.58 respectively, the null hypothesis of r=0 is rejected, which means that there is one cointegrating relationship among the variables.

Table 5- Cointegration Tests

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None * (H_0: r=0, H_1: r≥1)	0.617965	64.33054	47.85613	0.0007
At most 1 (H_0: r≤1, H_1: r≥2)	0.348331	27.76527	29.79707	0.0843
At most 2 (H_0: r≤2, H_1: r≥3)	0.253552	11.49299	15.49471	0.1829
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None * (H0: r=0, H1: r≥1)	0.617965	36.56527	27.58434	0.0027
At most 1 (H0: r≤1, H1: r≥2)	0.348331	16.27228	21.13162	0.2094
At most 2 (H0: r≤2, H1: r≥3)	0.253552	11.11229	14.26460	0.1487

Trace test indicates 1 cointegrating equation at 5% significance level

Max-eigenvalue test indicates 1 cointegrating equation at 5% significance level

* denotes rejection of the hypothesis at 5% significance level

**MacKinnon-Haug-Michelis (1999) p-values

4.3. VEC Model and Granger Causality

After observing that there is one cointegating equation among the four variables, we estimated a VEC model[2] assuming that there are intercepts in both cointegrating equation and VAR. As it stated previously, in a VEC model, there are two possible sources of causality: error correction term, which shows long-run causality, and lagged explanatory variables, revealing short-run causality.

Table 6 presents evidence for the long run behavior of the variables. Economic growth is positively related to the banking sector development, stock market development and investment in the long-run. It can be seen from the Table 6 that the positive effect of investment on economic growth has been larger than that of the two other financial sector development proxies.

Table 6- Long-run Cointegration Vector Estimates

	EG	BSD	SMD	INV
β	1.000	-0.188	-0.102	-1.106
α (speed of adjustment coefficient)	-0.217	0.495	1.180	-0.065
t-statistic for α	(-2.387)	(4.544)	(1.600)	(-1.718)

Furthermore, while speed of adjustments to the long-run change in economic growth and investment are relatively slow, speed of adjustment to the long-run change in economic stock market development is fast. In addition, stock market development and investment coefficients are insignificant implying that these two variables are weakly exogenous to the cointegration vector. As a conclusion, there is a bidirectional long run relationship between the economic growth and banking sector development. On the other hand, the long run causality between the stock market development and economic growth is from stock market development to

[2] VEC estimation results can be seen in the Appendix A.

economic growth. Similarly, the long run causality between the investment and economic growth is from investment to economic growth.

Table 7- VEC Granger Causality/Block Exogeneity Wald Tests

Dependent variable: DEG=f(DBSD, DSMD,DIR)			
Excluded	Chi-sq	df	Prob.
DBSD	0.087889	1	0.7669
DSMD	12.31669	1	0.0004
DIR	0.875248	1	0.3495
All	13.07693	3	0.0045
Dependent variable: DBSD=f(DEG, DSMD,DIR)			
Excluded	Chi-sq	df	Prob.
DEG	0.001411	1	0.9700
DSMD	8.217361	1	0.0041
DIR	11.29252	1	0.0008
All	17.82956	3	0.0005
Dependent variable: DSMD=f(DEG, DBSD,DIR)			
Excluded	Chi-sq	df	Prob.
DEG	0.015185	1	0.9019
DBSD	0.330823	1	0.5652
DIR	0.070516	1	0.7906
All	0.330876	3	0.9541
Dependent variable: DIR=f(DEG, DBSD,DSMD)			
Excluded	Chi-sq	df	Prob.
DEG	4.190738	1	0.0406
DBSD	0.839535	1	0.3595
DSMD	0.820004	1	0.3652
All	5.758426	3	0.1240

In an effort to determine the short run causality among the four variables Granger causality/Block Exogeneity Wald tests based upon VEC model is performed. According to the test results in Table 7, stock market development is seen to Granger cause the economic growth in the short-run. Furthermore, economic development Granger causes the investment in the short run as well.

In order to determine the robustness of the model, diagnostic tests are implemented in Table 8. We examine whether there is autocorrelation and

heteroscedasticity in the model. Moreover, normality of the model is tested. We can conclude from the test results that VEC model residual passes the diagnostic tests except the normality test.

Table 8- Diagnostic Tests of the VEC Model Residual

	Df.	Test Statistic	P-value
Serial Correlation LM Test	9	15.35935	0.0815
White Heteroskedaticity Test	228	252.7537	0.1249
Normality Test	6	8.544598	0.2009

CHAPTER 5

CONCLUSION

This thesis examines the causal link between financial deepening and economic growth in Turkey with quarterly time series data for the 2002-2011 periods. In this study, cointegration relationship among the banking sector development, stock market development, investment and economic growth proxy is investigated by Engle-Granger technique. We found that our financial development and economic growth proxies have a cointegration relationship.

Our model reveals that there is a bidirectional long run relationship between the economic growth and banking sector development. On the other hand, the long run causality between the stock market development and economic growth is from stock market development to economic growth. Similarly, the long run causality between the investment and economic growth is from investment to economic growth.

In the economic literature there exist two conflicting hypotheses that argue the relationship between the financial development and economic growth. The first one, supply-leading hypothesis, assumes a causal relationship from financial development to economic growth. It implies a pro-active creation of financial

institutions and markets will advance real growth by increasing the supply of financial services. As a result of this, financial development affects the economic growth positively. On the other hand, the demand-following hypothesis assumes a causal relationship from economic growth to financial development. It implies an increase in economic growth enhances the demand for financial services. As a consequence of this, financial development leads the economic growth. Beside these two competing hypotheses, bi-causality between economic growth and financial development has been argued in the literature as well.

Our findings support the view that supply leading hypothesis is valid for the Turkey for the concerned period. In addition, there is a bidirectional long run relationship between the economic growth and banking sector development. After hit by a disruptive economic crisis in 2001 Turkey strengthened its banking system and built a strong financial intermediation base that supports the economic activity. Since that time Turkish banking sector balance sheet underwent a principal transformation. In pre-crisis period, the sector moved away from real intermediation activities and just financed the public sector. Following the banking reform, banking sector concentrated mainly on intermediation activities by providing loans to the private sector. In the years following the 2001 crisis, banking sector started to finance the private sector and supported the economic growth in a strong manner. Furthermore, number of companies traded on the Istanbul Stock Exchange increased by a large amount and stock market capitalization to GDP ratio has climbed to its historic high levels.

Nowadays it has been argued that Turkish economy is overheated because of the rapid credit growth. Central Bank of Turkey (CBRT) and Banking Regulation and

Supervision Agency (BRSA) took some measures to slow down the pace of private credit growth starting from 2010. However, it should be kept in mind that private credit to GDP ratio is still low in Turkey compared to developed countries. Because of the overheating arguments and current account deficit concerns it can be accepted to take some measures to slow down the pace of credit growth in the very short run. However, we consider that Turkey needs to develop its financial sector progressively in order to grow consistently in the long run.

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APPENDICES

APPENDIX A

Table A.1- Vector Autoregression Estimates

Sample: 2002Q1 2011Q2
Included observations: 38
Standard errors in ( ) & t-statistics in [ ]

	LOGRGDP_SSA	PCR_SA	MCR_SA	PINVR_SSA
LOGRGDP_SSA(-1)	0.910429	0.399983	1.988305	0.057042
	(0.14282)	(0.16626)	(1.06988)	(0.05591)
	[6.37450]	[2.40582]	[1.85844]	[1.02024]
LOGRGDP_SSA(-2)	-0.179514	0.176995	-1.311604	-0.066293
	(0.14564)	(0.16953)	(1.09097)	(0.05701)
	[-1.23259]	[1.04401]	[-1.20223]	[-1.16277]
PCR_SA(-1)	-0.090536	1.054842	0.355117	0.076877
	(0.13018)	(0.15153)	(0.97513)	(0.05096)
	[-0.69549]	[6.96111]	[0.36417]	[1.50861]
PCR_SA(-2)	0.146647	-0.193929	-0.219402	-0.086613
	(0.12298)	(0.14316)	(0.92126)	(0.04814)
	[1.19241]	[-1.35462]	[-0.23815]	[-1.79906]
MCR_SA(-1)	0.104102	0.040135	1.000782	0.016492
	(0.02065)	(0.02404)	(0.15469)	(0.00808)
	[5.04131]	[1.66968]	[6.46980]	[2.04012]
MCR_SA(-2)	-0.067289	-0.046655	-0.505363	-0.003904
	(0.02412)	(0.02808)	(0.18072)	(0.00944)
	[-2.78918]	[-.66133]	[-2.79642]	[-0.41338]
PINVR_SSA(-1)	0.903979	0.935119	0.470757	1.052225

	(0.44272)	(0.51535)	(3.31634)	(0.17331)
	[2.04189]	[1.81452]	[0.14195]	[6.07145]
PINVR_SSA(-2)	-0.421868	-1.816173	-0.318026	-0.244058
	(0.42566)	(0.49549)	(3.18854)	(0.16663)
	[-0.99110]	[-3.66539]	[-0.09974]	[-1.46468]
C	4.409398	-9.483890	-11.09570	0.180144
	(1.76403)	(2.05345)	(13.2142)	(0.69055)
	[2.49961]	[-4.61851]	[-0.83968]	[0.26087]
R-squared	0.988138	0.998162	0.894110	0.939054
Adj. R-squared	0.984866	0.997655	0.864899	0.922241
Sum sq. resids	0.008375	0.011349	0.469950	0.001283
S.E. equation	0.016994	0.019782	0.127299	0.006652
F-statistic	301.9775	1968.680	30.60870	55.85371
Log likelihood	106.0621	100.2891	29.54194	141.7010
Akaike AIC	-5.108533	-4.804690	-1.081154	-6.984262
Schwarz SC	-4.720683	-4.416841	-0.693305	-6.596413
Mean dependent	16.95176	0.883913	1.060422	0.159148
S.D. dependent	0.138139	0.408510	0.346336	0.023857

Determinant resid covariance (dof adj.)	7.31E-14
Determinant resid covariance	2.48E-14
Log likelihood	379.5443
Akaike information criterion	-18.08128
Schwarz criterion	-16.52988

Table A.2- Vector Error Correction Estimates

Sample: 2002Q1 2011Q2
Included observations: 38
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LOGRGDP_SSA(-1)	1.000000
PCR_SA(-1)	-0.187996 (0.02509) [-7.49139]
MCR_SA(-1)	-0.102034 (0.02996) [-3.40597]
PINVR_SSA(-1)	-1.106088 (0.24535) [-4.50821]
C	-16.49683

Error Correction:	D(LOGRGDP_SSA)	D(PCR_SA)	D(MCR_SA)	D(PINVR_SSA)
CointEq1	-0.216541 (0.09074) [-2.38652]	0.494546 (0.10884) [4.54394]	1.180152 (0.73759) [1.60000]	-0.065393 (0.03807) [-1.71791]
D(LOGRGDP_SSA(-1))	0.200189 (0.12622) [1.58607]	-0.005688 (0.15140) [-0.03757]	-0.126434 (1.02603) [-0.12323]	0.108396 (0.05295) [2.04713]
D(PCR_SA(-1))	-0.031095 (0.10489) [-0.29646]	0.248169 (0.12581) [1.97256]	-0.490407 (0.85263) [-0.57517]	0.040317 (0.04400) [0.91626]
D(MCR_SA(-1))	0.076170 (0.02170) [3.50951]	0.074627 (0.02603) [2.86659]	0.269681 (0.17643) [1.52853]	0.008245 (0.00911) [0.90554]
D(PINVR_SSA(-1))	0.395664 (0.42292) [0.93555]	1.704725 (0.50729) [3.36043]	0.912949 (3.43797) [0.26555]	0.208888 (0.17742) [1.17734]
C	0.010032 (0.00438)	0.020561 (0.00525)	0.022318 (0.03558)	-0.001092 (0.00184)

	[2.29218]	[3.91683]	[0.62733]	[-0.59466]
R-squared	0.571067	0.708103	0.114610	0.360135
Adj. R-squared	0.504046	0.662494	-0.023732	0.260156
Sum sq. resids	0.009318	0.013406	0.615721	0.001640
S.E. equation	0.017064	0.020468	0.138713	0.007159
F-statistic	8.520738	15.52553	0.828456	3.602114
Log likelihood	104.0357	97.12353	24.40875	137.0442
Akaike AIC	-5.159772	-4.795975	-0.968881	-6.897064
Schwarz SC	-4.901206	-4.537409	-0.710315	-6.638497
Mean dependent	0.014216	0.031915	0.014239	0.002026
S.D. dependent	0.024230	0.035232	0.137096	0.008323

Determinant resid covariance (dof adj.)	1.02E-13
Determinant resid covariance	5.15E-14
Log likelihood	365.6617
Akaike information criterion	-17.77167
Schwarz criterion	-16.56503

APPENDIX B

Table B.1- VEC Residual Portmanteau Tests for Autocorrelations

VEC Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: no residual autocorrelations up to lag h
Sample: 2002Q1 2011Q2
Included observations: 38

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	3.584075	NA*	3.680942	NA*	NA*
2	12.89612	0.9934	13.51032	0.9903	28
3	29.68717	0.9514	31.74060	0.9162	44
4	40.30644	0.9762	43.60920	0.9449	60
5	54.86351	0.9678	60.37189	0.9052	76
6	69.65071	0.9603	77.93169	0.8521	92
7	85.91225	0.9422	97.86518	0.7475	108
8	105.2964	0.8869	122.4184	0.5233	124
9	114.9303	0.9404	135.0421	0.6025	140
10	127.2794	0.9554	151.8017	0.5800	156
11	141.7759	0.9554	172.2041	0.4813	172
12	160.5914	0.9270	199.7037	0.2658	188
13	168.9638	0.9650	212.4298	0.3283	204
14	176.2236	0.9865	223.9244	0.4138	220
15	185.1324	0.9938	238.6433	0.4396	236
16	191.6696	0.9982	249.9349	0.5249	252
17	206.4411	0.9979	276.6642	0.3449	268
18	215.5228	0.9991	293.9195	0.3302	284
19	230.0948	0.9990	323.0636	0.1722	300
20	240.2374	0.9995	344.4757	0.1299	316
21	246.0864	0.9999	357.5498	0.1604	332
22	255.2558	0.9999	379.3271	0.1193	348
23	263.6322	1.0000	400.5475	0.0907	364
24	268.4727	1.0000	413.6860	0.1128	380

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

Table B.2- VEC Residual Heteroskedasticity Tests: No Cross Terms

Sample: 2002Q1 2011Q2
Included observations: 38

Joint test:

Chi-sq	df	Prob.
84.85885	100	0.8604

Individual components:

Dependent	R-squared	F(10,27)	Prob.	Chi-sq(10)	Prob.
res1*res1	0.308576	1.204985	0.3312	11.72589	0.3038
res2*res2	0.330841	1.334915	0.2624	12.57196	0.2486
res3*res3	0.160442	0.515978	0.8638	6.096793	0.8071
res4*res4	0.373958	1.612813	0.1561	14.21042	0.1636
res2*res1	0.268990	0.993518	0.4726	10.22161	0.4213
res3*res1	0.134967	0.421268	0.9237	5.128748	0.8824
res3*res2	0.250169	0.900811	0.5454	9.506421	0.4848
res4*res1	0.212929	0.730440	0.6899	8.091301	0.6199
res4*res2	0.175892	0.576268	0.8187	6.683883	0.7549
res4*res3	0.124579	0.384229	0.9427	4.733984	0.9082

Table B.3- VEC Residual Normality Tests

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 2002Q1 2011Q2
Included observations: 38

Component	Skewness	Chi-sq	df	Prob.
1	-0.109239	0.075577	1	0.7834
2	-0.454781	1.309897	1	0.2524
3	-1.251529	9.920058	1	0.0016
4	0.147052	0.136954	1	0.7113
Joint		11.44249	4	0.0220

Component	Kurtosis	Chi-sq	df	Prob.
1	3.497707	0.392212	1	0.5311
2	3.590504	0.552101	1	0.4575
3	5.629099	10.94426	1	0.0009
4	2.635411	0.210465	1	0.6464
Joint		12.09903	4	0.0166

Component	Jarque-Bera	df	Prob.
1	0.467789	2	0.7914
2	1.861998	2	0.3942
3	20.86431	2	0.0000
4	0.347419	2	0.8405
Joint	23.54152	8	0.0027