THE DETERMINANTS OF FINANCIAL DEVELOPMENT IN TURKEY: A PRINCIPAL COMPONENENT ANALYSIS

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ABSTRACT

THE DETERMINANTS OF FINANCIAL DEVELOPMENT IN TURKEY: A PRINCIPAL COMPONENET ANALYSIS

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This thesis investigates the determinants of financial development in Turkey. Principle Component Analysis (PCA) is employed in order to examine the main determinants of financial sector development and shed light on the structure of the financial system in Turkey. The empirical studies on financial development suffer from the measurement problem. This study aims to remedy the measurement problem by providing proxies that explain different aspects of financial development more accurately than other proxies used in the extant literature. Hence, the present study constitutes a strong basis for studies that rely on measuring financial development in Turkey.

Keywords: Financial development, Principal Component Analysis, Turkey

ÖZ

TÜRKİYE’DE FİNANSAL GELİŞMENİN BELİRLEYİCİLERİ: TEMEL BİLEŞEN ANALİZİ

Börü, Mesrur

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Bu tez Türkiye’de finansal gelişmenin belirleyicilerini incelemektedir. Türkiye’de finansal sektör gelişmesinin temel belirleyicilerinin tespit edilebilmesi ve finansal sistemin yapısının incelenebilmesi için temel bileşen analizi kullanılmıştır. Finansal gelişme ile ilgili ampirik çalışmalar ölçüm problemi ile karşı karşıya kalmaktadır. Bu çalışma, finansal gelişmenin değişik yönlerini literatürdeki diğer çalışmalarda kullanılan yaklaşık değişkenlerden daha iyi temsil eden yaklaşık değişkenler sunarak, ölçüm problemini çözmeyi amaçlamaktadır. Sonuç olarak, bu çalışma Türkiye’de finansal gelişmenin ölçülmesiyle ilgili zaman serisi çalışmaları için sağlam bir temel oluşturmaktadır.

Anahtar Sözcükler: Finansal Gelişme, Temel Bileşen Analizi, Türkiye

To My Parents

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CHAPTER 1

INTRODUCTION & MOTIVATION OF STUDY

Financial development has been subject of many empirical studies in the literature, especially in the last decades. Researchers used various variables as proxies of different aspects of financial development in these studies. However none of these variables represent financial development accurately and comprehensively. The problem got more complicated in the recent years due to the rapid development of financial system. This measurement problem in the empirical studies related to financial development raises questions about the results of these studies. Therefore, in order to obtain reliable results from empirical studies that rely on measuring financial development, it is imperative to construct proxies that represent different aspects of financial development accurately and comprehensively.

Before further discussion, at this point, it is imperative to define financial development conceptually. In order to define financial development we should first examine the basic functions of a financial system. Levine (2004) summarizes functions of a financial system under five topics.

First of all, financial intermediaries provide information about investments and allocate capital. Individual investors face difficulties in acquiring information on projects and evaluating possible investment opportunities. These difficulties create incentives for development of financial intermediaries, since the economy avoids duplication of cost of acquiring information and evaluating possible investment opportunities. (Nieuwerburgh et al., 2005) Financial intermediaries decrease cost of acquiring information and ameliorate allocation of financial resources among possible investment opportunities. (Levine, 2004)

Another function of financial intermediaries is monitoring firms and exerting corporate governance. The extent of financial intermediaries' improvement on allocation of financial resources depends on the effectiveness of monitoring and influencing how firms use the funds. As the effectiveness of corporate governance increases, firms allocate resources more efficiently and savers become more willing to finance possible investment projects. (Levine, 2004)

Financial markets also reduce the various risks that investors face. Firstly, investors face liquidity risk when investing in long-term projects. Therefore supply of funds for long-term projects may fall in absence of financial markets. (Levine, 2004) A well developed financial market can provide the funds for long-term investments while allowing investors to withdraw their funds if need arise. Secondly, it is risky for investors to invest all their savings in a single high return project. Financial markets, by allowing investors to invest in small portions, facilitate risk diversification. (Nieuwerburgh et al., 2005)

One of the functions of financial markets is the pooling of savings from investors by overcoming transaction costs and informational asymmetries. (Levine 2004) Since individual households are incapable of providing all of the funds needed for an investment, financial systems pool savings from diverse households and provide the necessary funds for that investment. (Ang, 2008)

Lastly, financial markets, by reducing transaction costs, facilitate specialization. In a market as specialization increases, number of transactions also increase. Since each transaction brings additional costs to economic agents, efficient financial markets may increase specialization by lowering transaction costs. (Levine 1997)

As Levine (2004) states, financial development means improvement in efficiency of financial instruments, markets and intermediaries in performing these five functions. In particular, by reducing transaction costs and information asymmetries, and by effectively exerting corporate control; a developed financial system, pools savings and allocates capital efficiently, decreases risks of investment and increases specialization in the economy.

Most of the studies related to financial development in the literature discuss its relationship with economic growth. The relationship between financial development and economic growth is one of the most controversial subjects in the literature. While some economist claim that financial development leads economic growth (supply leading view), others support the view that economic growth leads financial development (demand following view). Some early economists such as Joseph Schumpeter (1912) point out the banking systems' ability to select most profitable investments among possible alternatives, and claim that banking sector development contributes to growth by providing funds for these profitable investments. Walter Bagehot (1873) and Hicks (1969) state that, financial development set up the basis for industrial revolution; and Hicks (1969) even claims that some of the products of industrial revolution may have been produced earlier if there had been a well developed financial system. On the other hand, there are other economists who view financial development as an unimportant issue, and some others, who view development of financial systems as a product of economic development. Robert Lucas (1988), who believes the role of financial development in economic growth is over-emphasized by economists, is a supporter of the first view. Joan Robinson (1952) supports the second view and claim that financial sector passively responds to the needs of real sector.

Despite the vast literature focused on finance and growth relationship, none of the studies come out with definite evidence supporting either the supply leading or demand following view. One of the reasons of this problem is the shortcomings of econometric methods. While cross-country studies overlook country specific differences, time series analyses provide results that cannot be generalized. Another important obstacle in front of econometric studies is the measurement problem. As explained above financial development has many different aspects. Using a single variable to represent degree of development in all different functions of financial system surely creates measurement problem. Moreover, it is clear that, whether it is a result or stimulant of economic growth, financial system has developed, and become much more sophisticated than it was in days of industrial revolution. Nowadays, besides banks financial system also includes stock market, bond market, financial derivative market, insurance companies and pension funds. This increase in the sophistication of financial system brings additional difficulties in selecting an appropriate proxy for financial development. Researchers remedy this problem, to an extent, by testing their findings using as many different proxies for financial development possible. However, testing results with more than one variable is far from being a remedy to the measurement problem, since, more than one variable may be used for even one dimension of financial development, and all of the variables have their own advantages and disadvantages compared to other possible variables.[1]

This thesis studies "financial development" in Turkey statistically by using a detailed data set. We extensively searched the literature and formed a set of 16 variables that represent different aspects of financial development in Turkey. By utilizing principal component analysis we reduced this large set of variables to a smaller set of variables that explain different aspects of financial development. Therefore we have been able to examine the structure of financial system of Turkey in depth. Moreover we obtained linear combinations of variables which may be used to construct indices that represent different dimensions of financial development better than any single variable.

The remainder of this thesis is as follows. Chapter 2 presents a review of the literature on finance and growth. Chapter 3 presents a brief description of Principal Component Analysis. Chapter 4 discusses the variables in the data set by statistical and conceptual means. Chapter 5 presents the results of empirical analysis. Chapter 6 concludes. An additional empirical analysis of determinants of financial development in Turkey for the period between 1990Q2 and 2007Q4, in which a variable representing the overall liquidity of the financial sector is included to the data set, is also presented in the Appendix.

[1] For example four different variables may be used to represent stock market liquidity.

CHAPTER 2

FINANCE & GROWTH NEXUS: A REVIEW OF THE LITERATURE

There has been a considerable development in the literature on the relationship between financial development and economic growth in last decades. Despite the earlier studies in the literature, which mostly focused on banking sector development, recent studies take other dimensions of financial development, such as stock markets and bond markets, into account. Also, in order to overcome problems associated with proxy variables representing financial development; researchers increased the variety of proxies they use, compared to the historical works on this issue.

A brief summary of some notable studies in the recent literature is exhibited in Table 2.1. Researchers utilized cross country and panel data techniques as well as time series analyses when investigating finance and growth nexus. Time series analyses are country specific and therefore their results cannot be generalized. On the other hand, although cross-country studies give a more general picture of finance and growth relationship, they are subject to much criticism. One of these criticisms is the existence of measurement problems in cross-country growth regressions due to inconsistent definition, collection and measurement of variables among countries examined. Moreover some structural shifts in countries, due to policy changes or business cycles, may be overlooked when the data is averaged over long periods. Also cross-country regressions do not provide evidence for causality issues. As a result, besides cross-country studies, country-specific time series analyses are needed to investigate the finance growth relationship in depth. On the other hand, results of any time series study contracting the results of cross-country studies should be viewed with caution. (Levine and Zervos, 1996)

This chapter reviews the literature in the following three subsections. First subsection presents cross-country and panel data studies. In the second subsection

Table 2.1: Literature Review

AUTHOR	TITLE	PROXIES OF FINANCIAL DEVELOPMENT	CONCLUSION
Robert G. King & Ross Levine	Finance & Growth: Schumpeter Might Be Right	**Financial development:** Liquid liabilities of financial system/ GDP, Deposit money bank assets/ Deposit money bank assets+ Central bank assets, Claims on non-financial private sector/ Total domestic credit ,Claims on non-financial private sector/ GDP	Financial development leads to economic growth by increasing rate and efficiency of capital accumulation.
Ross Levine & Sarah Zervos	Stock Market Development & Economic Growth	**Stock Market Size:** Market Capitalization /GDP **Stock Market Liquidity:** Turnover Ratio, V. Traded Ratio **Financial Depth:** Liquid liabilities of Financial system /GDP	Economic growth is positively linked with stock market development.
Ross Levine & Sarah Zervos	Stock Markets, Banks & Economic Growth	**Stock Market Size:** Market Capitalization/ GDP **Stock Market Liquidity:** Turnover Ratio, V. Traded Ratio **Stock Market Volatility:** Estimate based on 12 month rolling standard deviation of market returns **Banking Sector Development:** Loans made by commercial banks and other deposit banks to private sector/ GDP	Stock market liquidity and banking sector development significantly and positively affect economic growth. Stock markets and banking sector offer different financial services to real sector.
Felix Rioja & Nedev Valev	Finance and Sources of Economic Growth at Various Stages of Economic Development	**Financial Development:** Credit issued to private sector /GDP, Commercial Bank assets / Commercial bank + Central bank assets, Liquid liabilities of Financial system /GDP	While in low-income countries Finance influences economic growth via capital accumulation, in middle & high income countries, finance influences economic growth via productivity increase.
Chung-Hua Shen Chien-Chiang Lee	Same Financial Development yet Different Economic Growth—Why?	**Banking Sector Development:** Claims on private sector by banks/ GDP, Liquid liabilities of financial intermediaries/ GDP, Spread of borrowing and lending rates **Stock Market Development:** Market Capitalization /GDP, Value traded ratio	While s. market dev. has a positive effect on growth, banking dev. has negative effect or no effect at all. In high income countries or financially liberalized countries bank dev. has positive effect on growth. In middle income countries or in presence of banking crisis negative effect of bank dev. is strengthened. Inverse U shaped relationship between FD and EG.
Michael Graff	Financial Development and Economic Growth A new emprical analysis	**Financial Development:** Index formed by applying PCA to a set of variables including; share of manpower employed in the financial system, share of financial system in GDP, number of banks and branches per capita	Financial development effects economic growth, especially in less developed countries. There exists unidirectional causality between financial dev. & real development.

Table 2.1 continued

AUTHOR	TITLE	PROXIES OF FINANCIAL DEVELOPMENT	CONCLUSION
Raghuram Rajan & Luigi Zingales	Financial Dependence & Growth	**Financial development:** Domestic Credit / GDP, Domestic Credit + S. Market Capitalization / GDP, Accounting Standards	Finance influences economic growth positively by reducing cost of external finance for firms.
Stjin Van Nieuwerburgh& Frans Buelens&Ludo Cuyvers	Stock Market Development & Economic Growth in Belgium	**Stock Market Development:** Total Market Capitalization, Total number of Listed Shares, Total number of Firms Listed, Stock Market Concentration **Banking Sector Development:** Savings in commercial banks+ Deposits in commercial banks in per-capita terms	Financial development has significant and positive effect on economic growth. Banks fostered the growth of stock market pre-1873
Pontus Honsson&Lars Jonung	Finance and economic growth: the case of Sweden	**Financial development:** Total lending from the financial sector to the non-bank public, + lending from rural credit banks and insurance companies from world war 2, + public pension funds in 1959+ credits granted by finance corporations and investment companies starting 1968 & 1975	There is no stable relation between financial development and growth throughout the sample period, however, a positive and significant relationship exist in the early stages of period.
Peter L. Rousseau&Sheng Xiao	Banks, stock markets, and China's "great leap forward"	**Bank Development:** All claims on government and the private sector held by China's banks **Stock Market Development:** Market Capitalization, Total value traded, Total number of listed securities	While banking sector development has positive and significant effect on economic growth, stock market development does not have a significant effect on economic growth in China.
James B. Ang & Warwick J. Mckibbin	Financial liberalization, financial sector development and growth: Evidence from Malaysia	**Financial Development:** Index formed by applying PCA to a set of variables including; log of liquid liabilities (or M3) to nominal GDP, log of commercial bank assets to commercial bank + central bank assets, log of domestic credit to private sector /nominal GDP	Output growth cause financial development in the long-run.
Shandre M. Thangavelu & Ang B. J, James	Financial development and economic growth in Australia	**Financial Development:** Bank claims on private sector/ nominal GDP, Domestic bank deposit liabilities/ nominal GDP, Equities turnover / nominal GDP	While economic growth causes financial development, stock market development causes economic growth.
Philip Arestis & Panicos Demetriades	Financial development and growth: Assessing the evidence	**Stock Market Development:** Market Capitalization/GDP **Stock Market Volatility:** 16-quarter moving standard deviation of the end-of-quarter change of stock market prices **Banking Sector Development:** M2 / nominal GDP (Germany), domestic bank credit / nominal GDP (USA)	In US econ. Growth effects banking sector dev. & capital market dev. significantly & positively. In Germany, while, banking sector development causes output growth; stock market volatility has negative effect on output growth.

Table 2.1 (continued)

AUTHOR	TITLE	PROXIES OF FINANCIAL DEVELOPMENT	CONCLUSION
Peter L. Rousseau&Paul Watchel	Financial intermediation and economic performance: Historical evidence from five industrialized countries	**Intensity of Financial Intermediation:** Commercial Bank assets +saving institution assets+ insurance companies' assets+ credit companies' assets+ pension funds' assets+ investment companies' assets; diff. between stock of money & monetary base	While financial intermediation granger causes output, there also exists little evidence that supports a feedback from output to intensity of intermediation.
Kul B. Luintel & Mosahid Khan	A quantitative reassessment of the finance–growth nexus evidence from a multivariateVAR	**Financial Depth:** Total deposit liabilities of deposit banks/ one period lagged nominal GDP	Bi-directional causality exists in all 10 countries examined. In long run, levels of per-capita income & real interest rate positively & significantly effects financial depth.
Teame Ghirmay	Financial Development and Economic Growth in Sub-Saharan African Countries	**Financial Development:** Credit issued to private sector	In 8 of the 13 countries in the sample, financial development causes economic growth. In 6 of these countries there exists bi-directional relation.
Konstantinos Kassimatis&Spyros.I. Spyrous	Stock and credit market expansion and economic development in emerging markets	**Banking Sector Development:** Log of credit of private & public banks to private sector, Log of M2 **Stock Market Development:** Log of Market Capitalization **Stock Market Volatility:** 12-month rolling standard deviation of the first difference of the logarithmic levels of the IFC price indices	There exist negative relationship between banking sector dev. & econ. Growth in Chile & Mexico due to banking crises. In Taiwan stock market has negative effect on econ. growth. due to high volatility. Although financial liberalization is necessary for utilizing stock market development, a low-level of protection is beneficial in the early stages of development.
Peter L. Rousseau & Paul Watchel	Inflation, Financial Development and Growth	**Financial Development:** M3/ GDP, (M3-M1) / GDP, Total Credit/ GDP	The positive relationship between financial depth and growth is weaker in presence of high inflation.
Ali F. Darrat	Are Financial Development & Economic Growth Causally Related: another Look at the Evidence	**Financial Depth:** Currency / M1 M2/ GDP	Effect of financial markets on econ. growth is observed only in the long run in Turkey and Saudi Arabia. In UAE, while, increase in the size of financial sector causes econ. growth in short-run; in long-run econ. growth causes increase in financial sophistication.
Engin Küçükkaya & Uğur Soytaş	Economic Growth and Financial Development in Turkey: New Evidence	**Financial Development:** Index formed by applying PCA to a set of variables including; M2/NGDP; Domestic Credit/NGDP; Private bank assets/Private bank assets +Central bank assets; Deposit bank claims on private sector/ Domestic credit; Stock market capitalization/NGDP; Average trading value in bonds and bills market/ NGDP	No link between financial development and growth in Turkey

pure time series studies are presented. Lastly, the third subsection reviews the most notable works investigating the finance and growth nexus in Turkey.

2.1 Cross-Country and Panel Data Studies

One of the pioneering studies in the literature on finance and growth nexus is the work of King and Levine (1993). In their cross country study, they investigated the relationship between finance and growth using a data set that consists of data on 80 countries for the period between 1960 and 1989. They used; ratio of liquid liabilities of financial system to GDP, ratio of deposit money bank assets to deposit money bank assets plus central bank assets, ratio of claims on non-financial private sector to total domestic credit and ratio of claims on non-financial private sector to GDP as indicators of financial development. Besides investigating the relationship between finance and growth, King and Levine (1993) also attempted to reveal the linkages between financial markets and sources of growth. In order to achieve this, they used four different proxies representing different sources of growth. These for proxies are; per capita GDP, rate of physical capital accumulation, the ratio of domestic investment to GDP and a residual measure of improvements in the efficiency of physical capital allocation. They also included logarithm of initial income, logarithm of initial secondary school enrollment rate, ratio of exports plus imports to GDP, ratio of government spending to GDP and average inflation rate to cross country regressions as control variables. The results show that financial development positively and significantly affects economic growth regardless of the proxies used for representing financial development and economic growth. They also claim that financial development leads economic growth by increasing rate and efficiency of capital accumulation.

Levine and Zervos (1996) made an important contribution to the literature by examining the relationship between stock market development and economic growth in depth. They used ratio of stock market development to GDP as an indicator of stock market size. Turnover ratio and value traded ratio are used as indicators of stock market liquidity. They also constructed an index to measure the degree of stock market's international integration. The results show that there exists a positive and significant relationship between financial development and economic growth, even after controlling for political stability, investment in human income and macroeconomic conditions.

Levine and Zervos (1998) built on their previous study on stock market development and growth by including banking sector development to their study. In "Stock Markets, Banks and Economic Growth" they investigated the relationship between economic growth and two most important parts of the financial system; stock market and banking sector. They used a sample of 49 countries covering the period of 1976-1993. In addition to the variables they used to define stock market development in their previous study, they included an estimate based on 12 month rolling standard deviation of market returns as an indicator of stock market volatility. To define banking sector development they used loans made by commercial banks and other deposit banks to private sector divided by GDP. The results show that both stock market liquidity and banking sector development have significant and positive relationship with economic growth. They also claim that, since both stock market liquidity and banking sector development enter the regressions significantly, these two parts of financial system offer different services to the real sector.

Another distinguished study in the literature is the study of Rioja and Valev (2004), in which they investigated the relationship between finance and growth by taking the countries' levels of development into account. They used GMM dynamic panel techniques on a sample of 74 countries which they separated into 3 groups depending on the income levels of countries. Ratio of credit issued to private sector to GDP, ratio of commercial bank assets to commercial bank assets plus central bank assets and ratio of liquid liabilities of financial system to GDP are used as proxies for financial development. They used rate of growth of real per capita physical capital stock and a residual measure of productivity growth as dependent variables. The results show that, while in low-income countries finance influences economic growth via capital accumulation, in middle & high income countries, finance influences economic growth via productivity increase.

Another study examining the relationship between finance and growth by considering the differences between countries' level of development is the study of

Shen and Lee (2006). They used claims on private sector by banks divided by GDP, liquid liabilities of financial intermediaries divided by GDP and spread of borrowing and lending rates, in order to measure financial development. Stock market capitalization divided by GDP and value traded ratio is used as proxies of stock market development. The results of initial model show that while stock market development has a positive and significant effect on economic growth, banking sector development has no effect or negative effect on economic growth. However in high income countries or financially liberalized countries banking sector development has a positive effect on economic growth. On the other hand, negative effect of banking sector development is worsened in middle income countries or in presence of banking and currency crises. Most interestingly, when squares of bank development proxies are used in regressions, relationship between bank development and growth shows an inverse U shape. This relationship is strengthened when the squares of bank development proxies are used with squares of stock market development proxies. Therefore, Shen and Lee (2006) claim that there may be a non-linear, inverse U shaped relationship between financial development and growth.

The study of Graff (2003) departs from other studies examining finance growth nexus by the variable selected as proxy for financial development. Graff (2003) applies Principal Component Analysis to a set of variables that consists of share of manpower employed in the financial system, share of financial system in GDP and number of banks and branches per capita in order to construct an index which he names as share of resources a country devotes to run its financial system. In his study Graff (2003) claims that although traditional measures of financial depth are useful, the index he constructed captures the intensity of financial services better. He utilizes cross country regressions and also estimates two path models in order to examine the causality between finance and growth. He shows that there is a significant relationship between finance and growth especially in less developed countries. Moreover, results show that financial development leads economic growth, not the other way around.

Rajan and Zingales (1998) examined the finance growth nexus on firm level. They tested if financial development contributes to growth by decreasing cost of external financing. Ratio of domestic credit to GDP, ratio of sum of domestic credit and stock market capitalization to GDP and accounting standards are used as proxies of financial development. They measured a firm's dependence on external finance as the difference between capital expenditures and cash flow from operations; and its dependence on external equity finance as ratio of net amount of equity issues to capital expenditures. Assuming that the need for external finance depends on the structure of the industry, they used external dependence measures of U.S industries as proxies of the external finance dependence of other countries. Their results support the view that financial development contributes to the economic growth by reducing the cost of external finance for firms. Rajan and Zingales (1998) also add that financial development aids the emergence of new firms in the industry. Lastly, they claim that a developed financial system is a comparative advantage for a country, whose industries depend heavily on external finance.

2.2 Time Series Studies

As mentioned above cross country and panel studies overlook the differences across countries. Therefore, besides cross country and panel data studies, researchers also examined finance and growth nexus by utilizing time series analyses, in an attempt to reveal country specific relationships between finance and growth.

Nieuwerburgh et al. (2005) examine the relationship between financial development and economic growth in Belgium. They use a fairly large sample, covering the period 1873-1935. Nieuwerburgh et al. (2005) used total market capitalization, total number of listed shares, total number of firms listed and stock market concentration as proxies of different aspects of stock market development. They also included a measure of banking sector development; savings in commercial banks plus deposits in commercial banks in per-capita terms. For pre-1873 period they also used bank note in circulation in order to define banking sector development. The results show that there is a positive and significant relationship between financial development and economic growth. Nieuwerburgh et al. (2005) also show that; stock market development has a larger impact on economic growth, compared to banking sector development. Lastly, they state that banking sector, by its role in financing entrepreneurial activities and aiding initial development of stock market, is the main driver of economic growth in pre-1873.

Another country specific study is the study of Hansson and Jonung (1997) in which they investigated the finance and growth relationship in Sweden for period between 1834 and 1991. They used sum of total lending from financial sector to non-bank public, lending from rural credit banks and insurance companies from World War 2, public pension funds in 1959 and credits granted by finance corporations and investment companies starting 1968 & 1975; as a proxy for financial development. They also included education level of workforce and flow of innovations to the regressions, in an attempt to isolate their effects from the results. The results point out a positive and significant effect of financial development on economic growth in the early stages of Sweden's economic development.

Rousseau and Xiao (2007) examined the effect of financial development on the recent economic development of China. They used all claims on government and the private sector held by China's banks as a proxy for banking sector development. In order to capture different aspects of stock market development they used three variables; total stock market capitalization, total market value of shares traded and total number of shares listed. The value of GDP and fixed investment are used as proxies of economic growth. The results for the period 1995-2005 show that, while banking sector development significantly contributes to the recent growth of China, the contribution of stock market development is not significant. However, they add that the effect of recent development of stock market in China may yet to be seen. Furthermore, we should also point out that, the sample size covering ten years is not adequate to examine the relationship between variables properly.

Ang and McKibbin (2007), in their study which they also utilized principal component analysis, examine the finance and growth nexus in Malaysia. In order to obtain a more reliable measure of financial development they applied principal component analysis to a set of variables that consists of logarithm of liquid liabilities (or M3) divided by nominal GDP, logarithm of commercial bank assets divided by commercial bank assets plus central bank assets and logarithm of domestic credit to private sector divided by nominal GDP. We should note that although number of variables is small for a proper analysis of financial structure of Malaysia, principal component analysis is helpful to construct an index representing financial development in Malaysia. They constructed an index of financial development based on the factor scores calculated in the analysis. Logarithm of per capita GDP is used as a measure of economic growth and logarithmic ratio of gross domestic savings to nominal GDP, logarithmic ratio of gross investment to nominal GDP, real interest rate, logarithmic ratio of exports and imports to nominal GDP are used as control variables. Their results show a unidirectional causality that runs from economic growth to financial development. Ang and McKibbin (2007) claim that, the direction of this causality may depend on real sector's extensive usage of foreign funds instead of domestic sources and domestic banking sectors' unproductive investments in real estate business before 1998 economic crisis.

Thangavelu and Ang Beng Jiunn (2004) investigated the relationship between finance and growth in Australia. In order to measure financial development they used bank claims on private sector divided by nominal GDP, domestic bank deposit liabilities divided by nominal GDP and equities turnover divided by nominal GDP. GDP per capita is used to measure economic growth. Reserve bank discount rate and money market rate are used as control variables in regressions. The results suggest that, although causality runs from economic growth to banking sector development, the direction of causality is reversed in case of stock market development.

Arestis and Demetriades (1997) investigated the relationship between stock market development, banking sector development and economic growth for United States and Germany. They measured the stock market development by stock market capitalization and stock market volatility by 16-quarter moving standard deviation of the end-of-quarter change of stock market prices. While ratio of M2 to GDP is used for banking sector development in Germany, ratio of domestic bank credit to GDP is used for banking sector development in US. They used GDP per capita in order to measure economic growth. The results show that causality runs from growth to financial development in U.S. On the other hand evidence for Germany shows that financial development, in particular baking sector development causes economic growth. In Germany stock market development contributes to growth by aiding development of the banking sector. Furthermore stock market volatility has a negative effect on economic growth in Germany.

Rousseau and Watchel (1998) examined finance and growth relationship in five industrialized countries for the period between 1870 and 1929. The countries they examined are; United States, United Kingdom, Canada, Norway and Sweden. Their study is beneficial for assessing the effect of financial development in the early stages of these countries' economic development. In order to measure the intensity of financial intermediation in U.S, U.K and Canada; Rousseau and Watchel (1998) used sum of commercial Bank assets, saving institution assets, insurance companies' assets, credit companies' assets, pension funds' assets and investment companies' assets. They also used the difference between stock of money and monetary base as another measure of financial intermediation in these countries. For Norway and Sweden, they used deposits of commercial banks and sum of deposits of commercial banks and saving banks. The results show that financial development positively contributed growth during the industrialization period of these five countries. However there is also little evidence for a feedback from economic growth to financial development.

Luintel and Khan (1999) investigated the effects of financial depth on economic growth in a sample of ten countries. Their study is distinguished from other time series studies in the literature by the large sample of countries they examined. They used total deposit liabilities of deposit banks divided by one period lagged nominal GDP as a measure of financial development. The other variables they use in the regressions are; GDP per capita, real interest rate and logarithm of real per capita capital stock. The results show that a bi-directional causality exists between financial development and economic growth. Luintel and Khan (1999) also show that, in the long run, levels of per-capita income and real interest rate positively and significantly affects financial depth. Moreover, they show that, output shows diminishing returns to capital stock and productivity effect of real interest rate.

Another study examining finance growth nexus in a large sample of countries is the study of Ghirmay (2005). Ghirmay (2005) used a sample of 13 sub-saharan African countries. Since the most important and developed part of financial system in African countries is banking sector, credit issued to private sector is used as a measure of financial development. Ghirmay (2005) used growth of real GDP to measure economic growth. The results show that, in 8 of the 13 countries examined, financial development causes economic growth. Also, in 6 of these 8 countries, there exists a feedback from economic growth to financial development.

Kassimatis and Spyrous (2001) examined the relationship between stock market development, banking sector development and economic growth in five emerging markets. The emerging markets they chose to examine are; Chile, Mexico, South Korea, India and Thailand. Logarithm of credit of private and public banks to private sector, and logarithm of M2 are used as proxies of banking sector development. They used logarithm of stock market capitalization as a measure of financial development and 12-month rolling standard deviation of the first difference of the logarithmic levels of the IFC price indices as a measure of stock market volatility. The results of the study vary depending on the country examined. An interesting result is the negative relationship between banking sector development and economic growth in Mexico and Chile. Kassimatis and Spyrous (2001) claim that this may be due to the banking sector crises in these countries. Also while in India stock market has no significant effect on economic growth, it has a negative effect on economic growth in Thailand. Kassimatis and Spyrous (2001) state that, the insignificant effect of stock market in India may be due to financial repression in this country. They also state that the negative relationship observed in Thailand is due to high volatility in the stock market. Finally they conclude that although financial liberalization is necessary for utilizing stock market development, a low-level of protection is beneficial in the early stages of development.

Rousseau and Watchel (2000) investigated the effect of inflation on the relationship between financial development and economic growth. They used M3 divided by GDP, (M3-M1) divided by GDP and total credit divided by GDP as proxies of financial development. Economic growth is measured by average rate of real per capita GDP growth over 5 years period and inflation is measured as average annual inflation rate over 5 years period. Their results suggest that inflation does not affect the relationship between finance and growth. However the effect of financial development on economic growth is weaker in presence of high inflation.

The last study we will mention in this subsection is the study of Darrat (1999) in which he examined the finance and growth relationship in Saudi Arabia, United Arab Emirates and Turkey. He used ratio of currency to M1 and ratio of M2 to GDP to measure financial development. Economic growth is measured by growth rate of real GDP for Saudi Arabia and U.A.E; and by growth rate of real GNP for Turkey. The results show that effect of financial markets on economic growth is observed only in the long run in Turkey and Saudi Arabia. Darrat (1999) also claims that, in UAE, while increase in the size of financial sector causes economic growth in short-run; in long-run economic growth causes increase in financial sophistication.

2.3 Finance & Growth Relationship in Turkey

In this subsection we will review some of the most notable studies about financial development and economic growth relationship in Turkey. These studies differ in methods used, sample periods covered and proxies selected to define financial development. As a result, their results are different and are not comparable.

The most notable study on finance and growth nexus in Turkey is the study of Soytaş and Küçükkaya (2008). The authors examined the finance and growth relationship in a time-series sample covering period between 1991 and 2005. Soytaş and Küçükkaya (2008) pointed out the proxy variable problem in the finance and growth literature and tried to come up with a solution by forming an index of financial development. They chose six variables representing different aspects of financial development and applied principal component analysis to this set of variables. The variables they chose are; ratio of M2 to NGDP, ratio of domestic credit to nominal GDP, ratio of private bank assets to sum of private bank assets and central bank assets, ratio of deposit bank claims on private sector to domestic credit, ratio of stock market capitalization to nominal GDP and ratio of average trading value in bonds and bills market to nominal GDP. According to the results of principal component analysis they extracted the first three principal components which accounted for 93.74% of total variance and calculated the corresponding factor scores. The financial development index is constructed based on these scores. Since the variables have different orders of integration, they utilized Toda-Yamamato procedure, and therefore they could only test long-run Granger causality between financial development and economic growth. The results; in which they controlled for the effects of fiscal policies, monetary policies and inflation, do not show any long-run causality between financial development and economic growth in Turkey. Soytaş and Küçükkaya (2008) mention that this non-existence of causality may be due to the lack of a developed real sector in Turkey; and thus their results support Okuda (1990) who states that in order for a financial system to be effective, it should be accompanied with a developed real sector.

Doğan (2008) also investigated the relationship between financial development and growth in Turkey. Doğan (2008) used a rather small sample covering the period between 1999 and 2006. Ratio of claims on private sector by commercial banks to real GDP is used as a proxy of banking sector development and stock market capitalization to GDP is used as a proxy of stock market development. In order to measure economic growth, real GDP is used. Doğan (2008) utilized Johansen & Juselius cointegration test and vector error correction model to assess the relationship between financial development and economic growth in Turkey. The results show existence of bivariate causality between stock market development and economic growth in short-run, and existence of univariate causality that runs from economic growth to banking sector development in the long-run. Also evidence shows that, stock market development has a negative effect on economic growth and its impact on growth is much weaker than the impact of banking sector development. Doğan (2008) links negative impact of stock markets to the speculative nature of İstanbul Stock Exchange and effects of financial crises on İstanbul Stock Exchange. Overall, results support the demand following theory in case of Turkey.

Ünalmış (2002) examined finance growth nexus in Turkey for the period between 1970 and 2000. Logarithms of ratio of domestic credit to GNP, ratio of private credit to GNP, ratio of private credit to domestic credit, ratio of M2 to GNP and ratio of total deposits to GNP are used as proxies of financial development. Economic development is measured as change in per capita GNP at constant prices. The results, for four out of the five financial development proxies, show that in short-run financial development causes economic growth in Turkey but in long-run there is also feedback from economic growth to financial development.

CHAPTER 3

METHODOLOGY

This chapter presents a brief description of principal component analysis (PCA). PCA is a multivariate statistical technique which linearly transforms large group of variables to a smaller group of variables that contain large portion of the information contained in the original group of variables. (Dunteman, 1989) In contrast to the common factor analysis, which considers only common variance between variables, PCA considers the total variance and defines factors which represent small proportions of unique variance and error variance. It is convenient to use principal component analysis when the main purpose is deriving minimum number of factors which contain maximum amount of total variance contained in the original group of variables and when it is known a priori that specific or error variance is a small portion of total variance. (Hair et al., 2006) Since our purpose is to define financial development by reducing the number of correlated variables, used for defining financial development, we decided to employ PCA.

3.1 Assumptions of Principal Component Analysis

There are both conceptual and statistical assumptions underlying principal component analysis. First of all, it should be noted that, principal component analysis only considers the correlation between variables to determine patterns in data, and existence of correlated variables is not sufficient to guarantee relevance among factors. (Hair et al., 2006) Therefore care should be taken to select variables which are theoretically related. Statistically, violations of normality, homoscedasticity and linearity are important only if they diminish the observed correlations among variables. Furthermore normality of variables is not necessary unless significance tests for factors are used. Besides these statistical bases, it is necessary for data matrix to have enough correlations to continue analyzing the data. Barlett's test of sphericity is used for testing the existence of correlations between variables. Another measure of intercorrelations among variables is measure of sampling adequacy. Kaiser-Meyer-Olkin measure of sampling adequacy is used for measuring intercorrelations between variables. (Hair et al., 2006)

Besides the normality, homoscedasticity and linearity; one should examine the data to designate outliers. It is important that the researcher examine the data to detect outliers and assess their impact on the analysis. Then researcher must assess if the outlying value should be excluded as a result of its undue affect on the results or should be retained. Outliers can be detected by means of univariate, bivariate and multivariate perspectives depending on the number of variables included in analysis. In univariate detection method, generally, data values are transformed to standard scores and values falling out of the determined range of values are examined. Also variables can be examined pairwise by utilizing scatterplots. However bivariate method may be cumbersome; since as the number of variables increase, number of scatter plots to be examined increases. Also, since in multivariate analysis more than two variables are concerned, researcher needs to examine multidimensional position of each variable with respect to some common point. Mahalanobis D^2 is used as a measure of multidimensional position of a variable. (Hair et al., 2006)

Lastly, when working with a time series data, variables in the data set should be stationary. A time series data is stationary if statistical properties it possesses such as mean and correlation coefficients are stable over time. If time series data is non-stationary, correlation coefficients change overtime. It is suggested to test stationarity of any time series data before applying any data analysis that utilize correlations of variables and subsequently difference the data set if it is non-stationary. (K.Yang and C. Shahabi, 2005)

3.2 Principal Component Analysis

Principal component analysis, basically, defines linear combinations of variables (factors) which constitute most of the variance contained in the data with respect to other linear combinations, according to a criterion chosen by researcher. The first factor extracted, is the best linear combination of variables defined in the data set and the second factor is the second best linear combination of variables which is orthogonal to the first factor. Determining the number of factors to extract is a complex issue. Extracting too few factors may cause important dimensions of the information contained in the original set of variables to be omitted, and extracting too many factors may make interpretation of the results overwhelming. (Hair et al., 2006) There are several factor selection criteria. In the latent root criterion; factors that constitute a larger portion of total variance, compared to a single variable, are extracted. The portion of total variance a factor constitutes is measured by its eigenvalue. Initially all variables have eigenvalues of 1, meaning that they constitute equal portions of total variance. Therefore a researcher applying the latent root criterion chooses to extract factors with eigenvalues over 1. Researchers may also decide how many factors to extract; by determining a threshold level for percentage of total variance to be explained, by examining the common variance a factor constitutes or by simply setting a priori criterion for number factors to be extracted. (Hair et al., 2006) Throughout this study we follow the latent root criterion and extract factors with eigenvalues over 1.

After deciding on a factor selection criteria; component matrix, which shows the loadings of each variable to the extracted factors, is estimated. Factor loadings are the correlations between variables and factors. They measure the degree of correspondence between a variable and a factor. Therefore, variables with high loadings are considered as representatives of the corresponding factor. Researchers may choose different threshold levels for a factor to be considered as significant. Generally, 0.5 is recognized as a minimum practical level for a loading to be considered as significant. Researchers may also follow guidelines based on sample size in order to assess the significance of factor loadings. (Hair et al., 2006) Throughout this study we set 0.65 as a threshold level for significance of factor loadings. 0.65, which is a rather conservative minimum level, is appropriate for sample sizes between 70 and 85. It is calculated based on a significance level of 0.05 and a power level of 80 percent. (Hair et al., 2006) However in some situations, in order to obtain a component matrix that inclusively explains financial development, we also accepted loadings above 0.5 as significant.

After examining factor loadings, researchers may assess a variable's overall contribution to the analysis by examining its communality. Communality of a variable is the amount of total variance this variable shares with other variables in the analysis. Communalities are useful for identifying which variables are adequately accounted for by the factor solution. (Hair et al., 2006)

In a clear factor solution, each variable is expected to load significantly to only one factor. However, generally, initial component matrix does not give a clear solution. Therefore researchers utilize factor rotation methods in order to obtain a more interpretable component matrix. As the name indicates, rotation methods rotate the reference axes of factors around origin in order to obtain another position which provides a more interpretable factor solution. Two types of rotation methods are available, namely, orthogonal rotation methods and oblique rotation methods. While in orthogonal rotation methods, factors are assumed to be uncorrelated, oblique rotation methods are not constrained by this assumption. Rotation methods do not change the percentage of total variance explained by extracted factors or the communalities of variables. However they do change the distribution of total variance explained, among factors extracted, and they make the interpretation of the component matrix easier. (Hair et al., 2006) Throughout this study we generally employed orthogonal factor rotation method VARIMAX; and in some situations other orthogonal rotation methods QUARTIMAX and EQUAMAX in order to obtain interpretable results. In some rare situations we also utilized oblique rotation method OBLIMIN.

CHAPTER 4

DATA DESCRIPTION & ANALYSIS

In this chapter we analyze the variables in our data set both in statistical and conceptual frameworks. Our dataset consists of 15 variables selected as proxies for financial development in the literature. Table 4.1 exhibits the variables in the data set. Due to data availability problem for Turkey we covered a rather short period ranging from 1988Q2 to 2007Q4. [1] In order to include a measure of overall liquidity of financial system, an important dimension of financial development, we made a second analysis covering a shorter time period ranging from 1990Q2 to 2007Q4. We chose to work with quarterly data in order to capture the frequent changes in the financial variables, which may go unnoticed if annual data is used. Moreover, using annual data may decrease degrees of freedom since the sample period covered is short due data availability problem. (Soytaş and Küçükkaya, 2008)

4.1 An Overview of Indicators of Financial Development

4.1.1 Indicators of Banking Sector Development

4.1.1.1 Ratio of Domestic Credit to Nominal GDP (DOMCRE)

Variables related to the credit issued by banking sector in the financial system are widely used in the literature as proxies for financial development and in particular banking sector development. In an economy there are two suppliers of financial sources; namely, stock market and banking sector. Assuming, for most of the firms, amount of funds that can be raised from abroad is limited; credit issued by domestic banks is a large part of financial sources available for firms. In the case of Turkey, banking sector is much older and much more developed compared to the stock market, and therefore financial system is bank-based. Hence, credit supplied by domestic banks is the most important financial source of firms in the economy.

[1] The data sources we utilized are Central Bank of Republic of Turkey, İstanbul Stock Exchange, IMF International Financial Statistics and Datastream.

Table 4.1: Variables in the data set

Name	Measurement	Period Covered
DBCPStoGDP	Deposit bank claims on private sector/ Nominal GDP	1988Q2-2007Q4
DOMCRE	Domestic Credit/ Nominal GDP	1988Q2-2007Q4
TOTDEP	Bank Deposits/ Nominal GDP	1988Q2-2007Q4
M2	M2/ GDP	1988Q2-2007Q4
M3	M3/ GDP	1988Q2-2007Q4
M2toM1	M2/M1	1988Q2-2007Q4
MCAP	Total Stock Market Capitalization/ Nominal GDP	1988Q2-2007Q4
TURNOVER	Total Traded Value in Stock Market/ Total Stock Market Capitalization	1988Q2-2007Q4
VTRADED	Total Traded Value in Stock Market/ Nominal GDP	1988Q2-2007Q4
VOLATILITY	Eight Quarter Moving Standard Deviation of Stock Market Returns	1988Q2-2007Q4
T.OVERtoVOL	Turnover Ratio/ Eight Quarter Moving Standard Deviation of Stock Market Returns	1988Q2-2007Q4
V.TRAtoVOL	Value Traded Ratio/ Eight Quarter Moving Standard Deviation of Stock Market Returns	1988Q2-2007Q4
CONCENTRATION3	Market Capitilization of Largest Three Firm/ Total Stock Market Capitalization	1988Q2-2007Q4
IRATE	Volatility of Nominal 3 Month Deposit Rate-Volatility of Real 3 Month Deposit Rate	1988Q2-2007Q4
DMA	Deposit Money Bank Assets/ Nominal GDP	1988Q2-2007Q4
F.LIQ	Magnitude of Gross Capital Flows/ Nominal GDP	1990Q2-2007Q4

Total domestic credit divided by nominal GDP is used as a proxy for banking development by most of the researchers in the literature. Küçükkaya and Soytaş (2008) included ratio of domestic credit to nominal GDP into the index of financial development, which they constructed by utilizing PCA, in their study on causality between financial development and economic growth in Turkey. In their time series study focused on China, Rousseau and Xiao (2007) used "all claims on government and the private sector held by China's banks" as an indicator of China's banking sector development. Arestis and Demetriades (1997) also used this variable as a proxy of banking sector development in US. A shortcoming of this variable is that, it includes both credit supplied to private sector and credit supplied to the government sector. Assuming that the contribution of private sector to economic growth is much more than the contribution of the public sector; the variable may contain misleading information about financial development if most of the credit is issued to the public sector. On the other hand a large banking system reduces its costs by developing expertise and information networks and therefore can screen both public and quasi-public borrowers better. (Rousseau and Xiao, 2007) For the case of Turkey, considering the participation of government to the real sector before the acceleration of privatization efforts in 90's; while measuring banking sector development, taking credit issued to public sector into account is convenient. Moreover, since we will utilize PCA, it is important to include as many variables as possible that represent different aspects of financial development.

4.1.1.2 Ratio of Deposit Bank Claims on Private Sector to Nominal GDP (DBCPStoGDP)

Beside the variables that consider domestic credit issued to private and public sector as whole, variables that exclude credit issued to public sector are also widely used in the literature. One of these studies is the work of Rioja and Valev (2004) in which they investigate the effect of financial development on economic growth by taking differences of countries' levels of development into account. Kassimatis and Spyrous (2001) also used "credit of private and public banks to private sector" as a proxy for banking development. Ang and Mckibbin (2007) included "credit to private sector divided by nominal GDP" to the index, formed by utilizing principal component analysis, which they used as an indicator of financial development**.** Levine and Zervos (1998), used “loans made by commercial banks and other deposit banks to private sector divided by GDP” as a proxy for banking sector development. They claim that this measure is better than traditional financial depth measures of banking sector development since it excludes credits issued by central bank and other intermediaries and focuses only on credit issued to private sector. (Levine and Zervos, 1998) Also in their work, introducing a new and extensive database; Beck, Demirgüç-Kunt and Levine (2000) state that this variable represents the success of financial system in achieving one of its major goals which is channeling savings to investors. Following Levine and Zervos (1998), we included “deposit bank claims on private sector divided by nominal GDP” as another indicator of banking sector development which focuses on credit issued private sector rather than overall amount of domestic credit. Since investment & development banks and participation banks have a low share in total domestic credit supplied in Turkey, they are not considered in this variable. It is certain that excluding these banks will not cause significant loss of information.

4.1.1.3 Ratio of Total Deposits to Nominal GDP (TOTDEP)

Ratio of total deposits to nominal GDP is a measure that gives information about one of the primary goals of financial system, which is channeling of savings to investors, from a different perspective than the variables related to amount of domestic credit supplied. While magnitude of domestic credits is a measure of financial sources supplied to the real sector, magnitude of total deposits measures the amount of savings that are available for investors. Nieuwerburgh et al. (2005) who used “savings and deposits in commercial banks in per-capita terms” as a proxy for banking development; state that, usefulness of this variable depends on the degree of availability of these funds as long term loans to finance commercial development. The shortcoming of this variable is that, it does not give information about the allocation of funds. Nonetheless since our purpose is to form a data set that contains variables representing different dimensions of financial development; it is convenient to include ratio of total deposits to nominal GDP, which gives insight into the magnitude of savings available for investment, to our dataset.

4.1.1.4 Ratio of Deposit Money Bank Assets to Nominal GDP (DMA)

Researchers used various variables with the aim of representing the size of banking system in econometric studies. As stated by Beck et al. (2000), "central bank assets divided by nominal GDP" and "deposit money bank assets divided by nominal GDP" are variables that measure the size of these sectors relative to the overall size of the economy. The overall size of the banking system is an important indicator of banking sector development. Rousseau and Xiao (2007) claim that, a deep banking system can provide the funds, to overcome project indivisibilities for high return investments which require large start up costs and large scale economies, more easily. Moreover since large banks can form diversified portfolios more easily; they can provide funds for projects that involve high return and high risk, which contribute to economic growth more than safe but low return projects. Beck et al. (2000) names ratios of "central bank assets to total financial assets" and "deposit money bank assets to total financial assets" as relative size measures. These variables measure the size of these sectors relative to the overall size of the financial system. King and Levine (1993) state that banks are more successful at risk sharing and information services than central banks, and consequently use " ratio of deposit money bank assets to sum of deposit money bank assets and central bank assets" to capture this difference. Following King and Levine (1993), Ang and Mckibbin (2007) also use the ratio of commercial bank assets to sum of commercial bank assets and central bank assets as one of the variables representing banking development, and claim that banks allocate financial sources better than central banks by selecting profitable investments among available opportunities.

Although both absolute size measures and relative size measures, by alone, contain only limited information about banking sector's development; they are valuable variables to include in the data set for principal component analysis, since they contain information that is not fully represented by other variables used as banking sector development indicators. However due to data availability problem for Turkey we could only use ratio of deposit money bank assets to nominal GDP. We expect that, as the Central Bank of the Republic of Turkey (CBRT) does not provide credit to private sector and size of financial institutions other than deposit money banks is not too large compared to deposit money banks in Turkey; the absence of a relative size measure is not important.

4.1.1.5 Banking sector concentration ratio

Beck et al. (2000) defines banking sector concentration ratio as three largest banks' assets divided by total banking sectors' assets. This ratio gives valuable information about the structure of banking sector. As in the case of stock market concentration ratio, a high banking sector concentration ratio is a sign of underdevelopment. A high concentration ratio may indicate lack of competition for attracting savings and selecting most profitable investment opportunities (Beck et al, 2000). Therefore it may adversely affect economic growth. Although this variable contains valuable information, our quarterly data related to banking sector in Turkey covers a very short period. Thus, we could not include banking sector concentration ratio to our data set.

4.1.1.6 Indicators of Foreign Bank Participation

Besides banking sector concentration, another characteristic of banking sector structure is the participation of foreign banks. Demirgüç-Kunt, Levine and Min (1998) summarize affirmative claims on effects of foreign banks to an economy as; improvement in quality of financial services, increase in economic growth and decrease in financial fragility. They also add that, there are also claims on foreign bank participation that it would decrease stability of financial markets while not causing a significant increase in efficiency of banking sector and long-run economic growth. (Demirgüç-Kunt, Levine and Min, 1998) In their work, Demirgüç-Kunt, Levine and Min (1998) use "foreign bank assets divided by total domestic banking assets" and "number of foreign banks divided by total number of banks in country" as indicators of foreign bank participation. However as in the case of banking sector concentration ratio due to the unavailability of data for Turkey we could not include these ratios to our data set.

4.1.2 Stock Market Development

4.1.2.1 Ratio of Stock Market Capitalization to Nominal GDP (MCAP)

Ratio of stock market capitalization to nominal GDP is an indicator of stock market size relative to overall size of the economy which has gained wide acceptance by researchers as an indicator of stock market development. Stock market capitalization is the total value of listed shares in the exchange. Levine and Zervos (1996) state that under the assumption of positive correlation between stock market size and its ability to mobilize capital and diversify risk "ratio of stock market capitalization to GDP"is an indicator of stock market development. However Levine and Zervos (1998); in their study investigating the relationship between stock market development, banking sector development and economic growth, also add that, although this ratio is seen as an indicator of stock market development by many researchers, a large stock market may not be effective and taxes may distort incentives for firms to list on the stock market. Among others, Rousseau and Xiao (2007) also use this ratio as a proxy for stock market development and claim that, it is an indicator of importance of equity finance in the processes of capital mobilization and resource allocation. Following the literature we included stock market capitalization ratio to our data set as a variable which represents the size of the stock market relative to overall size of the stock market.

4.1.2.2 Turnover Ratio and Value Traded Ratio (TURNOVER & VTRADED)

Turnover ratio and value traded ratio are two variables that reflect the different aspects of stock market liquidity. Turnover ratio is the ratio of total value traded in stock market to total stock market capitalization. Therefore, as stated by Beck et al. (2000), it reflects the activity of the stock market relative to the size of the stock market. Also Levine and Zervos (1998) state that high turnover ratio is generally seen as reflection of low transaction costs. However Levine (2004) extensively presents the literature on financial development and states that turnover ratio is neither a direct measure of trading costs nor is a sign of ability to sell securities at posted prices. On the other hand, value traded ratio is equal to the total value traded in stock market divided by GDP. Therefore it reflects the liquidity of the stock market relative to the overall size of economy. These two variables complement each other since. Whilst, turnover ratio measures the overall activity in the stock market, value traded ratio reflects the impact of this activity on overall economy. For instance, a small but active stock market, which has a high turnover ratio but low value traded ratio, is not expected to have much impact on the economy. Levine and Zervos (1998) states that one shortcoming of the value traded ratio is that; even when degree of activity in the stock market remains same, since markets are forward looking, an expectation of increase in the listed firms' profitability may be reflected as a rise in prices which in turn increases the value traded ratio. Therefore it is suggested to examine both value traded ratio and turnover ratio together since turnover ratio is not affected from these price changes. (Levine and Zervos, 1998)

Levine and Zervos (1998) suggested two additional measures of stock market liquidity that consider the impact of stock market's volatility on stock market liquidity. These variables are turnover ratio divided by stock market volatility (T.OVERtoVOL) and value traded ratio divided by stock market volatility (V.TRAtoVOL). They claim that, all things equal, prices should not change too much as total trade that takes place in the stock market increases. These two variables are of much importance to us since İstanbul Stock Exchange is known as a highly volatile stock market. Therefore in order to capture the effect of volatility on the liquidity of the stock market, we added these two variables, with turnover ratio and value traded ratio, to our data set.

4.1.2.3 Stock Market Concentration Ratio (CONCENTR3)

Stock market concentration is equal to market capitalization of largest three firms divided by total stock market capitalization. A high concentration ratio is a sign of underdevelopment since it means that, few large firms crowd out the financial sources available for small firms and this crowding out effect prevents new firms to list on the exchange. (Nieuwerburgh et al., 2005) Therefore, we included stock market concentration ratio to our data set since it is an important variable which gives valuable information about the structure of the stock market.

4.1.2.4 Indicators of Stock Market Volatility (VOLATILITY)

According to economic theory, in addition to the stock market's size, structure and liquidity, its volatility also has an impact on economic growth. Therefore most of the studies in recent literature take stock market volatility into account while trying to capture different aspects of stock market development. In their study on measuring stock market volatility, Mala and Mahendra (2007) state that excessive stock market volatility may have effects on consumer spending and investment. They claim that increases in consumer spending due to a wealth effect may be wiped out as a result of a fall in consumer confidence caused by a sudden fall in stock market. Moreover, in presence of excessive volatility a rise in stock market may be interpreted as an increase in the risk of equity investment and may cause a flow of financial sources from risky investments to less risky investments. Since during this flow, investors will be biased towards large firms, new and small firms may experience difficulties in obtaining funds due to the high cost of investment which is a result of increased risk perceptions of investors. (Mala and Mahendra, 2007)

In order to measure stock market volatility researchers utilized various methods. For instance, Levine and Zervos (1998) estimated conditional standard deviation of stock market returns using 12-month rolling standard deviation of stock market returns. Mala and Mahendra (2007) utilized ARCH and GARCH methods in order to measure stock market volatility. Kassimatis and Spyrous (2001) used 12-month rolling standard deviation of the first difference of the logarithmic levels of the IFC price indices as a measure of stock market volatility. Arestis and Demetriades (1997) used 16-quarter moving standard deviation of the end-of-quarter change of stock market prices as a measure of stock market volatility. Following the extant literature, we measured stock market volatility as 8 quarter moving standard deviation of difference of the logarithmic levels of end-of-quarter stock market prices.

4.1.3 Indicators of Overall Development of Financial System

4.1.3.1 Ratios of M2 to GDP, M3 to GDP & M2 to M1

M2 divided by GDP is a ratio which has been used in order to represent financial depth especially in the early studies on financial development. The recent studies show that M3 (Liquid liabilities) divided by GDP is preferred to M2 ratio as a proxy of financial depth. One of the advantages of these ratios is that they are widely available for most of the countries. Outreville (1999) states that; the ratio of M2 to GDP is an indicator of size of the financial intermediary sector and is strongly correlated with level and rate of change of the real GDP per capita, but also adds that this ratio does not reflect the full extent of financial intermediation. Darrat (1999) states that, since rise in M2 means an increase in the financial assets, ratio of M2 to GDP is a sign of growth of financial sector relative to overall economy.

On the other hand, Ang and Mckibbin (2007) claims that; instead of reflecting financial system's ability of channeling funds from savers to investors, these ratios, more likely represent the extent of transaction services in the financial system. Ghirmay (2005) also supports this view and states that, these ratios based on monetary aggregates reflects the monetization of transactions instead of financial system's functions such as capital mobilization and resource allocation. Moreover Levine and Zervos (1998) also criticize M2 ratio's capability in reflecting financial system's capital allocation function and add that M2 ratio does not give information about whether the liabilities belong to banks, central banks or financial intermediaries. Luintel and Khan (1999) agree with these criticisms and suggest using a ratio of total deposit liabilities of banks (M2 minus currency in circulation) to one period lagged GDP.

Liu and Woo (1994) suggest that ratio of M2 to M1 is an indicator of financial sophistication. As stated in Outreville (1999); M1 which consists of physical currency and demand accounts is a short-term asset, while M2 which includes saving accounts, small denomination time deposits and money market accounts is a long-term asset. Hence, the ratio of M2 to M1 is an indicator of financial sophistication. As financial system develops; increase in saving accounts is expected to be greater than the increase in transaction balances, this ratio is expected to grow as financial system develops. (Outreville, 1999)

Despite the criticisms explained above, we included both M2 and M3 ratios to our data set as indicators of financial depth since they give at least some insight into the depth of financial system. We also included ratio of M2 to M1 to our data set as an indicator of financial sophistication.

4.1.3.2 Difference between nominal interest rate volatility and real interest rate volatility (IRATE)

In his descriptive study on measuring financial development, Lynch (1996) claims that the difference between nominal interest rate volatility and real interest rate volatility is an indicator of risk of the financial system. For calculating this differential, we used 3 month time deposit rates and obtained real interest rates using CPI indices. We measured volatility by eight quarter moving standard deviation of interest rates. Positive difference between nominal interest rate volatility and real interest rate volatility is an indicator of improvement in financial pricing efficiency. Moreover, unless low and stable rates of inflation are sustained, an economy can achieve low nominal interest rate stability only at the expense of high real interest rate volatility. Since difference between nominal interest rate and real interest rate is the expected inflation, as the difference between nominal interest rate volatility and real interest rate volatility increases it becomes harder to forecast inflation rate, and this creates an additional risk for investors. Therefore this differential, to some extent, measures the risk of the financial system. It is examined that countries with most developed financial systems have low differences between nominal and real interest rate volatilities while countries with less developed financial systems experience larger differences between nominal and real interest rate volatilities. (Lynch, 1996)

4.1.3.3 Indicators of Financial Openness & an Indicator of Financial System's Liquidity (F.LIQ)

Another important dimension of financial development is international openness of the financial system. However defining financial openness is even more complicated and problematic than defining financial development. Nonetheless researchers made various attempts to measure financial openness. Quinn and Toyoda (2008) separated these measures as de jure & de facto measures of financial openness

De jure measures of financial openness are developed based on IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) which is a binary index of financial openness. Quinn and Toyoda (2008) criticize AREAER since it does not show the degree of financial openness and does not differentiate between completely closed and partially closed countries. Moreover, Carvalho and Garcia (2006) state that, when sophisticated financial markets are of concern, implementation of capital controls is difficult and depends on ability of market to circumvent legal issues. Therefore, even de jure measures state that a financial system is closed due to the presence of capital account restrictions; it may be the fact that these restrictions have no effect on the capital flows at all.

Among various de jure measures in the literature some notable are i) KAOPEN which is developed by Chinn and Ito (2008) using principal component analysis, ii) a measure developed by Miniane (2004) which is based on "new" AREAER measure of IMF and includes 14 different categories of capital account transactions, and iii) a measure developed by Quinn (1997) which measures capital account transactions on a scale ranging from 0 to 4 and current account transactions on a scale ranging from 0 to 8. In spite of the improvements on IMF's AREAER measure of financial openness, de jure measures of financial openness still have properties of a dummy variable and the extent to which they measure financial openness in a category is presence or absence of controls (Quinn and Toyoda, 2008). Therefore, researchers alternatively developed de facto measures of financial openness which are based on observable economic variables. IMF (2001) uses gross holdings of international assets and liabilities as an indicator of openness in capital account transactions. One of the most notable works on this issue is the work of Lane and Milesi–Ferretti (2006) in which they formed a data base that contains aggregate foreign asset and liability positions of 91 countries, covering the period of 1970-2004. However, de facto measures based on capital flows also depend on nongovernmental considerations and a country may experience an increase in capital flows even without a change in the capital account openness policies. Moreover, a country with fully open capital account may also experience modest capital flows due to the prices that are close to the world prices. (Quinn and Toyoda, 2008)

Since de facto measures are not available for quarterly frequency and international investment position data is available for a limited period for Turkey, we could not include any variables that measure the financial openness of Turkey. Instead, we included the ratio of "absolute size of portfolio investment flows plus foreign direct investment flows divided by nominal GDP" as an indicator of overall liquidity of financial system, mainly due to the foreign investments. Since this measure is based on flow variables it is vulnerable to the impact of economic conditions and risk perception of foreign investors. Therefore it is not convenient to use this ratio as an indicator of financial openness. However, since it takes both capital inflows and capital outflows into account, to some extent, it measures the overall liquidity of financial sector relative to the overall size of the economy.

It is important to note that this measure of financial sector liquidity is primarily related to foreign investments and is different from VTRADED and TURNOVER proxies of stock market liquidity.

4.1.3.4 A measure of share of resources a society devotes to run its financial system

All of the variables presented above as indicators of different dimensions of financial development are monetary variables. Graff (2003) intends to measure financial depth from a different perspective and uses "share of resources a society devotes to run its financial system" as a proxy of financial depth. Graff (2003) claims that rather than measuring effectiveness of channels of finance as other traditional variables do, "share of resources a society devotes to run its financial system" measures the intensity of financial services. In order to quantify "share of resources a society devotes to run its financial system"; Graff (2003) forms an index by applying principal component analysis to a set of variables that consists of "the share of manpower employed in the system", "the share of financial system in GDP" and "the number of banks and branches per capita". Although including this variable to our data set would improve the extent of information on different dimensions of financial development, unavailability of the related data for Turkey does not allow us to use it in our analysis.

4.2 Data Analysis

This subsection evaluates if our data set meets the necessary assumptions of PCA. Since we are using time series data, we first tested the stationarity of the variables. Following Yang and Shahabi (2005) we take the first differences of the variables that are I(1). In order to cleanse the results from undue effects of outliers, we checked for outliers in the data and eliminated observations which are both statistically and economically outliers. After eliminating outliers, we again tested the stationary of variables and take the first difference of variables that are I(1). It is imperative to note that since we do not use significance tests for factors, normality is not a necessary assumption and therefore we did not examine the distributions of variables.

We tested the stationarity of the variables selected by four different unit root tests. These are namely; Augmented Dickey-Fuller, Phillips-Perron, Elliot-Rothenberg- Stock DFGLS and KPSS tests. Whilst, Augmented Dickey-Fuller, Phillips-Perron, Elliot- Rothenberg- Stock DFGLS tests set the null hypothesis as the variable has unit root, KPSS test sets the null hypothesis as the variable is stationary. As stated by Maddala and In-Moo (1998), it is suggested to use tests that set null hypothesis as stationarity of variable for confirmatory analysis. Therefore we utilized KPSS test for the purpose of confirmatory analysis.

The results of unit root tests are presented in Table 4.2.1 & Table 4.2.2.[1] As seen from tables, DBCPStoGDP, DMA, DOMCRE, M2, M3, MCAP, TOTDEP, TURNOVER, V.TRADED, T.OVERtoVOL, V.TRAtoVOL are stationary while CONCENTR3, VOLATILITY, M2toM1, I.RATE are I(1). In order to work with stationary variables we take the first difference of the variables that are I(1).

[1] Throughout the study, in case of discrepancies between the results of unit root tests, we chose the result supported by majority. In cases where the results P-P & KPSS contradict with results of ADF & DFGLS, we chose the result supported by P-P & KPSS.

As stated above, since we do not use significance tests for factors, normality is not a necessary assumption, however; it is imperative to examine the data, detect outliers and assess their impact on the results. To designate outliers by means of univariate perspective we first transformed data values to standard scores, with a mean of zero and standard deviation of 1, and examined extremely high and low values. Generally, for samples with 80 or less observations, observations with standard scores of 2.5 or larger are labeled as outliers. (Hair et al., 2006)

To designate outliers by means of multivariate perspective we secondly computed probability of Mahalanobis D^2 score. We set a rather conservative level of significance, 0.001, and considered cases with probability of Mahalanobis D^2 score lower than 0.001 as statistically unusual combination of variables. Cases, in which probability of Mahalanobis D^2 scores are lower than 0.001, are 2000Q1, 1994Q2 and 1989Q1.

Before deciding on which observations to eliminate we explored the economic reasons that led these unusual values. Variables with most extreme values and the corresponding quarters during which these extreme values observed are exhibited in Table 4.2.3.

In 1989Q1, M2 ratio has an extremely large value (3.28494). Turkish economy experienced an increase in public sector borrowing requirement and a rapid acceleration of inflation, after 1987. (Boratav & Akyüz; 2003) These macroeconomic imbalances, which eventually led government to liberalize capital account in August 1989, continued throughout 90's. However we could not find any particular economic reason to designate M2 ratio in 1989Q1 as an economically unusual value.

As seen from the table there is an extremely large value of difference between nominal interest rate volatility and real interest rate volatility in 1994Q2. (4.73545) In early 1994, due to the nonresident capital outflow by 12% of GDP, Turkish economy experienced a deep recession as Turkish Lira depreciated, inflation and interest rates increased sharply. (Boratav & Akyüz; 2003) Therefore it is not surprising to observe an extremely large value of difference between nominal

Table 4.2.1: Unit root tests for levels of variables before outliers are eliminated

	Variable	ADF	P-P	DF-GLS	KPSS		Variable	ADF	P-P	DF-GLS	KPSS
INTERCEPT	DBCPStoGDP	-2.005280(3)	-6.202054**	-1.857443	0.263013	INTERCEPT AND TREND	DBCPStoGDP	-2.163546 (3)	-6.286223**	-2.196330	0.150692*
	DOMCRE	-6.473780 (0)**	-6.491897**	-6.362407(0)**	0.224907		DOMCRE	-6.432282(0)**	-6.449620**	-6.454591(0)**	0.224257**
	TOTDEP	-3.833694(1)**	-5.968358**	-1.120404(3)	0.323866		TOTDEP	-6.118027(0)**	-6.034717**	-1.394070(3)	0.269380**
	M2	-6.335502(0)**	-6.346821**	-5.963830(0)**	0.577015*		M2	-6.913797(0)**	-6.832273**	-6.454884(0)**	0.150678*
	M3	-6.285256(0)**	-6.244041**	-6.325395(0)**	0.558351*		M3	-6.860969(0)	-6.874251**	-6.788996(0)**	0.152136*
	M2toM1	-1.383919(0)	-1.292315	-0.346298(0)	0.985489**		M2toM1	-2.067174(0)	-2.067111	-2.101393(0)	0.176578*
	MCAP	-7.857469(0)**	-7.863428**	-7.186313(0)**	0.123012		MCAP	-7.804301(0)**	-7.810920**	-7.694346(0)**	0.127811
	TURNOVER	-2.367260(1)	-3.023082*	-1.392621(1)	0.894642**		TURNOVER	-4.424587(0)**	-4.218693**	-2.930254(1)	0.129908
	VTRADED	-2.313617(1)	-3.458164*	-1.510647(1)	1.066161**		VTRADED	-6.905440(0)**	-6.880782**	-6.989037(0)**	0.085716
	VOLATILITY	-1.374416(0)	-1.273119	-0.694685(0)	0.556041*		VOLATILITY	-2.025013(0)	-2.038793	-2.080883(0)	0.129322
	TOVERtoVOL	-1.407361(1)	-1.669419	-0.726987(1)	0.989243**		TOVERtoVOL	-4.179176(0)**	-4.179176**	-4.186688(0)**	0.143816
	VTRAtoVOL	-1.792469(0)	-1.526352	-1.403692(0)	0.965877		VTRAtoVOL	-4.092881(0)**	-3.929998*	-4.009548(0)**	0.204494*
	CONCENTRATION3	3.009292(3)	2.297861	3.155213	1.056036**		CONCENTRATION3	0.174606(3)	-1.176648	-0.320508	0.294317**
	IRATE	-1.698240(0)	-1.845362	-1.693652(0)	0.449544		IRATE	-2.065046(0)	-2.245637	-1.857340(0)	0.143264
	DMA	-4.315479(0)**	-4.127188**	-4.128287(0)**	0.496607*		DMA	-4.636747**	-4.477609**	-4.698402(0)**	0.256037**

Notes: ** Significant at 0.01

*Significant at 0.05

Table 4.2.2: Unit root tests for first differences of variables before outliers are eliminated

	Variable	ADF	P-P	DF-GLS	KPSS		Variable	ADF	P-P	DF-GLS	KPSS
INTERCEPT	M2toM1	-8.159755(0)**	-8.295499**	-8.721336(0)	0.105808	INTERCEPT AND TREND	M2toM1	-7.729288(1)**	-8.262399**	-8.734514(0)	0.083899
	VOLATILITY	-8.838679(0)**	-8.839666**	-1.637212(1)	0.081690		VOLATILITY	-8.777078(0)**	-8.777788**	-8.912130(0)**	0.070429
	CONCENTR3	-10.23361(1)**	-10.84098**	-9.284158(1)**	0.354838		CONCENTR3	-11.12347(1)**	-30.24559**	--10.37941(1)**	0.149850*
	IRATE	-7.958311(0)**	-7.947765**	-8.042204(0)**	0.088301		IRATE	-7.905612(0)**	-7.894298**	-8.043480(0)**	0.091477

Notes: ** Significant at 0.01, *Significant at 0.05

Table 4.2.3: Variables with most extreme values

Date	Variable	Standard Score
1989Q1	M2	3.28494
1994Q2	I.RATE	4.73545
1996Q2	I.RATE	-4.05102
1997Q1	MCAP	2.95038
1998Q3	VOLATILITY	4.65224
1999Q4	VOLATILITY	3.14156
2000Q1	MCAP	4.02308
2000Q1	V.TRADED	3.78069
2000Q1	M2toM1	-3.13833
2001Q2	DOMCRE	3.49825
2006Q1	V.TRAtoVOL	3.37183

interest rate volatility and real interest rate volatility in 1994Q2. As the risk premium increased significantly, the real interest rates increased as well. However, since nominal interest rate is also affected by the inflation expectations, it should deviate from its mean more than the real interest rate. Examination of our data also supports our claim since, it is seen that in the second quarter of 1994 nominal interest rate rises approximately by 60% while real interest rate rises by approximately 13%. Hence, the observation at 1994Q2 economically stands out as an outlier among the usual values of observation.

In the second quarter of 1996, the difference between nominal interest rate volatility and real interest rate volatility gets an extremely low value. (-4.0512) Central Bank Annual Report for the year 1996 states that, after a peak in the early 1996, interest rates started to decline and stabilized at the second half of the year. This stabilization was due to the success of monetary policy at reaching its goals namely the stabilization of money markets. Also it is stated that short term fluctuations did not affect real time deposit interest rates, so the real interest rates on time deposits were stabilized in second half of 1996. Moreover, besides interest rate stability the Central Bank also achieved a high but stable inflation rate in 1996. (Central Bank of Turkey Annual Report, 1996) Therefore, this extremely low value of difference between nominal interest rate volatility and real interest rate volatility was due to ongoing monetary policy rather than an unusual effect of a financial fluctuation.

Table 4.2.3 shows that, an extremely high value of stock market volatility is observed in 1998Q3 (4.65224). Following the East Asian crisis in 1997, Russian economic crisis started in 1998. Russian economic crisis significantly affected the economic growth in Turkey. In particular, Central Bank Annual Report for the year 1998 states that ongoing rapid economic growth in Turkish economy terminated due to the effect of the capital outflows on real sector. The impact of Russian crisis was a capital outflow at an amount of 6.4 billion US dollars in the portfolio investment account. (Central Bank of Republic of Turkey Annual Report, 1998) It is clear that this capital outflow caused an extremely high volatility in İstanbul Stock Exchange.

Therefore extremely high value observed in stock market volatility in 1998Q3 was due to an unusual effect of a financial fluctuation.

It is seen from Table 4.2.3 that stock market volatility has also an extreme value at fourth quarter of 1999 (3.14156). Economic recession that has started in 1998 continued in 1999, due to the internal economic dynamics and two earthquakes occurred at August and November 1999. (Central Bank of Republic of Turkey Annual Report, 1999) Central bank Annual Report for the year 1999 states that despite 6.8 billion US dollars capital outflow in the second half of 1998, there had been capital inflows in 1999 at an amount of 6.7 billion US dollars which were made up largely of portfolio and short term capital. Therefore, we may conclude that the extremely large value observed in stock market volatility at 1999Q4 was not an unusual observation that stands out among other observations.

It is clearly seen from Table 4.2.3 that 3 variables have extreme values in 2000Q1. These variables are M.CAP (4.02308), V.TRADED (3.78069) and M2toM1 (-3.13833). In December 1999 with the help of the IMF stand-by agreement, government launched a new stabilization program. The new stabilization program and ongoing relationships with European Union affected expectations positively. Boratav and Akyüz (2003) states that net capital inflow amounted 12.5 billion US dollars in the first ten months of 2000. These outliers can be explained by the high expectations as a result of a stabilization program which will eventually fail at the end of the year. Therefore, although there are no obvious reasons that led the extremely low value of M2toM1, the extreme values of stock market capitalization and value traded ratio are unusual values.

During the second quarter of 2001 domestic credit as a share of GDP has an extremely high value. (3.49825) In the early 2001, Turkish economy experienced a financial market crisis and GDP fell by 8.3 percent in the first three quarters of 2001 compared to the first three quarters of 2000. (Central Bank of Republic of Turkey Annual Report, 2001) The increase in nominal domestic credit was 30 percent while nominal GDP increased by 24 percent. Therefore domestic credit as a share of GDP increased. However there are no obvious reasons that led to this extremely high value of domestic credit as a share of GDP. Therefore we accept this high value as a usual observation.

Lastly, V.TRAtoVOL has an extremely high value (3.37183) in 2006Q1. As stated by Onaran (2007), Turkey experienced historical high amounts of capital flows in the first four months 2006. Therefore it is reasonable to observe a high ratio of value traded ratio to nominal GDP in 2006Q1 due to the increase in liquidity of stock market. To conclude we think that this extreme value is a result of ongoing economic conditions, not an unusual financial fluctuation.

After examining the outliers for the sample period, we decided to delete those observations which are both statistically and economically unusual among other observations. However also have a sample size problem. Although extreme values of observations may have undue effects on empirical results, deleting too many observations may also deteriorate the results due to the inadequately small sample size. Therefore we applied two separate principal component analyses to two distinct samples, in an attempt to see the robustness of results. Indeed, with negligible differences, both analyses give the same result. In the first principal component analysis (henceforth PCA1) we eliminated outliers in 1994Q2, 2000Q1 and 1998Q3. As discussed above M.CAP, V.TRADED and M2toM1 at first quarter of 2000, and I.RATE at second quarter of 1994 clearly have statistically and economically unusual values. Looking at the probability of Mahalanobis D^2 score, it is seen that at these quarters, variables have unusual combinations which make them stand out among usual values of observations. Therefore in the first analysis we eliminated observations at 1994Q2 and 2000Q1. Also stock market volatility in the third quarter of 1998 has an extremely high value due to the capital flows resulted by the effect of Russian crisis on Turkish economy. Although in 1998Q3 the unique combination of variables is not an outlier from a multivariate perspective, since the variable has a rather high value and it is an obviously unusual observation we also eliminated observations in 1998Q3.

In order to check robustness of results in the second principal component analysis (henceforth PCA2) we used a sample of observations, in which observations in 1999Q4 and 2001Q2 are also deleted. At both quarters unique combination of variables does not stand out as unusual values among other observations. However when examined univariately; both stock market volatility in 1999Q4 and domestic credit as a share of GDP in 2001Q2 are statistically outliers.

After eliminating the outliers, we again tested the stationarity of variables in each of the samples. As before, we utilized Augmented Dickey-Fuller, Phillips-Perron, Elliot- Rothenberg-Stock DFGLS and KPSS tests.

Table 4.2.4 and Table 4.2.5 exhibit the results of unit root tests for the first sample in which observations in 1994Q2, 2000Q1 and 1998Q3 are eliminated. DBCPStoGDP, DOMCRE, TOTDEP, M2, M3, TURNOVER, M.CAP, V.TRADED, T.OVERtoVOL, V.TRAtoVOL, DMA are stationary and M2toM1, VOLATILITY, I.RATE, CONCENTR3 are I(1). Following Yang and Shahabi (2005) we take the first difference of variables which are I(1) in order to use variables that are stationary.

The results of unit root tests for the second sample, in which 1994Q2, 2000Q1, 1998Q3, 1999Q4 and 2000Q1 are eliminated, are presented in Tables 4.2.6 and 4.2.7. DBCPStoGDP, DOMCRE, TOTDEP, M2, M3, MCAP, TURNOVER, VTRADED, T.OVERtoVOL, V.TRAtoVOL, DMA are stationary and M2toM1, VOLATILITY, CONCENTR3 and I.RATE are I(1). Following Yang and Shahabi (2005) we take the first difference of the variables that are I(1) in order to work with stationary variables.

Table 4.2.4: Results of unit root tests for the levels of variables used in PCA1

	Variable	ADF	P-P	DFGLS	KPSS		Variable	ADF	P-P	DFGLS	KPSS
INTERCEPT	DBCPStoGDP	-1.950575(3)	-5.894025**	1.821967(3)	0.263296	**INTERCEPT AND TREND**	DBCPStoGDP	-2.112858(3)	-5.978458**	-2.143931(3)	0.142459
	DOMCRE	-6.618416(0)**	-6.714469**	-6.48509(0)**	0.232736		DOMCRE	-6.574635(0)**	-6.671476**	-6.597089(0)**	0.232646**
	TOTDEP	-1.698627(3)	-5.829980**	-1.13408(3)	0.321509		TOTDEP	-1.854924(3)	-5.993245**	-1.415735(3)	0.270158**
	M2	-6.233501(0)**	-6.180522**	-5.864760(0)**	0.564670*		M2	-6.785401(0)**	-6.677155**	-6.341412(0)**	0.160363*
	M3	-6.205639(0)**	-6.154211**	-6.244151(0)**	0.548530*		M3	-6.756923(0)**	-6.775595**	-6.686345(0)**	0.159241*
	M2toM1	-1.405290(0)	-1.326665	-0.403387(0)	0.956404**		M2toM1	-1.991284(0)	-2.031628	-2.024312(0)	0.175072*
	MCAP	-8.221759(0)**	-8.258336**	-7.396845(0)**	0.139319		MCAP	-8.169694(0)**	-8.210227**	-8.042328(0)**	0.140852
	TURNOVER	-2.407696(1)	-3.215434*	-1.430297(1)	0.894267**		TURNOVER	-4.378709(0)**	-4.349044**	-4.368402(0)**	0.131792
	VTRADED	-3.486426(0)*	-3.166745*	-1.641400(1)	1.035150**		VTRADED	-6.087124(0)**	-6.098132**	-6.162844(0)**	0.098261
	VOLATILITY	-1.307024(0)	-1.260242	-0.650942(0)	0.534879*		VOLATILITY	-1.914913(0)	-1.969984	-1.973064(0)	0.129829
	TOVERtoVOL	-1.413815(1)	-1.715304	-0.736203(1)	0.988746**		TOVERtoVOL	-4.186396(0)**	-4.062727**	-4.193550(0)**	0.145808
	VTRAtoVOL	-1.788729(0)	-1.458311	-1.394137(0)	0.970671**		VTRAtoVOL	-4.117340(0)**	-4.006912*	-4.032432(0)**	0.200248*
	CONCENTR3	2.520591(2)	2.275203	3.352722(2)	1.064483**		CONCENTR3	-0.133547(2)	-1.217355	-0.548773(4)	0.292858**
	IRATE	-1.688179(0)	-1.842707	-1.683572(0)	0.449530		IRATE	-2.053984(0)	-2.242223	-1.846402(0)	0.143068
	DMA	-4.334049(0)**	-4.151103**	-4.155297(0)**	0.490253*		DMA	-4.648103(0)**	-4.495316**	-4.709775(0)**	0.257693**

Notes: ** Significant at 0.01

*Significant at 0.05

Table 4.2.5: Results of unit root tests for the first differences of variables used in PCA1

	Variable	**ADF**	**P-P**				**Variable**	**ADF**	**P-P**		
INTERCEPT	M2toM1	-8.159755(0)**	-8.295499**	-8.193490(0)**	0.114806	**INTERCEPT AND TREND**	M2toM1	-7.729288(1)**	-8.262399**	-8.208366(0)**	0.087980
	VOLATILITY	-8.838679(0)**	-8.839666**	-6.523118(0)**	0.079528		VOLATILITY	-8.777078(0)**	-8.777788**	-8.019242(0)**	0.068033
	CONCENTR3	-10.23361(1)**	-10.84098**	-3.340417(3)**	0.347968		CONCENTR3	-11.12347(1)**	-30.24559**	-11.14089(1)**	0.169545*
	IRATE	-7.958311(0)**	-7.947765**	-8.012581(0)**	0.088703		IRATE	-7.905612(0)**	-7.894298**	-8.013862(0)**	0.091892

Notes: ** Significant at 0.01

*Significant at 0.05

Table 4.2.6: Results of unit root tests for the levels of variables used in PCA2

	VARIABLE	ADF	PP	DF-GLS	KPSS		VARIABLE	ADF	PP	DF-GLS	KPSS
INTERCEPT	DBCPStoGDP	-1.985841(3)	-5.899319**	-1.868472(3)	0.241087	INTERCEPT AND TREND	DBCPStoGDP	-6.006277(0)**	-6.006277**	-2.163948(3)	0.159801*
	DOMCRE	-2.100763(3)	-6.999471**	-1.998533(3)*	0.279261		DOMCRE	-2.168578(3)	-6.960072**	-1.981709(3)	0.272768**
	TOTDEP	-1.332749(3)	-6.061336**	-0.963527(3)	0.316704		TOTDEP	-1.549983(3)	-6.240751**	-1.128885(3)	0.296469**
	M2	-6.560315(0)**	-6.553554**	-6.195070(0)**	0.570896*		M2	-7.178235(0)**	-7.136793**	-6.714444(0)**	0.137688
	M3	6.548469(0)**	-6.546281**	-6.592892(0)**	0.548582*		M3	-7.179357(0)**	-7.177078**	-7.110391(0)**	0.144936
	M2toM1	-1.374107(0)	-1.251087	-0.385372(0)	0.969846**		M2toM1	-2.148272(0)	-2.128614	-2.187053(0)	0.162873*
	MCAP	-7.364807(0)**	-7.424264**	-6.731346(0)**	0.111919		MCAP	-7.313837(0)**	-7.376645**	-7.216537(0)**	0.115357
	TURNOVER	-2.388653(1)	-3.178599*	-1.444963(1)	0.870127**		TURNOVER	-4.326855(0)**	-4.303664**	-4.330197(0)**	0.120337
	VTRADED	-2.352322(1)	-3.477317*	-1.575454(1)	1.053843**		VTRADED	-6.911997(0)**	-6.945914**	-6.993755(0)**	0.073644
	VOLATILITY	-1.384934(0)	-1.288411	-0.696183(0)	0.587190*		VOLATILITY	-2.091489(0)	-2.069396	-2.144343(0)	0.120943
	TOVERtoVOL	-2.007378(0)	-1.626823	-0.758509(1)	0.973592**		TOVERtoVOL	-4.153178(0)**	-4.045329**	-4.154751(0)**	0.140698
	VTRAtoVOL	-1.777017(0)	-1.420414	-1.402956(0)	0.953158**		VTRAtoVOL	-4.119167(0)**	-4.010703*	-4.027736(0)**	0.204242*
	CONCENTR3	2.894978(3)	2.417043	2.993895(2)	1.033945**		CONCENTR3	0.048719(3)	-1.125320	-1.377114(0)	0.289805**
	IRATE	-1.679462(0)	-1.824770	-1.674538(0)	0.446092		IRATE	-2.053064	-2.230871	-1.842636(0)	0.143118
	DMA	-1.168486(3)	-4.473840**	-0.951797(3)	0.448637		DMA	-1.595911(3)	-4.808618**	-1.609547(3)	0.243965**

Notes: ** Significant at 0.01

*Significant at 0.05

Table 4.2.7: Results of unit root tests for the first differences of variables used in PCA2

	Variable	ADF	P-P	DF-GLS	KPSS
INTERCEPT	M2toM1	-9.255494(0)**	-9.536066**	-9.296073(0)**	0.103669
	VOLATILITY	-9.742509(0)**	-9.743011**	-1.899253(3)	0.075906
	CONCENTR3	-8.961065(1)**	-10.33196**	-8.708265(1)**	0.345052
	IRATE	-7.888885(0)**	-7.889978**	-7.944193(0)**	0.090423

	Variable	ADF	P-P	DF-GLS	KPSS
INTERCEPT AND TREND	M2toM1	-9.199592(0)**	-9.483837**	-9.301293(0)**	0.083974
	VOLATILITY	-9.672629(0)**	-9.672883**	-8.791441(0)	0.066607
	CONCENTR3	-8.012223(2)**	-28.24138**	-9.769492(1)**	0.165020*
	IRATE	-7.835426(0)**	-7.836610**	-7.945686(0)**	0.093764

Notes: ** Significant at 0.01

*Significant at 0.05

CHAPTER 5

EMPIRICAL RESULTS

This section presents the empirical results of Principal Component Analysis. As we previously stated, we carried out two separate analyses. In the first principal component analysis (PCA1) we eliminated outliers in 1994Q2, 1998Q3 and 2000Q1. In the second principal component analysis (PCA2) we used a sample of observations in which observations in 1999Q4 and 2001Q2 are also deleted. Furthermore, we will also present two different results of both analyses due to the reasons we will discuss later in detail. Therefore we will present four separate results, namely; PCA1A, PCA1B, PCA2A and PCA2B. Table 5.1 summarizes the four different analyses and their differences.

5.1 PCA1

Table 5.1.1 shows the correlation matrix for 15 variables. At a significance level of 0.05, 60 out of 105 correlations (57%) are significant. 57% is a fairly adequate percentage for further analysis of variables. However it should be noted that, while some of the variables have high numbers of significant correlations, other variables do not have any significant correlations. M3, M2, DMA and TOTDEP have highest number of significant correlations that are; 8, 8, 7 and 6 respectively. VOLATILITY, I.RATE and CONCENTR3 do not have any significant correlations. There are no threshold levels for what is too high and what is too low, but variables with too many significant correlations may belong to more than one factor and variables with no significant correlations may not belong to any factor. (Hair et al., 2006)

Kaiser-Meyer-Olkin mean sampling adequacy (KMO) measures the amount of intercorrelations among variables and gives information about the factorability of overall set of variables and individual variables. KMO statistics lower than 0.5 are unacceptable. KMO statistics of 0.6 or above and 0.7 or above may be interpreted as

Table 5.1: Summary of the analyses

	OUTLIERS	VARIABLES		VARIABLES RETAINED
PCA1	1994Q2 1998Q3 2000Q1	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2, M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP	PCA1A (Excluded variables with low KMO statistics)	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2, M3, M2toM1, VTRADED, MCAP, TOVERtoVOL, VTRAtoVOL
			PCA1B (Retained variables with low KMO statistics)	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2, M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP
PCA2	1994Q2 1998Q3 2000Q1 1999Q4 2001Q2	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2, M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP	PCA2A (Excluded variables with low KMO statistics)	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2, M3, M2toM1, VTRADED, MCAP, TOVERtoVOL, VTRAtoVOL
			PCA2B (Retained variables with low KMO statistics)	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2, M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP

Table:5.1.1: Correlations of variables included in PCA1

	DBCPS toGDP	DMA	DOMCRE	M2	M3	MCAP	TDEP	T.OVER	V.TRA	T.OVER toVOL	V.TRA toVOL	D(M2toM1,1)	D(VOLTY,1)	D(I.RATE,1)	D(CON3,1)
DBCPStoGDP	1	.549**	.412**	.273*	.300**	.171	.51**	-.165	-.065	-.061	-.003	.027	.013	-.111	-.053
DMA	.549**	1	.713**	.487**	.528**	.214	.81**	-.202	-.111	-.386**	-.318**	.083	.214	-.040	-.038
DOMCRE	.412**	.713**	1	.242*	.260*	.133	.63**	.132	.204	-.116	-.063	.027	.173	-.024	.025
M2	.273*	.487**	.242*	1	.967**	.259*	.40**	-.218	-.165	-.271*	-.219	.442**	-.007	-.109	.035
M3	.300**	.528**	.260*	.967**	1	.329**	.47**	-.210	-.150	-.270*	-.210	.460**	-.020	-.081	.044
MCAP	.171	.214	.133	.259*	.329**	1	.168	.086	.208	.139	.203	.101	-.092	-.013	-.102
TOTDEP	.517**	.818**	.631**	.408**	.472**	.168	1	-.135	-.053	-.285*	-.221	.104	.121	-.089	.022
TURNOVER	-.165	-.202	.132	-.218	-.210	.086	-.135	1	.833**	.756**	.572**	-.098	-.049	.141	.103
VTRADED	-.065	-.111	.204	-.165	-.150	.208	-.053	.833**	1	.765**	.790**	-.140	.002	.093	.007
T.OVERtoVOL	-.061	-.386**	-.116	-.271*	-.270*	.139	-.28*	.756**	.765**	1	.919**	-.007	-.122	.026	.085
V.TRAtoVOL	-.003	-.318**	-.063	-.219	-.210	.203	-.221	.572**	.790**	.919**	1	.003	-.068	-.003	.006
D(M2toM1,1)	.027	.083	.027	.442**	.460**	.101	.104	-.098	-.140	-.007	.003	1	.052	-.081	.075
D(VOLTY,1)	.013	.214	.173	-.007	-.020	-.092	.121	-.049	.002	-.122	-.068	.052	1	.109	.025
D(I.RATE,1)	-.111	-.040	-.024	-.109	-.081	-.013	-.089	.141	.093	.026	-.003	-.081	.109	1	-.088
D(CON3,1)	-.053	-.038	.025	.035	.044	-.102	.022	.103	.007	.085	.006	.075	.025	-.088	1

Notes: ** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

as mediocre and middling respectively. (Hair et al., 2006) Our set of variables has an overall KMO statistic of 0.573 which is above acceptable level. However 7 variables have individual KMO statistics below 0.5. When there are variables that have unacceptable KMO statistics; it is suggested to exclude the variable with lowest KMO statistic and recalculate KMO statistics until a set of variables, in which all variables have acceptable KMO statistics, is obtained. (Hair et al., 2006) In order to obtain a set of variables, in which all variables have acceptable KMO statistics, we eliminated CONCENTR3, TURNOVER, I.RATE, and VOLATILITY. However since these variables theoretically explain important aspects of financial development, that cannot be explained by other variables in the data set, in addition to the results in which all variables have acceptable KMO statistics (PCA1A), we will also present the results in which some variables have individual KMO statistics lower than minimum acceptable level (PCA1B).

5.1.1 PCA1A

As stated above, in this analysis, we excluded CONCENTR3, TURNOVER, I.RATE, and VOLATILITY in order to have a set of variables in which all variables have acceptable KMO statistics. Overall KMO statistic of 0.721 shows that set of variables is factorable. Barlett's test of sphericity is employed in order to assess the overall significance of the correlation matrix. (Hair et al., 2006) Barlett's test confirms existence of non-zero correlations at significance level of 0.0001. After assessing factorability and overall significance of correlation matrix we continue on further analysis of variables.

Table 5.1.1.1 exhibits the information about the portions of total variance explained by corresponding factors. Since we set the factor selection criteria as to extract factors that have eigenvalues over 1; among possible 11 factors, 3 factors are extracted. These extracted factors explain 74.724% of the variance of the set of 15 variables. Although in natural sciences, extracted factors are expected to explain fairly high portion of the total variance such as 95%; in social sciences, since information is less precise, 60% of the total variance explained by extracted factors is adequate to assess meaningful results. (Hair et al., 2006) Therefore 74.724% is fairly adequate to continue on further analysis.

Table 5.1.1.1: Total variance explained

Component	Initial Eigenvalues Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %
1	4.072	37.016	37.016	4.072	37.016	37.016
2	2.524	22.947	59.964	2.524	22.947	59.964
3	1.624	14.760	74.724	1.624	14.760	74.724
4	.824	7.493	82.216			
5	.687	6.250	88.466			
6	.566	5.143	93.609			
7	.320	2.909	96.519			
8	.140	1.276	97.795			
9	.139	1.265	99.060			
10	.077	.697	99.757			
11	.027	.243	100.000			

Component matrix, which shows factor loadings, is presented in Table 5.1.1.2. We chose minimum level, for a factor loading to be considered significant, as 0.65. However in some situations, as we discussed before, in order to obtain a component matrix that inclusively explains financial development, we also accepted loadings above 0.5 as significant. At minimum level of 0.65, DOMCRE and MCAP have no significant loadings. Moreover, beside their significant loadings to a factor; M2, M3, T.OVERtoVOL and V.TRAtoVOL also load to another factor with loadings above 0.5. (Henceforth we will use the term existence of cross-loadings to address this situation) Communalities of variables are shown in the Table 5.1.1.3. There are no statistical minimum levels for a communality to be considered sufficient, but a practical level of 0.5 may be used as a minimum level. (Hair et al., 2006) It is seen that DBCPStoGDP and MCAP have communalities of 0.486 and 0.344, respectively, which are below the practical level. These low communalities are not sufficient for deciding to exclude a variable from further analysis; however, it is important to keep them in mind for further evaluation of variables.

Table 5.1.1.2: Component Matrix

	Component		
	1	2	3
Zscore(DMA)	.860		
Zscore(M3)	.784		.512
Zscore(TOTDEP)	.781		
Zscore(M2)	.754		.526
Zscore(DOMCRE)	.579	.404	-.472
Zscore(DBCPStoGDP)	.542		
Zscore(VTRADED)		.826	
Zscore(V.TRAtoVOL)	-.522	.797	
Zscore(T.OVERtoVOL)	-.589	.740	
Zscore(MCAP)		.481	
Zscore: DIFF(M2toM1,1)			.678

Table 5.1.1.3: Communalities

	Initial	Extraction
Zscore(DBCPStoGDP)	1.000	.486
Zscore(DMA)	1.000	.888
Zscore(DOMCRE)	1.000	.721
Zscore(M2)	1.000	.865
Zscore(M3)	1.000	.909
Zscore(TOTDEP)	1.000	.784
Zscore(VTRADED)	1.000	.832
Zscore(T.OVERtoVOL)	1.000	.907
Zscore(V.TRAtoVOL)	1.000	.919
Zscore: DIFF(M2toM1,1)	1.000	.565
Zscore(MCAP)	1.000	.344

If the result of the analysis is not clear, before labeling problematic variables as candidates for deletion, it is suggested to apply a rotation method. (Hair et al., 2006) Therefore we applied orthogonal factor rotation method VARIMAX. Rotation methods neither change the number of factors extracted nor do they change the portion of total variance explained by extracted factors. However rotation methods redistribute the portion of total variance explained by extracted factors and they make the interpretation of component matrix easier. (Hair et al., 2006) As it is clearly seen from the Table 5.1.1.4, after VARIMAX rotation, distribution of the portion of total variance explained by extracted factors, becomes more even.

Table 5.1.1.4: Total Variance Explained (After VARIMAX rotation)

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.072	37.016	37.016	3.049	27.714	27.714
2	2.524	22.947	59.964	2.816	25.598	53.312
3	1.624	14.760	74.724	2.355	21.412	74.724
4	.824	7.493	82.216			
5	.687	6.250	88.466			
6	.566	5.143	93.609			
7	.320	2.909	96.519			
8	.140	1.276	97.795			
9	.139	1.265	99.060			
10	.077	.697	99.757			
11	.027	.243	100.000			

Component matrix, after VARIMAX rotation, is shown in Table 5.1.1.5. All of the variables except M.CAP load significantly to only one factor. M.CAP loads insignificantly to factor 3 which is composed of ratios of monetary aggregates. Previous examination of the communalities of variables also signals MCAP, since it has the lowest communality (0.344). If the result of the analysis is not clear, even after rotation; it is suggested, if possible, to ignore the problematic variables or delete the problematic variables depending on their importance and communality value. If it is not possible to ignore or delete the variable, an alternative rotation method may be applied. (Hair et al., 2006) Since we consider M.CAP as an important variable that contains valuable information about financial system that is not fully reflected by other variables in the data set, we decided to retain M.CAP. We applied other rotation methods, namely; OBLIMIN, EQUAMAX and QUARTIMAX. [1]However none of these rotation methods solves the problem, and therefore we excluded MCAP from the dataset and continued on analyzing variables.

[1] Results are available upon request

Table 5.1.1.5: Rotated Component Matrix

	Component		
	1	2	3
Zscore(DMA)	.889		
Zscore(TOTDEP)	.853		
Zscore(DOMCRE)	.845		
Zscore(DBCPStoGDP)	.688		
Zscore(V.TRAtoVOL)		.950	
Zscore(T.OVERtoVOL)		.928	
Zscore(VTRADED)		.900	
Zscore(M3)			.875
Zscore(M2)			.862
Zscore: DIFF(M2toM1,1)			.741
Zscore(MCAP)			.420

The new data set, in which M.CAP is excluded, has an overall KMO statistic of 0.723 which may be interpreted as middling. Also individual KMO statistics of all variables are above acceptable level. Barllett's test of sphericity confirms existence of non-zero correlations at significance level of 0.0001. Table 5.1.1.6 exhibits the information about the portions of the total variance explained by corresponding factors. 3 factors extracted, among 10 factors, explain 79.853% of the total variance. The increase in portion of total variance explained by extracted factors is expectable since a variable, M.CAP, with low communality is excluded from the set of variables. In the new set of variables, all variables share high amount of their variance with other variables therefore the extracted factors explain more of the total variance contained in the set of remaining variables.

Component matrix is exhibited in Table 5.1.1.7. As seen from the Table, DOMCRE and DBCPStoGDP have no significant loadings. Also, M2, M3, T.OVERtoVOL and V.TRAtoVOL have cross-loadings. Communalities of variables are presented in Table 5.1.1.8. It is seen that DBCPStoGDP is the only variable with communality below 0.5. (0.487)Since some variables have no significant loadings and others have cross-loadings, we applied orthogonal rotation method VARIMAX with purpose of obtaining a more interpretable component matrix.

Table 5.1.1.6: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.034	40.338	40.338	4.034	40.338	40.338
2	2.366	23.662	64.000	2.366	23.662	64.000
3	1.585	15.853	79.853	1.585	15.853	79.853
4	.688	6.876	86.729			
5	.618	6.179	92.908			
6	.321	3.206	96.114			
7	.142	1.419	97.533			
8	.140	1.403	98.936			
9	.077	.774	99.710			
10	.029	.290	100.000			

Table 5.1.1.7: Component Matrix

	Component		
	1	2	3
Zscore(DMA)	.852		
Zscore(TOTDEP)	.774		
Zscore(M3)	.767		.538
Zscore(M2)	.741		.557
Zscore(DOMCRE)	.568	.489	-.405
Zscore(DBCPStoGDP)	.531		
Zscore(VTRADED)	-.413	.818	
Zscore(V.TRAtoVOL)	-.561	.764	
Zscore(T.OVERtoVOL)	-.623	.709	
Zscore: DIFF(M2toM1,1)			.723

Table 5.1.1.8: Communalities

	Initial	Extraction
Zscore(DBCPStoGDP)	1.000	.487
Zscore(DMA)	1.000	.887
Zscore(DOMCRE)	1.000	.726
Zscore(M2)	1.000	.877
Zscore(M3)	1.000	.904
Zscore(TOTDEP)	1.000	.787
Zscore(VTRADED)	1.000	.841
Zscore(T.OVERtoVOL)	1.000	.925
Zscore(V.TRAtoVOL)	1.000	.930
Zscore: DIFF(M2toM1,1)	1.000	.620

Table 5.1.1.9 exhibits the information about the portions of the total variance explained by corresponding factors. As before, after VARIMAX rotation, total variance explained is distributed more even among extracted factors.

Rotated component matrix is shown in Table 5.1.1.10. All of the loadings are above minimum level of 0.65 and none of the variables have cross-loadings.

Table 5.1.1.9: Total Variance Explained (After VARIMAX rotation)

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.034	40.338	40.338	3.026	30.261	30.261
2	2.366	23.662	64.000	2.741	27.407	57.668
3	1.585	15.853	79.853	2.218	22.185	79.853
4	.688	6.876	86.729			
5	.618	6.179	92.908			
6	.321	3.206	96.114			
7	.142	1.419	97.533			
8	.140	1.403	98.936			
9	.077	.774	99.710			
10	.029	.290	100.000			

Table 5.1.1.10: Rotated Component Matrix

	Component		
	1	2	3
Zscore(DMA)	.889		
Zscore(TOTDEP)	.855		
Zscore(DOMCRE)	.849		
Zscore(DBCPStoGDP)	.692		
Zscore(V.TRAtoVOL)		.957	
Zscore(T.OVERtoVOL)		.942	
Zscore(VTRADED)		.901	
Zscore(M3)			.866
Zscore(M2)			.866
Zscore: DIFF(M2toM1,1)			.780

The first factor which explains 30.261% of total variance is composed of DMA, TOTDEP, DOMCRE and DPCPStoGDP. All of the loadings on the first factor are positive meaning that they are positively correlated. Clearly, all these variables explain banking sector development which is an important dimension of financial development. Also it is not surprising to see that banking sector development factor is explaining most of the total variance, since Turkey has a much older and more developed banking sector compared to its stock market. Among the variables in the factor DMA has the highest loading (0.889). This implies that deposit money bank assets divided by nominal GDP is the most appropriate proxy of banking sector development among these four variables. However it should be noted that there is not much difference between loadings of DMA (0.889), TOTDEP (0.855) and DOMCRE (0.849). Therefore factor score, which takes contributions of all variables into account, may be a more appropriate proxy for banking sector development. The second factor which explains 27.407% of the total variance is composed of V.TRAtoVOL, T.OVERtoVOL and V.TRADED. All of the loadings in this factor are positive. V.TRAtoVOL has the largest loading (0.957) in the factor; however, the loadings of other two variables are fairly close to it. Variables in this factor explain different aspects of stock market liquidity. The results suggest that among stock market size, volatility and liquidity which theoretically explain different dimensions of stock market development only stock market liquidity statistically defines stock market development. However, care should be taken when interpreting these results, since stock market capitalization and stock market concentration, which explain overall size of stock market and its structure, may be left out of analysis because they explain a different aspect of the financial development and hence are not correlated with other variables. The third factor which explains 22.185% of the total variance is composed of M2, M3 and M2toM1. Same as other factors, all loadings on this factor are also positive. As we discussed before, these variables give insight into the depth and sophistication of the financial system. Therefore results statistically support the theory that these variables which are related to monetary aggregates explain a part of financial development. Furthermore, the loadings of M2 and M3 (0.866) are equal and they are greater than the loading of M2toM1 (0.780). This implies that M2 and M3 ratios are identical as proxies of financial depth and sophistication.

5.1.2 PCA1B

As stated before, we also present the results in which CONCENTR3, TURNOVER, VOLATILTY and I.RATE are not excluded from analysis. Since theoretically we know that these variables explain important aspects of financial development, even at the expense of violating theoretical foundations of principal component analysis, it is important to examine their contribution to defining financial development. Also we should consider the reason that these variables have unacceptable individual KMO statistics is that they are not correlated with the other variables included in the analysis, and this does not necessarily imply that they do not explain any dimension of the financial development. Besides, anticipating the results, these variables form factors which are economically meaningful. As a result we decided to examine the results, which are quite interesting, when we retain them.

The set of variables have an overall KMO statistic of 0.573 which is above minimum acceptable level of 0.5. Barlett's test confirms existence of non-zero correlations at significance level of 0.0001. Therefore all assumptions of PCA, other than to have a set of variables in which all variables have acceptable individual KMO statistics, hold. Table 5.1.2.1 exhibits the information about the portions of the total variance explained by corresponding factors. 5 factors extracted, among 15 factors, explain 75.143% of the total variance. 75.143% is a fairly adequate percentage to continue on further analysis of variables.

Component matrix is presented in Table 5.1.2.2. It is seen that VOLATILITY, M.CAP, DOMCRE and DBCPStoGDP have no significant loadings. Moreover; T.OVERtoVOL, M3, M2, V.TRAtoVOL, V.TRADED, TURNOVER and CONCENTR3 have cross-loadings. Communalities of variables are shown in Table 5.1.2.3. As seen from Table 5.1.2.3 all of the variables have communalities above minimum level of 0.5. In order to obtain a more interpretable component matrix, we applied orthogonal rotation method VARIMAX.

Table 5.1.2.1: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.358	29.056	29.056	4.358	29.056	29.056
2	2.929	19.530	48.586	2.929	19.530	48.586
3	1.692	11.283	59.869	1.692	11.283	59.869
4	1.171	7.807	67.675	1.171	7.807	67.675
5	1.120	7.468	75.143	1.120	7.468	75.143
6	.872	5.812	80.955			
7	.720	4.798	85.753			
8	.694	4.626	90.379			
9	.547	3.645	94.024			
10	.325	2.167	96.191			
11	.283	1.886	98.077			
12	.133	.889	98.966			
13	.121	.810	99.776			
14	.026	.172	99.948			
15	.008	.052	100.000			

Table 5.1.2.2: Component Matrix(a)

	Component				
	1	2	3	4	5
Zscore(DMA)	.791				
Zscore(T.OVERtoVOL)	-.732	.590			
Zscore(M3)	.722		.505		
Zscore(TOTDEP)	.703	.430			
Zscore(M2)	.702		.515		
Zscore(V.TRAtoVOL)	-.650	.617			
Zscore(DBCPStoGDP)	.485				
Zscore(VTRADED)	-.561	.753			
Zscore(TURNOVER)	-.600	.617			
Zscore(DOMCRE)	.461	.557	-.466		
Zscore(MCAP)		.471			
Zscore: DIFF(M2toM1,1)			.627		
Zscore: DIFF(CONCENTR3,1)				.614	-.542
Zscore: DIFF(VOLATILITY,1)				.581	
Zscore: DIFF(I.RATE,1)					.760

Table 5.1.2.3: Communalities

	Initial	Extraction
Zscore(DMA)	1.000	.897
Zscore(M2)	1.000	.863
Zscore(M3)	1.000	.909
Zscore(TOTDEP)	1.000	.784
Zscore(TURNOVER)	1.000	.778
Zscore(VTRADED)	1.000	.895
Zscore(T.OVERtoVOL)	1.000	.914
Zscore(V.TRAtoVOL)	1.000	.830
Zscore: DIFF(M2toM1,1)	1.000	.616
Zscore: DIFF(VOLATILITY,1)	1.000	.563
Zscore: DIFF(I.RATE,1)	1.000	.673
Zscore: DIFF(CONCENTR3,1)	1.000	.688
Zscore(DBCPStoGDP)	1.000	.573
Zscore(MCAP)	1.000	.530
Zscore(DOMCRE)	1.000	.756

Table 5.1.2.4 exhibits the information about the portions of the total variance explained by corresponding factors after VARIMAX rotation. It is seen that after the rotation while portion of the total variance explained by first factor decreases, portions of total variance explained by other four factors increase.

Table 5.1.2.4: Total Variance Explained (After VARIMAX rotation)

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.358	29.056	29.056	3.478	23.186	23.186
2	2.929	19.530	48.586	3.092	20.613	43.799
3	1.692	11.283	59.869	2.329	15.525	59.324
4	1.171	7.807	67.675	1.206	8.039	67.364
5	1.120	7.468	75.143	1.167	7.780	75.143
6	.872	5.812	80.955			
7	.720	4.798	85.753			
8	.694	4.626	90.379			
9	.547	3.645	94.024			
10	.325	2.167	96.191			
11	.283	1.886	98.077			
12	.133	.889	98.966			
13	.121	.810	99.776			
14	.026	.172	99.948			
15	.008	.052	100.000			

Table 5.1.2.5: Rotated Component Matrix

	Component				
	1	2	3	4	5
Zscore(VTRADED)	.931				
Zscore(T.OVERtoVOL)	.927				
Zscore(V.TRAtoVOL)	.891				
Zscore(TURNOVER)	.860				
Zscore(DMA)		.885			
Zscore(TOTDEP)		.854			
Zscore(DOMCRE)		.841			
Zscore(DBCPStoGDP)		.696			
Zscore(M3)			.867		
Zscore(M2)			.854		
Zscore: DIFF(M2toM1,1)			.759		
Zscore: DIFF(I.RATE,1)				.737	
Zscore: DIFF(VOLATILITY,1)				.675	
Zscore: DIFF(CONCENTR3,1)					.809
Zscore(MCAP)					-.508

Component matrix is presented in Table 5.1.2.5. As seen from Table 5.1.2.5, all of the variables except MCAP have loadings above minimum level of 0.65. Also all of the variables load to only one factor. M.CAP loads to fourth factor and its loading of -0.508 is just above the practical significance level of 0.5. Since, as we will explain later in detail, it is economically meaningful for stock market concentration and stock market capitalization to form a factor that explains stock market size and structure, which is a theoretically important dimension of financial development, we accept - 0.508 as a significant loading.

The first factor which explains 23.186% of the total variance is composed of V.TRADED, T.OVERtoVOL, V.TRAtoVOL and TURNOVER. All variables load positively to the factor and they represent different aspects of stock market liquidity.

V.TRADED (0.931) is the variable with the highest loading; however, the loadings of other variables are also fairly close to it. Therefore as in the previous analysis it is better to use factor score as a proxy variable for stock market liquidity instead of using V.TRADED as sole representative of stock market liquidity. The second factor which explains 20.613% of the total variance is composed of DOMCRE, DMA, TOTDEP and DBCPStoGDP. All of the variables load positively to the factor and they represent different aspects of banking sector development. Also the loadings of variables, except DBCPStoGDP, are fairly close. It is interesting to note that in this result stock market liquidity explains a larger part of the financial development compared to the banking sector development. The third factor which explains 15.525% of the total variance is composed of M3, M2 and M2toM1. As in the previous result, this means that growth of monetary aggregates explains some part of the financial development. The highest loading in this factor is the loading of M3 (0.867) However loadings of other two variables are also fairly close. There are two additional factors which did not exist in the first analysis. First of these additional factors extracted in this analysis explains 8.039% of the total variance and is composed of I.RATE and VOLATILTY. Although it explains a rather small amount of total variance compared to the first three factors, it has an important economic meaning. First difference of I.RATE is the increase in the difference between nominal interest rate volatility and real interest rate volatility. As Lynch (1996) states unless a stable and low inflation is attained, nominal interest rate stability can be achieved only at the expense of real interest rate volatility. And therefore, as we discussed before, project evaluation becomes harder as the difference between nominal interest rate volatility and real interest rate volatility increases. The other variable in this factor is the first difference of stock market volatility. Together these variables explain at least some part of the volatility in the financial markets. It is important to note that both variables load positively, meaning that they are positively related. Therefore we may conclude that as the growth of difference between nominal interest rate volatility and real interest rate volatility increases, implying an increase in financial risks, growth of stock market volatility also increases. Also it should be noted that, although I.RATE has higher loading, since they explain the volatility in the financial system from different perspectives (riskiness of system & volatility of stock market), it is better to use factor score as a proxy variable instead I.RATE. The second additional factor explains 7.780% of the total variance and is composed of CONCENTR3 and M.CAP. As the fourth factor, this factor explains a relatively low portion of total variance but it gives valuable information about an important aspect of financial development which is stock market size and structure. Market capitalization as a share of GDP is an indicator of the stock market size relative to the size of the economy. As explained before, concentration ratio gives information about the structure of the stock market. It should be noted that these variables have loadings with opposite signs. Therefore as stock market gets dominated by large firms, overall size of the stock market contracts, since financial sources of small firms are crowded out by few large firms. Furthermore, we may conclude that while overall size of the stock market is a sign of financial development, a too much concentrated market is a sign of underdevelopment. Also, even CONCENTR3 has a fairly higher loading than M.CAP; as in the case of fourth factor, it is better to use factor score as a proxy variable instead CONCENTR3 since they explain two different and equally important aspects of stock market development.

5.2 PCA2

As we stated before, we also applied principal component analysis to a second sample in which, in addition to the outliers deleted in the first analysis, observations at 1999Q4 and 2001Q2 are also deleted. In this part, we briefly present the results of this second analysis which proves that the results of first analysis are robust to the selection of outliers.

Correlations between variables are shown on Table 5.2.1. 68 out of 105 correlations (64%) are significant at 0.05 significance level. 64% is a fairly adequate percentage for further analysis of variables. In order to assess factorability of the set of variables we use KMO statistic. KMO statistic of 0.575 is above the minimum acceptable level of 0.5. However as in the first analysis some variables have individual KMO statistics lower than 0.5. Again we decided to present results of two different analyses. In the first one (PCA2A), starting with the variable with lowest KMO statistic, we deleted variables with low KMO statistics until we obtain a set of variables in which all variables have KMO statistics above minimum acceptable level of 0.5. And in the second one (PCA2B), we retained these variables with low KMO statistics since they explain important aspects of financial development.

In order to have a set of variables in which all variables have acceptable KMO statistics, starting with CONCENTR3, we need to delete TURNOVER, VOLATILITY and I.RATE. After deleting these variables overall KMO statistic rises to 0.725 which may be interpreted as middling.

5.2.1 PCA2A

The new set of variables in which CONCENTR3, TURNOVER, I.RATE, and VOLATILITY are excluded, in order to have a set of variables in which all variables have acceptable KMO statistics, has an overall KMO statistic of 0.725. Overall KMO statistic of 0.725 shows that set of variables is factorable. Also Barlett's test confirms existence of non-zero correlations at significance level of 0.0001.

Table 5.2.1.1 exhibits the information about the portions of the total variance explained by corresponding factors. 3 factors extracted, among 11 factors, explain 75.670% of the total variance. 75.670% is fairly adequate percentage for further analysis of variables.

Table 5.2.1.1: Total variance explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.155	37.769	37.769	4.155	37.769	37.769
2	2.489	22.630	60.399	2.489	22.630	60.399
3	1.680	15.271	75.670	1.680	15.271	75.670
4	.881	8.008	83.678			
5	.580	5.271	88.949			
6	.463	4.211	93.160			
7	.352	3.200	96.360			
8	.161	1.463	97.823			
9	.137	1.246	99.069			
10	.077	.697	99.766			
11	.026	.234	100.000			

Table 5.2.1: Correlations

	DBCPS toGDP	DMA	DCRE	M2	M3	MCAP	TOTDEP	TOVER	VTRA	T.OVER toVOL	V.TRA toVOL	D(I.R,1)	D(CON3,1)	D(VOLTY,1)	D(M2toM1,1)
DBCPStoGDP	1	.635**	.541**	.292*	.324**	.227	.569**	-.144	-.033	-.066	-.002	-.107	-.026	.058	.036
DMA	.635**	1	.671**	.487**	.522**	.156	.812**	-.277*	-.203	-.401**	-.339**	-.047	-.060	.164	.117
DOMCRE	.541**	.671**	1	.223	.230*	.020	.612**	.062	.113	-.118	-.075	-.037	-.022	.084	.044
M2	.292*	.487**	.223	1	.967**	.233*	.395**	-.241*	-.202	-.269*	-.221	-.120	-.033	-.110	.454**
M3	.324**	.522**	.230*	.967**	1	.307**	.458**	-.237*	-.192	-.268*	-.213	-.092	-.023	-.127	.478**
MCAP	.227	.156	.020	.233*	.307**	1	.104	.043	.139	.167	.217	-.031	-.225	-.269*	.111
TOTDEP	.569**	.812**	.612**	.395**	.458**	.104	1	-.181	-.117	-.285*	-.229*	-.096	-.001	.076	.106
TURNOVER	-.144	-.277*	.062	-.241*	-.237*	.043	-.181	1	.831**	.772**	.579**	.143	.125	-.050	-.086
VTRADED	-.033	-.203	.113	-.202	-.192	.139	-.117	.831**	1	.799**	.814**	.101	.065	.043	-.111
T.OVERtoVOL	-.066	-.401**	-.118	-.269*	-.268*	.167	-.285*	.772**	.799**	1	.919**	.026	.092	-.120	-.002
V.TRAtoVOL	-.002	-.339**	-.075	-.221	-.213	.217	-.229*	.579**	.814**	.919**	1	-.001	.022	-.054	.014
D(I.RATE,1)	-.107	-.047	-.037	-.120	-.092	-.031	-.096	.143	.101	.026	-.001	1	-.057	.160	-.090
D(CON3,1)	-.026	-.060	-.022	-.033	-.023	-.225	-.001	.125	.065	.092	.022	-.057	1	-.047	-.087
D(VOLTY,1)	.058	.164	.084	-.110	-.127	-.269*	.076	-.050	.043	-.120	-.054	.160	-.047	1	-.153
D(M2toM1,1)	.036	.117	.044	.454**	.478**	.111	.106	-.086	-.111	-.002	.014	-.090	-.087	-.153	1

Notes: ** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Component matrix is presented in Table 5.2.1.2. As seen from the component matrix DBCPStoGDP, DOMCRE, MCAP, M2toM1 have loadings below minimum acceptable level of 0.65. Moreover, T.OVERtoVOL, M3, M2 and V.TRAtoVOL have cross-loadings. Communalities of variables are exhibited in Table 5.2.1.3. All variables except M.CAP have communality above minimum level of 0.5. (0.327) Keeping that in mind we continued on further analysis of variables and applied VARIMAX rotation in order to obtain a more interpretable component matrix.

Table 5.2.1.2: Component Matrix

	Component		
	1	2	3
Zscore(DMA)	.864		
Zscore(TOTDEP)	.771		
Zscore(M3)	.763		.533
Zscore(M2)	.737		.538
Zscore(DBCPStoGDP)	.590	.421	
Zscore(DOMCRE)	.567		-.507
Zscore(V.TRAtoVOL)	-.551	.786	
Zscore(VTRADED)	-.464	.776	
Zscore(T.OVERtoVOL)	-.611	.733	
Zscore(MCAP)		.459	
Zscore: DIFF(M2toM1,1)			.644

Table 5.2.1.3: Communalities

	Initial	Extraction
Zscore(DBCPStoGDP)	1.000	.648
Zscore(DMA)	1.000	.878
Zscore(DOMCRE)	1.000	.721
Zscore(M2)	1.000	.862
Zscore(M3)	1.000	.911
Zscore(MCAP)	1.000	.327
Zscore(TOTDEP)	1.000	.770
Zscore: DIFF(M2toM1,1)	1.000	.539
Zscore(V.TRAtoVOL)	1.000	.926
Zscore(T.OVERtoVOL)	1.000	.916
Zscore(VTRADED)	1.000	.827

Table 5.2.1.4 exhibits the information about the portions of the total variance explained by corresponding factors after VARIMAX rotation. It is seen that after the rotation total variance explained is distributed more evenly among extracted factors.

Table 5.2.1.4: Total Variance Explained (After VARIMAX rotation)

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.155	37.769	37.769	3.051	27.738	27.738
2	2.489	22.630	60.399	2.887	26.242	53.980
3	1.680	15.271	75.670	2.386	21.690	75.670
4	.881	8.008	83.678			
5	.580	5.271	88.949			
6	.463	4.211	93.160			
7	.352	3.200	96.360			
8	.161	1.463	97.823			
9	.137	1.246	99.069			
10	.077	.697	99.766			
11	.026	.234	100.000			

Rotated component matrix is presented in Table 5.2.1.5. All of the variables, except MCAP, have loadings higher than 0.75 which is above the minimum level of 0.65. Also all variables load to only one factor. M.CAP loads to the third factor with a loading of 0.452 which is even below 0.5. MCAP has also the lowest communality among variables. (0.327)Since the problem is neither ignorable nor M.CAP has relatively low importance in the set of variables, as in previous analysis (PCA1A), we applied other rotation methods, namely; OBLIMIN, QUARTIMAX, EQUAMAX.[1] However none of these rotation methods solved the problem. Therefore we decided to exclude MCAP from the set of variables.

[1] Results are available upon request.

The new set of variables, after excluding M.CAP, has an overall KMO statistic of 0.736 which may be interpreted as middling. Barlett's test of sphericity also confirms existence of non-zero correlations at significance level of 0.0001. Table 5.2.1.6 exhibits the information about the portions of the total variance explained by corresponding factors after deleting MCAP. It is seen that the portion of the total variance explained by 3 extracted factors increased to 81.135%. Increase in the portion of total variance explained by extracted factors is expectable since we excluded M.CAP, which has the lowest communality among other variables, from the set of variables.

Table 5.2.1.5: Rotated Component Matrix

	Component		
	1	2	3
Zscore(DMA)	.866		
Zscore(DOMCRE)	.848		
Zscore(TOTDEP)	.841		
Zscore(DBCPStoGDP)	.791		
Zscore(V.TRAtoVOL)		.956	
Zscore(T.OVERtoVOL)		.939	
Zscore(VTRADED)		.902	
Zscore(M3)			.882
Zscore(M2)			.862
Zscore: DIFF(M2toM1,1)			.729
Zscore(MCAP)			.452

Component matrix, after excluding M.CAP, is presented in Table 5.2.1.7. It is seen that DBCPStoGDP and DOMCRE have loadings below minimum level of 0.65. Also, T.OVERtoVOL, M3, M2 and V.TRAtoVOL have cross-loadings. Communalities of variables are shown in Table 5.2.1.8. As seen from Table 5.2.1.8, all variables have communalities above minimum level of 0.5. In order to obtain a more interpretable component matrix we applied VARIMAX rotation.

Table 5.2.1.6: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.135	41.351	41.351	4.135	41.351	41.351
2	2.354	23.545	64.896	2.354	23.545	64.896
3	1.624	16.239	81.135	1.624	16.239	81.135
4	.614	6.143	87.278			
5	.511	5.114	92.392			
6	.354	3.541	95.933			
7	.162	1.623	97.556			
8	.139	1.386	98.943			
9	.077	.771	99.714			
10	.029	.286	100.000			

Table 5.2.1.7: Component Matrix(a)

	Component		
	1	2	3
Zscore(DMA)	.861		
Zscore(TOTDEP)	.768		
Zscore(M3)	.750		.563
Zscore(M2)	.727		.576
Zscore(DBCPStoGDP)	.579	.460	
Zscore(DOMCRE)	.565	.471	-.421
Zscore(VTRADED)	-.484	.782	
Zscore(V.TRAtoVOL)	-.575	.759	
Zscore(T.OVERtoVOL)	-.632	.710	
Zscore: DIFF(M2toM1,1)			.707

Table 5.2.1.9 exhibits the information about the portions of the total variance explained by corresponding factors after VARIMAX rotation. As seen from the table, after rotation, total variance explained is distributed more even among 3 factors extracted.

Table 5.2.1.8: Communalities

	Initial	Extraction
Zscore(DBCPStoGDP)	1.000	.644
Zscore(DMA)	1.000	.877
Zscore(DOMCRE)	1.000	.718
Zscore(M2)	1.000	.880
Zscore(M3)	1.000	.909
Zscore(TOTDEP)	1.000	.771
Zscore(VTRADED)	1.000	.846
Zscore(T.OVERtoVOL)	1.000	.928
Zscore(V.TRAtoVOL)	1.000	.931
Zscore: DIFF(M2toM1,1)	1.000	.610

Table 5.2.1.9: Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.135	41.351	41.351	3.039	30.392	30.392
2	2.354	23.545	64.896	2.805	28.055	58.447
3	1.624	16.239	81.135	2.269	22.688	81.135
4	.614	6.143	87.278			
5	.511	5.114	92.392			
6	.354	3.541	95.933			
7	.162	1.623	97.556			
8	.139	1.386	98.943			
9	.077	.771	99.714			
10	.029	.286	100.000			

Rotated component matrix is presented at Table 5.2.1.10. As seen from Table all of the variables have loadings higher than 0.75 which is a rather high value for a loading. Also all variables load to only one factor. Three factors extracted explain 27.738%, 22.630%, 15.271% respectively. First factor consists of variables showing the banking sector development while second and third factor consists of variables representing stock market liquidity and depth of financial system, respectively. It is clearly seen that the results are same as the results of the first analysis (PCA1A).

Table 5.2.1.10: Rotated Component Matrix

	Component		
	1	2	3
Zscore(DMA)	.865		
Zscore(DOMCRE)	.846		
Zscore(TOTDEP)	.841		
Zscore(DBCPStoGDP)	.795		
Zscore(V.TRAtoVOL)		.960	
Zscore(T.OVERtoVOL)		.947	
Zscore(VTRADED)		.911	
Zscore(M3)			.881
Zscore(M2)			.876
Zscore: DIFF(M2toM1,1)			.775

5.2.2 PCA2B

In this part we present results when we retain variables with low individual KMO statistics. Overall KMO statistic of 0.575 is above the minimum acceptable level of 0.5. Barlett's test of sphericty also confirms existence of non-zero correlations at significance level of 0.001. Table 5.2.2.1 exhibits the information about the portions of the total variance explained by corresponding factors. 5 factors extracted, among 15 factors, explain 76.468% of the total variance. 76.468% is a fairly adequate percentage for further analysis of variables.

Component matrix is exhibited in Table 5.2.2.2. It is seen from the component matrix that TURNOVER, DBCPStoGDP, DOMCRE, M2toM1, VOLATILITY, MCAP and I.RATE have loadings that are below minimum level of 0.65. Moreover, TURNOVER, M2, V.TRAtoVOL and V.TRADED have cross-loadings. Communalities of the variables are presented in Table 5.2.2.3. It is seen that all variables have communalities that are above minimum level of 0.5. In order to obtain a more interpretable component matrix we applied VARIMAX rotation.

Table 5.2.2.1: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.495	29.966	29.966	4.495	29.966	29.966
2	2.832	18.878	48.844	2.832	18.878	48.844
3	1.869	12.460	61.304	1.869	12.460	61.304
4	1.170	7.802	69.106	1.170	7.802	69.106
5	1.104	7.363	76.468	1.104	7.363	76.468
6	.869	5.791	82.259			
7	.720	4.800	87.059			
8	.581	3.874	90.933			
9	.436	2.908	93.840			
10	.347	2.311	96.151			
11	.281	1.871	98.022			
12	.137	.915	98.937			
13	.127	.847	99.784			
14	.025	.164	99.948			
15	.008	.052	100.000			

Table 5.2.2.2: Component Matrix

	Component				
	1	2	3	4	5
Zscore(DMA)	.801				
Zscore(T.OVERtoVOL)	-.741	.603			
Zscore(M3)	.706		-.460		
Zscore(TOTDEP)	.696	.408			
Zscore(M2)	.687		-.461		
Zscore(V.TRAtoVOL)	-.661	.623			
Zscore(TURNOVER)	-.646	.558			
Zscore(DBCPStoGDP)	.516	.497			
Zscore(VTRADED)	-.625	.691			
Zscore(DOMCRE)	.461	.504	.487		
Zscore: DIFF(M2toM1,1)			-.578		
Zscore: DIFF(VOLATILITY,1)			.558		.468
Zscore: DIFF(CONCENTR3,1)				.840	
Zscore(MCAP)		.445		-.469	
Zscore: DIFF(I.RATE,1)				-.410	.632

Table 5.2.2.3: Communalities

	Initial	Extraction
Zscore(DBCPStoGDP)	1.000	.679
Zscore(DMA)	1.000	.886
Zscore(M2)	1.000	.877
Zscore(M3)	1.000	.917
Zscore(MCAP)	1.000	.692
Zscore(TOTDEP)	1.000	.768
Zscore(TURNOVER)	1.000	.778
Zscore(VTRADED)	1.000	.900
Zscore(T.OVERtoVOL)	1.000	.924
Zscore(V.TRAtoVOL)	1.000	.836
Zscore: DIFF(CONCENTR3,1)	1.000	.735
Zscore: DIFF(M2toM1,1)	1.000	.576
Zscore: DIFF(I.RATE,1)	1.000	.630
Zscore(DOMCRE)	1.000	.710
Zscore: DIFF(VOLATILITY,1)	1.000	.565

Table 5.2.2.4: Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.495	29.966	29.966	3.524	23.494	23.494
2	2.832	18.878	48.844	3.112	20.746	44.240
3	1.869	12.460	61.304	2.293	15.287	59.528
4	1.170	7.802	69.106	1.276	8.506	68.033
5	1.104	7.363	76.468	1.265	8.435	76.468
6	.869	5.791	82.259			
7	.720	4.800	87.059			
8	.581	3.874	90.933			
9	.436	2.908	93.840			
10	.347	2.311	96.151			
11	.281	1.871	98.022			
12	.137	.915	98.937			
13	.127	.847	99.784			
14	.025	.164	99.948			
15	.008	.052	100.000			

Table 5.2.2.4 exhibits the information about the portions of the total variance explained by corresponding factors after VARIMAX rotation. As seen from the Table, after VARIMAX rotation, while the portion of total variance explained by

first factor falls portions of variance explained by other four factors increases. Rotated component matrix is exhibited in Table 5.2.2.5. It is seen that all variables have loadings higher than minimum level of 0.65. Also all variables load to only one factor. Therefore the component matrix is interpretable.

First factor, which explains 23.494% of the total variance, consists of T.OVERtoVOL, V.TRADED, V.TRAtoVOL and TURNOVER which are variables explaining different aspects of stock market liquidity. Second factor explains 20.746% of the total variance and consists of DMA, TOTDEP, DOMCRE and DBCPStoGDP which are variables representing different aspects of banking sector development. Third factor is formed by M2, M3 and M2toM1, which represent the depth and sophistication of financial system, explains 15.287% of total variance. Fourth factor and fifth factor explains 8.506% and 8.465% of the total variance, respectively. Fourth factor is composed of I.RATE and VOLATILITY, and represent the overall volatility of financial system. Lastly, fifth factor is formed by M.CAP and CONCENTR3 gives information about stock market's size and its structure. It is seen that the results are the same as the first analysis (PCA1B).

Table 5.2.2.5: Rotated Component Matrix(a)

	Component				
	1	2	3	4	5
Zscore(T.OVERtoVOL)	.938				
Zscore(VTRADED)	.938				
Zscore(V.TRAtoVOL)	.894				
Zscore(TURNOVER)	.862				
Zscore(DMA)		.866			
Zscore(TOTDEP)		.840			
Zscore(DOMCRE)		.833			
Zscore(DBCPStoGDP)		.799			
Zscore(M3)			.875		
Zscore(M2)			.866		
Zscore: DIFF(M2toM1,1)			.753		
Zscore: DIFF(I.RATE,1)				.763	
Zscore: DIFF(VOLATILITY,1)				.686	
Zscore: DIFF(CONCENTR3,1)					-.824
Zscore(MCAP)					.692

Table 5.2.2.6: Summary of the results

	Outliers	Original variable set	Variables retained in the result	Overall KMO	Variance explained	Extracted Factors
PCA1A	1994Q2 1998Q3 2000Q1	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2,M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2, M3, M2toM1, VTRADED,TOVERtoVOL, VTRAtoVOL	0.723	79.853%	Factor 1: DMA, TOTDEP, DOMCRE, DBCPStoGDP (30.261%) Factor 2: V.TRAtoVOL, T.OVERtoVOL, V.TRADED (27.407%) Factor 3: M3, M2, M2toM1 (22.185%)
PCA1B	1994Q2 1998Q3 2000Q1	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2,M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2,M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP	0.573	75.143%	Factor 1: V.TRADED, T.OVERtoVOL, V.TRADEDtoVOL, TURNOVER (23.186%) Factor 2: DMA, TOTDEP, DOMCRE, DBCPStoGDP (20.613%) Factor 3: M3, M2, M2toM1 (15.525%) Factor 4: I.RATE, VOLATILITY (8.039%) Factor 5: CONCENTR3, M.CAP (7.780%)
PCA2A	1994Q2 1998Q3 2000Q1 1999Q4 2001Q2	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2,M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2, M3, M2toM1, VTRADED, TOVERtoVOL, VTRAtoVOL	0.736	81.135%	Factor 1: DMA, TOTDEP, DOMCRE, DBCPStoGDP (30.392%) Factor 2: V.TRAtoVOL, T.OVERtoVOL, V.TRADED (28.055%) Factor 3: M3, M2, M2toM1 (22.688%)
PCA2B	1994Q2 1998Q3 2000Q1 1999Q4 2001Q2	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2,M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP	DBCPStoGDP, DOMCRE, TOTDEP, DMA, M2,M3, M2toM1, TURNOVER, VTRADED, VOLATILITY, TOVERtoVOL, VTRAtoVOL, I.RATE, CONCENTR3, MCAP	0.575	76.468%	Factor 1: V.TRADED, T.OVERtoVOL, V.TRADEDtoVOL, TURNOVER (23.494%) Factor 2: DMA, TOTDEP, DOMCRE, DBCPStoGDP (20.746%) Factor 3: M3, M2, M2toM1 (15.287%) Factor 4: I.RATE, VOLATILITY (8.506%) Factor 5: CONCENTR3, M.CAP (8.435%)

CHAPTER 6

CONCLUSION

This thesis investigates the determinants of financial sector development in Turkey for the period between 1988Q2 and 2007Q4. A data set of 15 variables which represents different aspects of financial sector development, namely; stock market development, banking sector development and financial market's sophistication, is analyzed.

In Chapter 1 an overview of finance and growth relationship is presented and financial development is defined conceptually. A review of recent literature in investigating finance and growth relationship is presented in Chapter 2. Principal component analysis (PCA) is used for empirical analysis. In Chapter 3, a brief description of PCA is presented. The variables are analyzed both in conceptual and statistical frameworks in Chapter 4. The empirical results are discussed in Chapter 5. 5 factors are extracted as the main determinants of financial development in Turkey. These factors correspond to banking sector development, stock market liquidity, financial markets' depth and sophistication, overall volatility of financial system and stock market's size and structure.

The results suggest that banking sector development and stock market liquidity are the most important determinants of financial sector development in Turkey. Empirical evidence shows that, although it is measured to a limited extent, depth and sophistication of financial markets is another factor explaining the financial development. The results also support the view that stock market volatility is an important determinant of financial development. Moreover, there exists a positive relationship between the overall riskiness of financial system and stock market volatility. The last determinant of financial development is the size and structure of stock market. There exists a negative relationship between stock market concentration and stock market size. This implies that as stock market is dominated by few large firms, financial sources available for small firms are crowded out and the overall size of stock market contracts.

Financial development has been the subject of many empirical studies in the literature. Most of these empirical studies are related to finance and growth relationship. Majority of studies related to finance and growth relationship support the view that financial development has a significant effect on economic growth. However, the direction of the causality varies depending on the country examined and the variables used as proxies of financial development. Assessing the direction of this causality is especially important for emerging economies such as Turkey. Since their financial sectors are still in the early stages of development; determining the direction of the finance and growth relationship, in this early stage, has many policy implications that may improve economic performance of these countries.

The most important obstacle in front of empirical studies is the measurement problem. Since financial sector development has many aspects, it is difficult to measure the level of financial sector development using a single variable. In order to assess reliable results, it is imperative to construct proxies that represent financial development accurately and comprehensively.

The purpose of this thesis is to solve the proxy variable problem in the literature in investigating the effects of financial development. This study makes two important contributions to the literature. First, to the best of our knowledge, the data set used in the present study is larger than the data sets of previous studies that use PCA in an attempt to obtain a proxy variable for financial development. This large data set enables us to observe the different aspects of financial development. Unlike any other study in the extant literature, we have been able to obtain factors that give insight into financial sector's structure and determinants of financial development in Turkey.

Second, factor scores obtained from the PCA results may be used in further time series analyses that rely on measuring financial development in Turkey. Previous time series analyses that rely on measuring financial development in Turkey use either a single variable or indices formed by limited data sets as proxies of financial development. Since these proxies do not represent financial development comprehensively, results of these studies should be viewed with caution. By providing more accurate proxies for different aspects of financial development, this study constitutes a strong basis for further time series analyses related to financial development in Turkey.

APPENDIX

In this part we present the results of analysis when F.LIQ, a variable measuring the overall liquidity of the financial system, is included in the analysis. Since F.LIQ is only available for sample period 1990Q2-2007Q4, we included it in a separate analysis.

Results of the unit root tests are presented in Table A.1 and Table A.2. Although there are discrepancies between results of different tests; DBCPStoGDP, DOMCRE, TOTDEP, M2, M3, MCAP, TURNOVER, VTRADED, T.OVERtoVOL, VTRAtoVOL, I.RATE, DMA and F.INT are stationary and M2toM1, VOLATILITY and CONCENTR3 are I(1). Following Yang and Shahabi (2005) we take first difference of variables that are I(1) in order to work with stationary variables.

As before, we examined the data both by means of univariate perspective and multivariate perspective to designate outliers. In order to assess outliers in univariate dimension we transformed data values to standard scores and examined extremely high and low values. Variables with most extreme values and the corresponding quarters during which these extreme values observed are exhibited in Table A.3.

We calculated the probability of Mahalanobis D^2 score in order to assess outliers in multivariate dimension. The results indicate that, at significance level of 0.001, unique combinations of variables stand out as an outlier among other observations only at 2000Q1 and 1998Q3.

As we discussed before, while extremely high value of volatility in 1998Q3 (3.37192) is an unusual observation due to Russian economic crisis, its extreme value in 1999Q4 (3.05539) is not necessarily an unusual observation. Extremely low value of I.RATE (-4.27475), and extremely high values of M.CAP (3.88473) and V.TRADED (3.77665) in 2000Q1 are due to expectations. Also high value of DOMCRE (3.37192) in 2006Q1 is not necessarily an unusual observation.

Table A.1: Results of unit root tests for the levels of variables before outliers are eliminated

	Variable	ADF	P-P	DFGLS	KPSS		Variable	ADF	P-P	DFGLS	KPSS
INTERCEPT	DBCPStoGDP	-1.892407(3)	-5.666758**	-1.793300(3)	0.349468	INTERCEPT AND TREND	DBCPStoGDP	-2.082672(3)	-5.937368**	-1.880187(3)	0.124407
	DOMCRE	-6.610516(0)**	-6.610516**	-1.535236(3)	0.271278		DOMCRE	-6.712351(0)**	-6.712351**	-1.804022(3)	0.207242*
	TOTDEP	-3.162940(1)*	-5.408003**	-2.491353(1)*	0.438732		TOTDEP	-5.751939(0)**	-5.742860**	-2.886884(1)	0.254110
	M2	-5.933130(0)**	-5.974985**	-5.022400(0)**	0.535820*		M2	-6.257475(0)**	-6.303953**	-6.225047(0)	0.200776*
	M3	-5.828999(0)**	-5.776862**	-4.890285(0)**	0.524741*		M3	-6.133402(0)**	-6.181304**	-6.083571(0)**	0.199659*
	M2toM1	-1.251380(0)	-1.250157	-0.458576(0)	0.818505**		M2toM1	-1.623558(0)	-1.655451	-1.668497(0)	0.206114*
	MCAP	-6.914226(0)**	-6.923361**	-6.388582(0)**	0.100688		MCAP	-6.866037(0)**	-6.875715**	-6.818391(0)**	0.084075
	TURNOVER	-3.537601(0)**	-3.537601**	-1.884138(1)	0.748348**		TURNOVER	-4.390090(0)**	-4.254082**	-4.426710(0)**	0.126197
	VTRADED	-3.599764(0)**	-3.517488*	-2.883798(0)**	0.899522**		VTRADED	-4.928731(0)**	-4.955220**	-4.997672(0)**	0.110514
	VOLATILITY	-1.307925(0)	-1.307925	-0.943736(0)	0.362028		VOLATILITY	-1.708043(0)	-1.708043	-1.792725(0)	0.166609*
	TOVERtoVOL	-2.154788(0)	-1.814043(4)	-0.954313(1)	0.892028		TOVERtoVOL	-4.004623(0)*	-3.885620*	-4.007290(0)**	0.158423*
	VTRAtoVOL	-1.918211(0)	-1.582300	-1.541093(0)	0.898263		VTRAtoVOL	-4.052133(0)*	-3.919623*	-4.020206(0)**	0.187020*
	CONCENTR3	1.844408(4)	2.165344	1.750245(4)	1.015094**		CONCENTR3	-0.425627(4)	-1.735301	-0.597069(4)	0.276419**
	IRATE	-2.989329(0)*	-2.981018*	-3.003546(0)**	0.168556		IRATE	-3.151173(0)	-3.144336	-3.205626(0)*	0.067901
	DMA	-4.044307(0)**	-3.932474**	-3.988715(0)**	0.611689*		DMA	-4.704583(0)**	-4.635063**	-4.388840(0)**	0.239112**
	F.LIQ	-4.891694(0)**	-4.861155**	-4.272279(0)**	0.675029*		F.LIQ	-6.015837(0)**	-5.998729**	-6.098104(0)**	0.075150

Notes: ** Significant at 0.01

*Significant at 0.05

Table A.2: Results of unit root tests for the first differences of variables before outliers are eliminated

	Variable	**ADF**	**P-P**				**Variable**	**ADF**	**P-P**		
INTERCEPT	M2toM1	-7.112427(1)**	-7.040330**	-6.269630(0)**	0.111400	**INTERCEPT AND**	M2toM1	-7.100695(1)**	-7.032136**	-6.883746(0)**	0.089355
	VOLATILITY	-9.174799(0)**	-9.188455**	-1.338821(4)	0.119949		VOLATILITY	-9.199325(0)**	-9.225674**	-7.101259(0)**	0.082721
	CONCENTR3	-3.589144(3)**	-10.06229**	-2.499086(3)*	0.353354		CONCENTR3	-8.523198(2)**	-18.37120**	-8.472400(2)**	0.144375

Notes: ** Significant at 0.01

*Significant at 0.05

Table A.3: Variables with most extreme values

OBSERVATION	VARIABLE	STANDARD SCORE
1998Q3	VOLATILITY	3.37192
1999Q4	VOLATILITY	3.05539
2000Q1	MCAP	3.88473
2000Q1	VTRADED	3.77665
2000Q1	I.RATE	-4.27475
2000Q1	M2toM1	3.10268
2001Q2	DOMCRE	3.37192
2006Q1	V.TRAtoVOL	3.26431
2006Q4	F.LIQ	3.07727
2007Q1	F.LIQ	3.26431

Other extreme values are high values of F.LIQ in 2006Q4 (3.07727) and 2007Q1 (3.26431) and high value of V.TRAtoVOL (3.26431) in 2006Q1. It is known that financial turmoil that started at May 2006 affected Turkey more severely than other emerging markets that suffered from this turmoil. During this financial turmoil Turkey experienced a severe outflow of portfolio investments. However at the second quarter of 2006 foreign direct investment inflow increased and compensated the portfolio investment outflow. As stated by Onaran (2007), with the end of the financial turmoil, central bank attracted foreign investors by increasing interest rates and economy calmed down by the portfolio investment inflows. These high values of portfolio investment and foreign direct investment inflows continued till the second quarter of 2007. In their study comparing the effects of financial fluctuation in 2006 and the financial fluctuations at 2003 and 2004; Sak and Acar (2006) state that after the 2006 financial fluctuation the riskiness of the Turkish economy measured by EMBI+ index, which is an index prepared by J.P. Morgan that measures the risks of emerging markets, raised over the average riskiness of the overall emerging market economies. Moreover, during first months of 2007; carry-traders, who invest the funds they raised from Japan at a low cost to emerging markets in order to benefit from the high-yields of financial instruments in emerging markets, tried to close their positions due to the expectations of an appreciation in Yen. This movement in financial markets also increased the risk premium of emerging markets such as Turkey. (Central Bank of Turkey Financial Stability Report, 2007) It may be claimed that the extreme values of F.LIQ at 2006Q4 and 2007Q4 are due to unusual fluctuations in international economy, however it should be noted that the F.LIQ is a variable which highly depends on the foreign investors' risk perception on Turkish economy. Therefore, as we will discuss later, to some extend the variable measures the overall liquidity of financial system with respect to the foreign investors' risk perception. Thus it would be inconvenient to delete observations at 2006Q4 and 2007Q1, claiming that these observations are both statistically and economically unusual values. Moreover probability of Mahalanobis D^2 score of 0.22559 and 0.20433 for observations at 2006Q4 and 2007Q1 are much higher than the significance level of 0.001. Therefore unique combinations of variables at these observations do not stand out as an outlier among other observations. Also extreme value of V.TRAtoVOL is probably due to the increase in portfolio flows during first half of 2006, which is not a result of an unusual financial fluctuation. As a result, we eliminated observations 1998Q3 and 2000Q1; since they are designated as outliers both by means of univariate perspective and multivariate perspective.

After eliminating observations designated as outliers, as before, we tested for unit root using Augmented Dickey-Fuller, Phillips-Perron, Elliot-Rothenberg-Stock DFGLS and KPSS tests. Results of these unit root tests are exhibited in Table A.4 and Table A.5. DBCPStoGDP, DOMCRE, TOTDEP, M2, M3, MCAP, TURNOVER, VTRADED, T.OVERtoVOL, VTRAtoVOL, I.RATE, DMA and F.INT are stationary and M2toM1, VOLATILITY and CONCENTR3 are I(1). Following Yang and Shahabi we take first difference of variables that are I(1) in order to work with stationary variables.

Correlation matrix of variables is shown on Table A.6. 69 out of 120 (57.5%) correlations are significant at significance level of 0.05. 57.5% is fairly adequate percentage of correlation between variables for further analysis of variables. Overall KMO statistic of 0.625 shows that, degree of intercorrelations among variables is adequate for principal component analysis. Barlett's Test of Sphericity also confirms the presence of correlations among variables at significance level of 0.0001.

Table A.4: Results of unit root tests for the levels of variables after outliers are eliminated

INTERCEPT

Variable	ADF	P-P	DFGLS	KPSS
DBCPStoGDP	-5.323209(0)**	-5.323209**	-1.725007(3)	0.296296
DOMCRE	-6.359938(0)**	-6.365458**	-1.466485(3)	0.273805
TOTDEP	-3.130377(1)*	-5.307711**	-2.497406(1)*	0.419492
M2	-5.992405(0)**	-6.030348**	-5.086526(0)**	0.572295*
M3	-5.862474(0)**	-5.900087**	-4.932379(0)**	0.509048*
M2toM1	-1.297845(0)	-1.226559	-0.570571(0)	0.812093**
MCAP	-7.965371(0)**	-7.970420**	-7.033160(0)**	0.136141
TURNOVER	-3.509026(0)*	-3.537601**	-1.884138(1)	0.748348**
VTRADED	-3.748936(0)**	-3.511064*	-1.899001(1)	0.899876**
VOLATILITY	-1.339714(0)	-1.347922	-0.946472(0)	0.384912
TOVERtoVOL	-2.135346(0)	-1.844253	-0.947376(1)	0.880749
VTRAtoVOL	-1.859906(0)	-1.504062	-1.502369(0)	0.881665**
CONCENTR3	2.329829(2)	2.114139	2.921295(2)	0.994463**
IRATE	-3.026464(0)*	-3.062183*	-3.053815(0)**	0.191110
DMA	-3.987180(0)**	-4.236601**	-3.939129(0)**	0.579390*
F.INT	-4.445516(0)**	-4.383817**	-3.926071(0)**	0.667120*

INTERCEPT AND TREND

Variable	ADF	P-P	DFGLS	KPSS
DBCPStoGDP	-5.564096(0)**	-5.498189**	-5.263464(0)**	0.131222
DOMCRE	-6.452526(0)**	-6.449990**	-1.704016(3)	0.218159**
TOTDEP	-5.683255(0)**	-5.564710**	-2.880362(1)	0.244772**
M2	-6.311840(0)**	-6.353145**	-6.280734(0)**	0.194645*
M3	-6.159624(0)**	-6.159624**	-6.111156(0)**	0.193841*
M2toM1	-1.810916(0)	-1.872659	-1.855168(0)	0.194957*
MCAP	-7.914128(0)**	-7.920136**	-7.779472(0)**	0.105833
TURNOVER	4.365185(0)**	-4.254082**	-4.426710(0)**	0.126197
VTRADED	-5.852058(0)**	-5.865074**	-5.937273(0)**	0.099149
VOLATILITY	-1.777884(0)	-1.718518	-1.857142(0)	0.157330*
TOVERtoVOL	-4.011617(0)*	-3.894720*	-4.010241(0)**	0.153877*
VTRAtoVOL	-4.040375(0)*	-3.951199*	-3.999662(0)**	0.195873*
CONCENTR3	-0.494281(2)	-1.617352	-0.366628(2)	0.272715**
IRATE	-3.248824(0)	-3.162040	-3.304459(0)*	0.078899
DMA	-4.616504(0)**	-4.761264**	-4.328945(0)**	0.230733**
	-5.548793(0)**	-5.569077**	-5.625721(0)**	0.084049

Notes: ** Significant at 0.01

*Significant at 0.05

Table A.5: Results of unit root tests for the first differences of variables after outliers are eliminated

	Variable	ADF	P-P				Variable	ADF	P-P		
INTERCEPT	M2toM1	7.232481(1)**	-7.756240**	-6.854704(0)**	0.114422	INTERCEPT AND	M2toM1	-7.208614(1)**	-7.729476**	-7.464872(0)**	0.097164
	VOLATILITY	-8.615706(0)**	-8.615706(0)**	-2.090412(2)*	0.095656		VOLATILITY	-8.630057(0)**	-8.630057**	-6.782173(0)**	0.077084
	CONCENTR3	-9.869983(1)**	-10.35764**	-2.456380(3)*	0.353174*		CONCENTR3	-10.75470(1)**	-27.54659**	-10.80073(1)**	0.201779*

Notes: ** Significant at 0.01

*Significant at 0.05

Table A.6: Correlations

Correlations

	DBC PSto GDP	DMA	DOM CRE	M2	M3	MCAP	TOT DEP	TURN OVER	VTRAD ED	I. RATE	T. OVERto VOL	V. TRAto VOL	F.LIQ	DIFF(M 2toM1)	DIFF(V OLTY)	DIFF(C0 N3)
DBCPStoGDP	1	.541**	.390**	.218	.270*	.178	.456**	-.243*	-.108	-.168	-.101	-.026	-.071	-.024	.020	-.045
DMA	.541**	1	.718**	.549**	.573**	.212	.834**	-.275*	-.164	-.122	-.457**	-.367**	-.165	.069	.206	-.046
DOMCRE	.390**	.718**	1	.277*	.299*	.121	.606**	.026	.125	-.158	-.229	-.145	.012	.017	.187	.024
M2	.218	.549**	.277*	1	.977**	.297*	.515**	-.144	-.094	-.054	-.231	-.182	-.143	.404**	.023	.062
M3	.270*	.573**	.299*	.977**	1	.356**	.540**	-.139	-.078	-.070	-.224	-.167	-.166	.423**	-.006	.072
MCAP	.178	.212	.121	.297*	.356**	1	.145	.030	.182	-.255*	.107	.184	-.079	.090	-.090	-.097
TOTDEP	.456**	.834**	.606**	.515**	.540**	.145	1	-.225	-.127	-.110	-.373**	-.289*	-.135	.121	.130	.014
TURNOVER	-.243*	-.275*	.026	-.144	-.139	.030	-.225	1	.793**	.147	.704**	.506**	.232	-.110	-.064	.104
VTRADED	-.108	-.164	.125	-.094	-.078	.182	-.127	.793**	1	-.486**	.720**	.764**	.480**	-.153	-.010	-.006
I.RATE	-.168	-.122	-.158	-.054	-.070	-.255*	-.110	.147	-.486**	1	-.160	-.515**	-.444**	.095	-.073	.163
T.OVERtoVOL	-.101	-.457**	-.229	-.231	-.224	.107	-.373**	.704**	.720**	-.160	1	.911**	.461**	.000	-.144	.081
V.TRAtoVOL	-.026	-.367**	-.145	-.182	-.167	.184	-.289*	.506**	.764**	-.515**	.911**	1	.556**	.011	-.083	-.004
F.LIQ	-.071	-.165	.012	-.143	-.166	-.079	-.135	.232	.480**	-.444**	.461**	.556**	1	.196	.041	.094
M2toM1,1	-.024	.069	.017	.404**	.423**	.090	.121	-.110	-.153	.095	.000	.011	.196	1	.033	.097
DIFF(VLTILTY)	.020	.206	.187	.023	-.006	-.090	.130	-.064	-.010	-.073	-.144	-.083	.041	.033	1	.028
DIFF(CON3)	-.045	-.046	.024	.062	.072	-.097	.014	.104	-.006	.163	.081	-.004	.094	.097	.028	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

However as in the previous analyses some variables such as CONCENTR3, I.RATE and VOLATILITY which represent important dimensions of financial development that are unexplained by other variables in the data set have individual KMO statistics that are lower than the acceptable level. In order to have a data set in which all variables have acceptable KMO statistics we had to exclude CONCENTR3, I.RATE, VOLATILITY, TURNOVER and M2toM1. However excluding these variables would cause huge loss of information related to different aspects of financial development. Therefore we decided to retain these variables.

Table A.7 exhibits the information about the portions of total variance explained by corresponding factors. Since we set the factor selection criteria as to extract factors that have eigenvalues over 1; among possible 16 factors, 5 factors are extracted. Extracted factors explain 75.096% of the total variance which is fairly adequate for further analysis.

Table A.7: Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.642	29.013	29.013	4.642	29.013	29.013
2	3.119	19.494	48.507	3.119	19.494	48.507
3	1.675	10.469	58.975	1.675	10.469	58.975
4	1.331	8.321	67.296	1.331	8.321	67.296
5	1.248	7.800	75.096	1.248	7.800	75.096
6	.931	5.817	80.913			
7	.782	4.887	85.799			
8	.710	4.438	90.238			
9	.586	3.661	93.899			
10	.323	2.020	95.919			
11	.316	1.972	97.891			
12	.202	1.265	99.156			
13	.106	.663	99.819			
14	.018	.110	99.929			
15	.011	.070	99.999			
16	.000	.001	100.000			

Component matrix is presented in Table A.8. It is clearly seen from component matrix that some variables have no significant loadings and most of the variables have cross-loadings. Therefore we applied orthogonal rotation method VARIMAX in order to obtain a more interpretable component matrix.

Table A.8: Component Matrix

	Component				
	1	2	3	4	5
Zscore(DMA)	.812	.401			
Zscore(T.OVERtoVOL)	-.781	.463			
Zscore(TOTDEP)	.738	.400			
Zscore(V.TRAtoVOL)	-.714	.607			
Zscore(M3)	.656	.480	.498		
Zscore(M2)	.643	.447	.501		
Zscore(TURNOVER)	-.598			.510	
Zscore(DOMCRE)	.492	.474			
Zscore(DBCPStoGDP)	.447				
Zscore(VTRADED)	-.603	.700			
Zscore(I.RATE)		-.594		.479	
Zscore(MCAP)		.467		-.414	
Zscore: DIFF(M2toM1,1)			.644		.475
Zscore: DIFF(CONCENTR3,1)				.544	
Zscore(F.INT)	-.457	.453			.581
Zscore: DIFF(VOLATILITY,1)					.460

Information about the portions of total variance explained by corresponding factors, after VARIMAX rotation, is exhibited in Table A.9. After the rotation, portion of the total variance explained by first factor decreases and the portions of the total variance explained by other 4 factors increase.

As seen from the component matrix, presented in Table A.10, even after VARIMAX rotation, results are not clear. V.TRAtoVOL has a cross-loading. Also loadings of VOLATILTY and CONCENTR3 are below 0.65 but above practical level. We also applied other rotation methods such as OBLIMIN, QUARTIMAX and EQUAMAX but same problems exist regardless of the rotation method applied. [1] Communalities of variables are exhibited in Table A.11. Among the problematic variables V.TRAtoVOL (0.903), VOLATILITY (0.419) and CONCENTR3 (0.441);

[1] Results are available upon request

VOLATILITY has the lowest communality. This means, variance that V.TRAtoVOL shares with other variables is larger than the variances shared with other variables by VOLATILITY and CONCENTR3. Although standard procedures suggest eliminating the variable with the lowest communality, since our purpose is to use a data set that consists of variables which represents as many different dimensions of financial development as possible, we decided to exclude V.TRAtoVOL from analysis. Since there are 3 variables other than V.TRAtoVOL that explain different aspects of stock market liquidity, deleting V.TRAtoVOL causes minimum loss of information contained in the dataset, compared to the cases in which the other two problematic variables are deleted.

Table A.9: Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.642	29.013	29.013	3.319	20.745	20.745
2	3.119	19.494	48.507	3.221	20.134	40.879
3	1.675	10.469	58.975	2.217	13.857	54.736
4	1.331	8.321	67.296	1.904	11.899	66.635
5	1.248	7.800	75.096	1.354	8.461	75.096
6	.931	5.817	80.913			
7	.782	4.887	85.799			
8	.710	4.438	90.238			
9	.586	3.661	93.899			
10	.323	2.020	95.919			
11	.316	1.972	97.891			
12	.202	1.265	99.156			
13	.106	.663	99.819			
14	.018	.110	99.929			
15	.011	.070	99.999			
16	.000	.001	100.000			

Table A.10: Rotated Component Matrix

	Component				
	1	2	3	4	5
Zscore(DMA)	.903				
Zscore(DOMCRE)	.846				
Zscore(TOTDEP)	.821				
Zscore(DBCPStoGDP)	.613				
Zscore(TURNOVER)		.926			
Zscore(VTRADED)		.885			
Zscore(T.OVERtoVOL)		.841			
Zscore(V.TRAtoVOL)		.729		.556	
Zscore(M3)	.449		.804		
Zscore(M2)	.421		.799		
Zscore: DIFF(M2toM1,1)			.799		
Zscore(I.RATE)				-.851	
Zscore(F.INT)				.696	
Zscore(MCAP)					-.643
Zscore: DIFF(VOLATILITY,1)					.540
Zscore: DIFF(CONCENTR3,1)					.516

Table A.11: Communalities

	Initial	Extraction
Zscore(DBCPStoGDP)	1.000	.451
Zscore(DMA)	1.000	.907
Zscore(M2)	1.000	.867
Zscore(M3)	1.000	.915
Zscore(MCAP)	1.000	.574
Zscore(TOTDEP)	1.000	.766
Zscore(TURNOVER)	1.000	.925
Zscore(VTRADED)	1.000	.911
Zscore(I.RATE)	1.000	.835
Zscore(T.OVERtoVOL)	1.000	.869
Zscore(F.INT)	1.000	.756
Zscore: DIFF(M2toM1,1)	1.000	.723
Zscore: DIFF(VOLATILITY,1)	1.000	.419
Zscore: DIFF(CONCENTR3,1)	1.000	.441
Zscore(DOMCRE)	1.000	.753
Zscore(V.TRAtoVOL)	1.000	.903

Table A.12: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.266	28.441	28.441	4.266	28.441	28.441
2	2.662	17.749	46.190	2.662	17.749	46.190
3	1.675	11.165	57.355	1.675	11.165	57.355
4	1.304	8.691	66.047	1.304	8.691	66.047
5	1.242	8.280	74.327	1.242	8.280	74.327
6	.923	6.155	80.482			
7	.781	5.206	85.688			
8	.692	4.613	90.301			
9	.569	3.794	94.094			
10	.323	2.151	96.245			
11	.285	1.897	98.142			
12	.156	1.037	99.179			
13	.106	.706	99.885			
14	.017	.114	99.999			
15	.000	.001	100.000			

Table A.13: Component Matrix

	Component				
	1	2	3	4	5
Zscore(DMA)	.884				
Zscore(TOTDEP)	.815				
Zscore(M3)	.761		.498		
Zscore(M2)	.739		.502		
Zscore(DOMCRE)	.587				
Zscore(DBCPStoGDP)	.535				
Zscore(VTRADED)	-.406	.863			
Zscore(T.OVERtoVOL)	-.618	.624			
Zscore(TURNOVER)	-.498	.582			.426
Zscore(I.RATE)		-.563		.459	.401
Zscore: DIFF(M2toM1,1)			.643		-.479
Zscore: DIFF(CONCENTR3,1)				.587	
Zscore(MCAP)				-.506	
Zscore: DIFF(VOLATILITY,1)					
Zscore(F.INT)		.559			-.607

After excluding V.TRAtoVOL the new data set has an overall KMO statistic of 0.603 which is above acceptable level. Barlett's test of sphericity also confirms presence of correlation among variables at significance level of 0.001. Table A.12 exhibits the information about the portions of total variance explained by corresponding factors. 5 factors extracted, explain 74.327% of the total variance. Component matrix is presented in Table A.13. Since some variables load to more than one factor and some variables have no significant loadings, as before, we applied VARIMAX rotation in order to obtain a more interpretable component matrix.

Information about the portions of total variance explained by corresponding factors after rotation is exhibited in Table A.14. After VARIMAX rotation, the portions of total variance explained by first two factors decreased and the portions of total variance explained by other factors increased

Rotated component matrix is presented in Table A.15. As seen from the rotated component matrix, most of the variables have loadings above statistically convenient level of 0.65. DBCPStoGDP, CONCENTR3 and MCAP have loadings above practical level and there are no cross-loadings. However fifth factor which consists of M.CAP, CONCENTR3 and VOLATILITY has no economic meaning. Although M.CAP and CONCENTR3 give information about stock market size and structure, stock market volatility has no relation with these variables according to economic theory. Since applying other rotation methods does not solve the problem and reducing number of factors creates other problems, we decided to delete VOLATILITY.

The new data set, in which VOLATILITY is excluded, has an overall KMO statistic of 0.606 is above the minimum acceptable level. Barlett's test of sphericty confirms presence of correlations among variables at significance level of 0.001. Information about the portions of total variance explained by corresponding factors after rotation is exhibited in Table A.16. 5 factors extracted explain 78.496% of the total variance.

Table A.14: Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.266	28.441	28.441	3.273	21.821	21.821
2	2.662	17.749	46.190	2.611	17.406	39.227
3	1.675	11.165	57.355	2.239	14.926	54.154
4	1.304	8.691	66.047	1.681	11.207	65.361
5	1.242	8.280	74.327	1.345	8.966	74.327
6	.923	6.155	80.482			
7	.781	5.206	85.688			
8	.692	4.613	90.301			
9	.569	3.794	94.094			
10	.323	2.151	96.245			
11	.285	1.897	98.142			
12	.156	1.037	99.179			
13	.106	.706	99.885			
14	.017	.114	99.999			
15	.000	.001	100.000			

Table 15: Rotated Component Matrix

	Component				
	1	2	3	4	5
Zscore(DMA)	.904				
Zscore(DOMCRE)	.842				
Zscore(TOTDEP)	.823				
Zscore(DBCPStoGDP)	.623				
Zscore(TURNOVER)		.945			
Zscore(VTRADED)		.870			
Zscore(T.OVERtoVOL)		.800			
Zscore(M3)			.811		
Zscore(M2)			.807		
Zscore: DIFF(M2toM1,1)			.794		
Zscore(I.RATE)				-.850	
Zscore(F.INT)				.751	
Zscore(MCAP)					-.656
Zscore: DIFF(CONCENTR3,1)					.537
Zscore: DIFF(VOLATILITY,1)					.527

Component matrix is presented in Table A.17. As seen from the component matrix, since there are both cross-loadings and insignificant loadings, the results are not clear. Therefore in order to obtain a more interpretable component matrix we applied VARIMAX rotation.

Table A.16: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.247	30.333	30.333	4.247	30.333	30.333
2	2.662	19.014	49.348	2.662	19.014	49.348
3	1.644	11.745	61.093	1.644	11.745	61.093
4	1.279	9.137	70.230	1.279	9.137	70.230
5	1.157	8.267	78.496	1.157	8.267	78.496
6	.816	5.828	84.324			
7	.721	5.152	89.476			
8	.581	4.151	93.628			
9	.323	2.310	95.937			
10	.285	2.036	97.973			
11	.156	1.117	99.090			
12	.110	.783	99.873			
13	.018	.126	99.999			
14	.000	.001	100.000			

Table A.17:Component Matrix

	Component				
	1	2	3	4	5
Zscore(DMA)	.879				
Zscore(TOTDEP)	.813				
Zscore(M3)	.767		.476		
Zscore(M2)	.744		.488		
Zscore(DOMCRE)	.581				
Zscore(DBCPStoGDP)	.537				
Zscore(VTRADED)	-.409	.862			
Zscore(T.OVERtoVOL)	-.615	.624			
Zscore(TURNOVER)	-.498	.582		.522	
Zscore: DIFF(M2toM1,1)			.679		
Zscore(I.RATE)		-.562	.400	.582	
Zscore(F.INT)		.557			.600
Zscore(MCAP)		.402			-.556
Zscore: DIFF(CONCENTR3,1)				.444	.456

Table 18 exhibits information about the portions of total variance explained by corresponding factors after rotation. It is seen from the table that, after the rotation, portion of total variance explained is redistributed from first two factors to other 3 factors.

Rotated component matrix is exhibited in Table 19. All variables except DBCPStoGDP and M.CAP have loadings above 0.65. However, these two variables have loadings that are very close to 0.65, therefore the results are statistically acceptable and all factors have economic meanings. First factor which explains 22.090% of total variance consists of variables representing banking system development. Second factor, formed by variables representing different aspects of stock market liquidity, explains 18.331% of total variance. Third factor consists of variables related to depth and sophistication of financial system, and explains 16.930% of total variance. 9.412% of the total variance is explained by fifth factor which gives information about stock market size and structure. Fourth factor is the only difference of this analysis from the previous analyses in which F.LIQ is not included. Fourth factor explains 11.733% of total variance and is formed by I.RATE and F.LIQ. It is important to note that loadings of these variables have opposite signs, meaning that they are negatively correlated. As we discussed before, as I.RATE increases, which is the difference between nominal interest rate volatility and real interest rate volatility, project evaluation becomes harder and this creates an additional risk for investors. In previous analyses we claimed that this additional risk creates volatility in the financial system. However this result suggests that overall liquidity of the financial system, measured by magnitude of capital flows relative to nominal GDP, is negatively related to the risk of the economy measured by I.RATE. Therefore we may claim that as the risk of the economy increases, liquidity of financial system decreases, meaning that in order to avoid risks related to uncertainties investors prefer to trade in economies with less uncertainties. Overall, the factor represents the financial systems liquidity relative to its riskiness. It is also important to note that, although the loading of the F.LIQ is higher than the loading of I.RATE; since they jointly explain liquidity of financial system relative to its riskiness, it is better to use factor score as proxy variable rather than using only F.LIQ as proxy variable.

Table A.18: Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.247	30.333	30.333	3.093	22.090	22.090
2	2.662	19.014	49.348	2.566	18.331	40.422
3	1.644	11.745	61.093	2.370	16.930	57.352
4	1.279	9.137	70.230	1.643	11.733	69.085
5	1.157	8.267	78.496	1.318	9.412	78.496
6	.816	5.828	84.324			
7	.721	5.152	89.476			
8	.581	4.151	93.628			
9	.323	2.310	95.937			
10	.285	2.036	97.973			
11	.156	1.117	99.090			
12	.110	.783	99.873			
13	.018	.126	99.999			
14	.000	.001	100.000			

Table A.19: Rotated Component Matrix

	Component				
	1	2	3	4	5
Zscore(DMA)	.889				
Zscore(DOMCRE)	.856				
Zscore(TOTDEP)	.824				
Zscore(DBCPStoGDP)	.642				
Zscore(TURNOVER)		.946			
Zscore(VTRADED)		.881			
Zscore(T.OVERtoVOL)		.789			
Zscore(M3)			.861		
Zscore(M2)			.852		
Zscore: DIFF(M2toM1,1)			.741		
Zscore(F.LIQ)				.841	
Zscore(I.RATE)				-.780	
Zscore: DIFF(CONCENTR3,1)					.698
Zscore(MCAP)					-.643

REFERENCES

Akyüz, Y., Boratav, K. (2003), "The Making of Turkish Financial Crisis", World Development Vol. 31, No. 9, pp. 1549–1566

Ang, J. B. (2008), "A Survey of Recent Developments in the Literature of Finance and Development", Journal of Economic Surveys (2008) Vol. 22, No. 3, pp. 536–576

Ang, J.B., McKibbin, W.J. (2007), "Financial liberalization, financial sector development and growth: Evidence from Malaysia", Journal of Development Economics, Vol.84, No: 1 (September 2007), pp. 215-233

Arestis, P., Demetriades, P. (1997), "Financial Development and Economic Growth: Assessing the Evidence", The Economic Journal, Vol. 107, No. 442 (May, 1997), pp. 783-799

Bagehot, W., "Lombard Street" in Levine, R. (1997), "Financial Development and Growth: Views and Agenda", Journal of Economic Literature, Vol.35 (June 1997), pp. 688–726

Beck, T., Demirgüç-Kunt, A., Levine, R. (2000), "A New Database on the Structure and Development of Financial Sector", World Bank Economic Review, Vol.14, No: 3, pp. 597-605

Carvalho, B.S.M, Garcia, M.G.P. (2006), "Ineffective controls on capital inflows under sophisticated financial markets: Brazil in the nineties", NBER Working Papers, w12283

Central Bank of the Republic of Turkey, various years, Annual Report, Ankara: Central Bank of the Republic of Turkey

Central Bank of the Republic of Turkey, 2007, Financial Stability Report, Ankara: Central Bank of the Republic of Turkey

Chinn, M.D., Ito, H., (2008), "A New Measure of Financial Openness," Journal of Comparative Policy Analysis, Vol.10, No: 3 (September), pp. 309 - 322.

Darrat, Ali F. (1999) "Are Financial Deepening and Economic Growth Causally Related? Another Look at the Evidence", International Economic Journal,13:3,19 — 35

Demirgüç-Kunt, Asli, Ross Levine, and Hong-Ghi Min (1998), "Opening to Foreign Banks: Stability, Efficiency and Growth", in The Implications of Globalization Financial Markets, ed. by A. Meltzer (Korea: Bank of Korea)

Dickey D.A., Fuller W.A., (1979)," Distribution of the Estimators for Autoregressive Time Series with a Unit Root, Journal of the American Statistical Society, 75, pp. 427-431.

Elliot, G., Rothenberg, T.J., and Stock J.H., (1996) "Efficient Test for an Autoregressive Unit Root", Econometrica, 64, pp. 813-836

Doğan, H., (2008), "Türkiye'de finans ve reel ekonomi ilişkisi: Schumpeter haklı mıydı?, İktisat İşletme ve Finans, Vol.272 (Nov 2008), pp.49-79

Dunteman, George H. (1989). "Principal Components Analysis", Sage Publications.

Ghirmay, T. (2005), "Financial Development and Economic Growth in Sub-Saharan African Countries: Evidence from Time Series Analysis", African Development Review, Vol.16, No: 3 (May 2005), pp. 415-432

Graff, M. (2003) "Financial Development and Economic Growth –A New Empirical Analysis", Dresden Discussion Papers in Economics No.5/99

Hair, J., Black, W., Babin, B., Anderson, R., and Tatham, R., (2006), "Multivariate Data Analysis", 6/E, Prentice Hall, 2006, ISBN 0-13-228139-2

Hicks, J. (1969), "A Theory of Economic History", in Levine, R. (2004), "Finance and Growth: Theory and Evidence", NBER Working Papers, w10766

Hansson, P., Jonung, L. (1997) “Finance and Economic Growth: The Case of Sweden 1834-1991”, Stockholm School of Economics the Economic Research Institute Working Paper, No: 176

International Monetary Fund, (2001), “International financial integration and developing countries”, World Economic Outlook (October 2001), pp. 145-173

Kassimatis, K., Spyrous, S. I. (2001), “Stock and Credit Market Expansion and Economic Development in Emerging Markets: Further Evidence Utilizing Cointegration Analysis”, Applied Economics, Vol.33, pp. 1057-1064

King, R. G., Levine, R. (1993), “Finance and Growth: Schumpeter Might be Right”, The Quarterly Journal of Economics, Vol. 108, No. 3 (Aug., 1993), pp. 717-737

Kwiatkowski D, Phillips PCB, Schmidt P, and Shin Y. (1992) “Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root”, Journal of Econometrics, 54, pp. 159-178

Lane, P.R., Milesi-Ferretti, G.M (2006) “The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities”, 1970-2004. IMF Working Paper 06/69

Levine, R. (2004), “Finance and Growth: Theory and Evidence”, NBER Working Papers, w10766

Levine, R. (1997), “Financial Development and Growth: Views and Agenda”, Journal of Economic Literature, Vol.35 (June 1997), pp. 688–726

Levine, R., Zervos, S. (1996), “Stock Market Development and Long-Run Growth”, The World Bank Economic Review, Vol.10, No: 2, pp. 323-339

Levine, R., Zervos, S. (1998), “Stock Markets, Banks, and Economic Growth”, The American Economic Review, Vol. 88, No. 3 (Jun., 1998), pp. 537-558

Liu, L.Y., Woo, W.T. (1994), "Saving behavior under imperfect financial markets and the current account consequences", *The Economic Journal*, Vol.104, pp. 512–527

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

Luintel, K. B., Khan, M. (1999), "A quantitative reassessment of the finance–growth nexus: evidence from a multivariate VAR", Journal of Development Economics, Vol.60 (1999), pp. 381–405

Lynch, D. (1996), "Measuring Financial sector development: a study of selected Asia-Pacific countries", *The Developing Economies*, 32 (1), pp. 3-33.

Maddala G.S., Kim In-Moo (1998), "Unit Roots, Cointegration, and Structural Change", Cambridge University Press: Cambridge.

Mala, R., Mahendra R., (2007), "Measuring Stock Market Volatility in an Emerging Economy, International Research Journal of Finance and Economics", Vol.8, 126-133

Miniane, J. (2004), "A New Set of Measures on Capital Account Restrictions," Staff Papers, International Monetary Fund, Vol. 51, No. 2, pp. 276–308

Nieuwerburgh, S. V., Buelens, F., and Cuyvers, L. (2005) "Stock Market Development and Economic Growth in Belgium", Explorations in Economic History, Vol.43 (2006), pp. 13-38.

Phillips P.C.B., Perron P., (1988), Testing for a Unit Root in Time Series Regressions, Biometrica, 75, pp. 335-346

Okuda, H. (1990), "Financial factors in economic development: A study of the financial liberalization policy in the Philippines", The Developing Economies, 28, 240-270.

Outreville, J. François. (1999), "Financial Development, Human Capital and Political Stability", UNCTAD Discussion Papers, No. 142

Onaran, O. (2007), ¨ Capital Flows, Turbulences and Distribution: The Case of Turkey", Unpublished Manuscript, Istanbul Technical University

Quinn, D., Toyoda, M. (2006), "Does Capital Account Liberalization Lead to Growth?", Manuscript, Georgetown University, Forthcoming in Review of Financial Studies

Quinn, D. (1997), "The correlates of change in international financial regulation", American *Political Science Review,* Vol.91, pp. 531-51

Rajan, R.G., Zingales, L. (1998) "Financial Dependence and Economic Growth", The American Economic Review, Vol. 88, No. 3 (June 1998), pp. 559-586

Rioja, F. and N.Valev (2004), "Finance and the Sources of Growth at Various Stages of Economic Development", Economic Inquiry, Vol.42, pp. 27-40.

Robinson, J., (1952) "The Generalization of the General Theory," in The rate of interest, and other essays in "Financial Development and Growth: Views and Agenda", Journal of Economic Literature, Vol.35 (June 1997), pp. 688–726

Rousseau, P. L., Xiao, S. (2007), "Banks, stock markets, and China's 'great leap forward' "Emerging Markets Review, Vol.8, No: 3 (September 2007), pp. 206-217

Rousseau, P. L., Watchel, P. (1998), "Financial Intermediation and Economic Performance: Historical Evidence from Five Industrialized Countries", Journal of Money, Credit and Banking, Vol. 30, No. 4 (Nov., 1998), pp. 657-678

Rousseau, P., Watchel, P. (2000), 'Inflation, Financial Development and Growth', in Economic Theory, Dynamics and Markets: Essays in Honor of Ryuzo Sato, edited by T. Negishi, R. Ramachandran and K. Mino, Kluwer, 2001.

Sak, G., Acar, O., (2006), "2006 Mayıs Çalkantısı 2003 ve 2004'teki çalkantılardan Nasıl Farklı?", "Türkiye Politikaları Araştırma Vakfı Politika Notu," pp. 1-5

Schumpeter, J. A., (1912) Theorie der Wirtschaftlichen Entwicklung [The theory of eco-nomic development] in Levine, R. (1997), "Financial Development and

Growth: Views and Agenda”, Journal of Economic Literature, Vol.35 (June 1997), pp. 688–726

Shen, C., Lee C. (2006) “Same Financial Development yet Different Economic Growth—Why?”, Journal of Money, Credit, and Banking, Vol. 38, No. 7 (October 2006)

Soytaş, U., Küçükkaya, E. (2008), “Economic Growth and Financial Development in Turkey New Evidence”, Unpublished Manuscript, Middle East Technical University

Thangavelu, S.M., Ang J.B. (2004) “Financial Development and Economic Growth in Australia: An empirical analysis”, Empirical Economics, Vol.29, pp. 247-260

Unalmıs D. (2002), “The causality between financial development and economic growth: The case of Turkey”, The Central Bank of the Republic of Turkey Research Department, Working Paper No: 3.

Yang, K., Shahabi, C. (2005) "On the stationarity of multivariate time series for correlation-based data analysis," In The Fifth IEEE International Conference on Data Mining, Houston, TX, USA, November 2005.