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DEPARTMENT OF BUSINESS ADMINISTRATION

PHD THESIS

THE IMPACT OF FINANCIAL FRAGILITY ON FIRM PERFORMANCE: AN ANALYSIS OF BIST COMPANIES, 2005-2017

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ABSTRACT

THE IMPACT OF FINANCIAL FRAGILITY ON FIRM PERFORMANCE: AN ANALYSIS OF BIST COMPANIES, 2005-2017

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PhD in Business Administration in English

Advisor: Assoc. Prof. Dr. F. Dilvin TAŞKIN YEŞİLOVA

2019

Business firms have a typical life cycle; they legally come into being, have an initial start-up phase, grow and enjoy stabilization and maturity. On the other hand, downturns occur frequently and even consecutively. Managed improperly, bankruptcy is the ultimate end.

Whereas distress and performance prediction studies utilizing accounting-based and market-based firm data were voluminous in the literature, those incorporating aggregate indicators were scarce. Accordingly, the aim of this study was to analyze the impact of financial fragility on firm performance through panel data regression models. An in-depth analysis of the literature suggested that financial fragility be represented by nine macroeconomic indicators as the regressors and firm performance with three independent variables. Integrating data from 4,193 observations of 492 diverse listed companies on Istanbul Stock Exchange with coverage from 2005 to 2017, separate regression models were constituted for each firm performance construct with selected nine indicators of the given years.

Empirical findings primarily suggested that a significant relationship existed between financial fragility and firm performance based on selected representative parameters.

Keywords: Financial Fragility, Firm Performance, Early Warning Indicators, Panel Data Analysis

ÖZ

FİNANSAL KIRILGANLIĞIN ŞİRKET PERFORMANSINA ETKİSİ: BIST ŞİRKETLERİNİN BİR ANALİZİ, 2005-2017

Tolga TUZCUOĞLU

İngilizce İşletme Doktora Programı

Danışman: Doç. Dr. F. Dilvin TAŞKIN YEŞİLOVA

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İşletmeler tipik bir yaşam döngüsüne sahiplerdir; hukuki olarak kurulurlar, ilk olarak filizlenirler, büyürler ve istikrar ve olgunlaşma dönemini geçirirler. Diğer yandan, sık ve birbirini tekrar edebilen iniş ve çöküş dönemleri de bu döngünün olağan bir parçasıdır. Bu tür negatif dönemler, doğru bir şekilde yönetilmedikleri zaman kaçınılmaz olarak iflas ile sonuçlanmaktadırlar.

Şirket finansalları ve piyasa verilerine dayanan finansal sıkıntı ve performans tahmin modellerine literatürde sıkça rastlansa da bütünsel makro seviye göstergeleri modellere dahil eden çalışmalar nadir gözlenmektedir.

Bu açıklamalar ışığında, çalışmanın amacı finansal kırılganlığın şirket performansı üzerinde etkisini panel veri modelleri ile analiz etmektir. Literatür araştırması sonucunda finansal kırılganlık dokuz makroekonomik bağımsız değişken; finansal performans da üç bağımlı değişken ile temsil edilmiştir. Borsa İstanbul'da işlem gören 492 farklı şirketin 2005-2017 dönemine ait 4,193 adet gözleminden elde edilen verilerle her bir firma performans değişkeni için seçili dokuz makroekonomik değişkeni içeren regresyon modelleri oluşturulmuştur.

Ampirik sonuçlar, seçili değişkenler ışığında finansal kırılganlık ile şirket performansı arasında anlamlı bir ilişkinin var olduğunu ortaya koymuştur.

Anahtar Kelimeler: Finansal Kırılganlık, Şirket Performansı, Erken Uyarı Göstergeleri, Panel Veri Analizi

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Last but not least, my little beloved daughter, Tuğçe Sena, your ever-smiling face enlightened my way during the preparation of this thesis. I am grateful to your patience and cheerfulness.

TEXT OF OATH

I declare and honestly confirm that my study, titled "THE IMPACT OF FINANCIAL FRAGILITY ON FIRM PERFORMANCE: AN ANALYSIS OF BIST COMPANIES, 2005-2017" and presented as a PhD Thesis, has been written without applying to any assistance inconsistent with scientific ethics and traditions. I declare, to the best of my knowledge and belief, that all content and ideas drawn directly or indirectly from external sources are indicated in the text and listed in the list of references.

24.05.2019

Tolga TUZCUOĞLU

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LIST OF ABBREVIATIONS

BIST	Istanbul Stock Exchange Corporation
CBRT	Central Bank of the Republic of Turkey
CDS	Credit Default Swap
CEO	Chief Executive Officer
CPI	Consumer Price Index
Datastore	Borsa Istanbul Historic and Reference Data Platform
EBIT	Earnings Before Interest and Tax
EBT	Earnings Before Tax
EMU	European Monetary Union
EVDS	Electronic Data Delivery System
FED	The Federal Reserve
FOMC	The Federal Open Market Committee
GDP	Gross Domestic Product
GNP	Gross National Product
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
LTFD	Long Term Foreign Debt
M	Million
M2	Broad Money
NPL	Non-Performing Loan
PDP	Public Disclosure Platform
PMI	Purchasing Managers Index
PSFD	Private Sector Foreign Debt
STFD	Short Term Foreign Debt
TRY	Turkish Lira
US	United States
USD	United States Dollars
VBA	Visual Basic for Applications

INTRODUCTION

Business firms have a typical life cycle; they legally come into being, have an initial start-up phase, grow and enjoy stabilization and maturity. However, in today's volatile, uncertain, complex and ambiguous as well as at a dizzying pace changing business environment, the life cycle is subject to frequent and even consecutive negative phases. Managed improperly, bankruptcy is the ultimate end of such downturns.

To illustrate, averagely 56,590 companies were established and 13,103 were liquidated each year between 2010 and 2017 in Turkey corresponding to a percentage of 23.2% including corporations, limited liability companies and general partnerships (Central Bank of the Republic of Turkey (CBRT) Electronic Data Delivery System (EVDS), 2018c). This is to imply that each year thousands of companies were set up and started their operations. On the contrary, a large number of companies ceased their operations in the same period. Although it may not be definitely inferred that approximately one-quarter of newly established companies are quitting their business, it is obvious to say that a considerably high number of companies regularly stop their operations.

The reasons why companies suffer from insufficient performance, fail and quit their business have been of major interest to researchers. One reviewing the literature in the field of distress and performance prediction models is likely to encounter voluminous studies incorporating accounting-based and market-based firm data. In contrast, those touching upon external conditions and aggregate indicators in relation to firm performance are comparatively less evident.

Accordingly, the aim of this study is to analyze the impact of financial fragility on firm performance through panel data regression models. Integrating data from 4,193 observations of 492 diverse listed companies on Borsa Istanbul with coverage from 2005 to 2017, the study will focus on selected firm performance constructs with respect to a variety of macroeconomic indicators.

In this context, the study will focus on the following research questions:

- Research Question 1: How can financial fragility be measured?

- Research Question 2: What characterizes firm performance or firm success?
- Research Question 3: How can the impact of financial fragility on firm performance be measured?
- Research Question 4: What macroeconomic indicators are to be primarily followed up on by company management in terms of financial performance?

The study comprises three main components, which are financial fragility, firm performance and the impact of the former on the latter. Accordingly, the structure of this study is based on three main chapters.

Chapter 1 will examine the key terms with regard to financial fragility, which will be then followed by a detailed review of the literature on fragility measurement. Finally, a financial fragility index for Turkey will be presented.

Chapter 2 will shed light on the components of firm performance and analyze the performance of listed Turkish companies based on real market data.

After laying out the fundamentals of financial fragility and firm performance in the preceding two chapters, Chapter 3 will investigate the impact of financial fragility on firm performance through panel regression models.

The last part will conclude the thesis in the light of the key findings of the study.

1. CHAPTER FINANCIAL FRAGILITY

The aim of this chapter is to define and measure financial fragility. In this respect, first and foremost the key terms with regard to the analysis of financial fragility will be examined, which are financial stability, financial instability, financial crises and early warning indicators, respectively. This will be followed by the review of the literature, especially concerning the measurement of financial fragility. The third and the last focus of this chapter will be an attempt to construct a financial fragility index for Turkey in the light of the findings of the literature review. Accordingly, as for the first step, the selected components of the fragility index will be defined and the development of these indicators in Turkey will be examined for a given time period. Subsequently, the indicators will be integrated into a single index value and its interpretation will be presented. The chapter will end with concluding remarks.

1.1. Financial Stability, Instability and Financial Fragility

In general, the common characteristic of all economic units such as the households and firms at the micro level and governments and policy-makers at the macro level is to strive for a sound and a healthy functioning economy.

In reality, a sound and a healthy functioning economy is foremost characterized with monetary and financial stability in which monetary stability implies the absence of inflation or deflation; hence, stability in the overall price level, and financial stability is relevant to the proper functioning of financial markets and institutions (Crockett, 1997:1-2). In stable financial markets, financial asset prices do not fluctuate extensively and the solvency of financial institutions is secured (Saccomanni, 2008:35). In addition, as Montiel (2011:69-72) concludes with empirical evidence from the findings of recent research, macroeconomic stability fosters economic growth; hence, it is of key importance from the viewpoint of all economic and financial players.

Besides the basic definitions illustrated above, describing and gauging financial stability is a tough endeavor due to the complexity of the financial system as well as the cobweb-like structure of diverse relations among financial and macroeconomic units (Gadanecz & Jayaram, 2009:365-366). With this respect, the endeavors aimed at expressing financial stability on quantitative terms have been a

focal point for researchers from academic, public and private areas (Gadanecz & Jayaram, 2009:366). Table 1 is a concise summary of financial stability relevant variables by sectors in the literature.

Table 1. Financial Stability Measures by Economic Sectors in the Literature

Economic Sector	Representation
Real sector	Gross Domestic Product (GDP) growth, government's fiscal position and inflation
Corporate sector	Leverage and expense ratios, net foreign exchange exposure to equity and the number of applications for protection against creditors
Household sector	Net assets and net disposable income
External sector	Real exchange rates, foreign exchange reserves, the current account, capital flows and maturity/currency mismatches
Financial sector	Monetary aggregates, real interest rates, banking sector's risk measures, banks' capital and liquidity ratios, loan book qualities, standalone credit ratings and the concentration/systemic focus of lending activities
Financial markets	Equity indices, corporate spreads, liquidity premium and volatility

Source: Summary table based on Gadanecz & Jayaram (2009:366-370).

Table 1 portrays the various dimensions of financial stability and its complex nature in terms of micro and macroeconomic actors as well as the production, consumption, service and financial sectors including a country's transactions with the rest of the world.

The financial system acts as an intermediary between those in excess of funds and fund seekers literally known as creditors/lenders and debtors/borrowers. In this context, it is incumbent on the financial system to make an efficient allocation of funds between these two parties (Klemkosky, 2013:675). Any possible malfunctions in the system increase the likelihood of an unwanted adverse state in the economy as a whole.

The periods where stability is distorted can be expressed as times of instability, disorder, stress or distress. Such periods are characterized and defined by particular instances. To illustrate, Hakkio and Keeton (2009:6-10) describe the situation in which

the ordinary operations of the financial system are disturbed as financial stress. The authors further argue that stress in this context pertains to:

- Elevated ambiguity in asset values
- Raised unpredictability in the actions of financial actors
- Reduction in the availability of information to all relevant parties
- Increase in risk-averseness
- Increase in the preference for liquidity

Davis (1995:117) describes financial instability by referring to systematic risk and disorder clarifying that instability is an instance characterized by upheavals and volatilities in the financial markets that are likely to result in financial failure.

Allen and Wood (2006:159-160) define financial instability as an incident where numerous economic actors regardless of being at the micro or macro level such as the "households, companies, or (individual) governments experience financial crises which are not warranted by their previous behavior, and where these crises collectively have seriously adverse macro-economic effects". Taking this definition as a starting point, the authors define financial stability as an instance far from financial instability in which the actions of economic actors are not affected by the likelihood of such an unfavorable situation.

Montiel (2011:53-54) defines macroeconomic instability as an event in which macroeconomic parameters are no longer foreseen or forecasted clearly and highlights volatility and unsustainability as the main reasons for instability. As for volatility, the author explains that as macroeconomic circumstances alter quickly, predictability becomes thus more and more difficult. From the point of unsustainability, Montiel explains three fundamental reasons; the debt paying ability of governments, imbalances in the real exchange rates and financial-sector fragility. In addition, the author compares diverse group of countries such as advanced, developing and emerging in terms of GDP growth, inflation and the ratio of current account balance to GDP in an effort to assess their macroeconomic volatility and instability conditions from 1981 to 2006, and finds out that emerging and developing nations have a relatively more unsteady structure (Montiel, 2011:172).

Instability and fragility are two terms that may be often used interchangeably. For instance, Bernanke and Gertler (1990:87-88) define financial instability or fragility as an instance in which economic actors willing to invest in a project are short of sufficient funds or net wealth, causing them to borrow at a comparatively high rate which implies inefficiency for the economy as a whole. In this definition, it can be said that fragility and instability are evaluated in the context of indebtedness, investment finance and risk-taking behavior. As for risk-taking, Demirgüç-Kunt and Detragiache (1998:8) relate the risk-taking attitude of financial institutions to financial liberalization and deregulation, which in turn augments the possibility of instabilities.

When the relevant literature on financial fragility is reviewed, we are most likely to be confronted with a number of definitions. As for a start, Davis (1995:354) defines financial fragility as a condition characterized with "heightened vulnerability to default in a wide variety of circumstances". In this sense, fragility is associated with elevated susceptibility to fail to meet financial obligations.

Minsky (1995:6) alleges that financial fragility can be primarily traced back to the single microeconomic unit due to the fact that the debt of these individual units constitutes in turn the assets of financial institutions. Minsky concludes that the debt paying ability of microeconomic units basically determines the degree of financial fragility in the given economy. In this sense, it can be said that Minsky relates financial fragility with indebtedness and ability to service debt. Based on the Minskyan view, the instability is an intrinsic characteristic of the economic system in that in the positive periods of the business cycle, economic actors are more inclined to take additional risk, especially in the form of augmented borrowing. However, in the subsequent downturn period, such vulnerable debtors end up with bankruptcy (Sinapi, 2014:44).

Calomiris (1995:47) explains that models that examine the relationship to what extent financial institutions, contracting forms and government financial policies have an impact on macroeconomic volatility are occasionally coined as financial fragility models. According to the author, these models determine the causes for the disorders in the financial markets which may either emanate from the financial activities such as financial contracts, the undertakings of intermediaries or even the relevant actions of governments concerning the finance sector or from the production sector.

Taylor (1995:170) puts forward that the understanding of financial fragility evolved in the course of time. The author explains that this term used to express market

volatility; however, this association lost its significance as instruments for hedging evolved which in turn increased the endurance against volatility.

Goodhart et al. (2006:127) interpret that fragility occurs when a considerable number of economic actors no longer have the ability to service their debt along with declining profits of lenders, especially the banks. This definition is again relevant to extreme borrowing and riskiness.

Montiel (2011:54-55) focuses on fragility in terms of the financial sector which is characterized with low net worth, high risk exposure and insufficient regulation. Together with fiscal insolvency and exchange rate misalignment, the author considers financial fragility as one of the main reasons for an unsustainable macroeconomic environment, especially in view of emerging and developing countries. Taking the country's financial system into consideration, Montiel (2011:598) further defines fragility "as vulnerability to a loss of capital in response to even mild shocks". In addition, he claims that it is the vulnerability, which distinguishes a crisis from a downturn. The author enumerates four diverse factors affecting vulnerability, in particular with regard to emerging economies, which are presented below (Montiel, 2011:729-730):

1. Health of the financial system associated with restructurings, improvements, norms, rules and regulatory bodies and administration.
2. The independent role of the central banks related to price stability and trustworthiness.
3. Flexible exchange rate regimes.
4. Macroeconomic and fiscal reforms which show their reflection on the indicator of public debt as a percentage of GDP

In the light of the explanations above, financial fragility can be viewed as the ability of the nation's economy to tolerate indigenous and exogenous shocks. It can be thought of as a measure gauging to what degree the economy is susceptible to and resilient against crises.

1.2. Financial Crises

Similar to financial fragility, there are various definitions for financial crises in the literature. Apart from numerous definitions, those reviewing financial crises would probably be confused with bumping into several types of financial crises. The abundancy of terms and types will be presented below.

Eichengreen (2003:27) explains that the term financial crisis does not have a uniform description, which may range from financial and non-financial instances such as fluctuations in asset prices or harvest failures.

Allen and Gale (2007:58,147) emphasize two traditional approaches that characterize financial crises in which one approach claims that crises are results of sudden panics; whereas the other implies that crises emerge as a consequence of common economic essentials. In other words, some regard financial crises as random events; others associate them with the alterations in the real economy (Allen & Gale, 2007:262).

Montiel (2011:611) roughly defines financial crises as occasions in which fundamental economic actors can no longer meet their financial obligation. What the author identifies as key economic agents are the government, the central bank or a significant portion of the banking system.

Reinert (2012:457) explains crises as any kind of severe difficulties with which economies are confronted enumerating various types of crises as examples.

Case et al. (2017:269) similarly allege that there is no consensus on the definition of financial crises. The authors conclude that the term is characterized with durations in which financial institutions no longer operate properly as well as macroeconomic imbalances come out.

Ihori (2017:3) perceives financial crises as exogenous shocks hindering especially the private sector, and the author favors the involvement of governments to eliminate or mitigate the adverse impacts of such shocks.

Williamson (2018:95) associates financial crises with chaos in credit markets underlined by highly volatile stock prices, interest rates and reduced trade volumes.

One conclusion that can be drawn from the views of the authors presented above is that, financial crises are rather described by the very instances with which they are characterized.

There are two mainstream approaches aimed at outlining the nature of financial crises, which are the financial fragility and monetarist approaches (Davis, 1995:118). Financial fragility approaches mainly focus on "an increase in debt finance, a shift from long- to short-term debt; a shift from borrowing which is adequately covered by cash flow to borrowing not covered at all" (Davis, 1995:209). In addition, monetarist views underline banking panics (or panics in the financial sector) leading to monetary contraction; in other words, such approaches are related to the structure of financial markets (Davis, 1995:210). On the other hand, Lucatelli (1997:71) reviews that the financial fragility approach was proposed and later enhanced by Fisher (1932, 1933), Minsky (1972, 1982) and Kindleberger (1978). Additionally, the author informs that the monetarist view can be traced back to Friedman and Schwartz (1963) and Schwartz (1986) (Lucatelli, 1997:73).

Tymoigne (2009:142) explains that Minsky frequently referred to the notions financial fragility, financial instability and financial crises in which financial fragility was expressed "as the propensity of an economic system to generate financial instability". The author interprets from Minsky's works that instability is associated with failure to meet full employment and price stability in an economy (Tymoigne, 2009:143). Furthermore, financial crises are characterized with extensive financial distress prevailing in the country as a whole (Tymoigne, 2009:144).

D'Apice and Ferri (2010:9) mention that the financial crises approach of Minsky relies mainly on the fact that financial instability is already inherent in the periods of macroeconomic prosperity in that in such stable time periods, microeconomic units tend to expand their indebtedness, the increase of which make them more prone to defaults and hence, to financial crises.

Klemkosky (2013:676-678) underlines that during financial crises, the financial system ceases functioning in a proper way where fund-lenders are reluctant to invest further due to uncertainties inherent in the markets and loss of confidence. On the other hand, fund-seekers are no longer able to access financial means easily. The author further lists down the reasons as follows:

- Increasing debt stock in the system
- Burden of external debt
- Indebtedness of the public sector
- Overvalued asset prices (asset bubbles)
- Behavioral biases such as overconfidence in the system
- Augmented complexity in the banking sector
- Shadow banking system implying the presence of non-bank institutions
- Emergence of new financial tools such as the derivatives
- Mismeasurement in creditworthiness and rating/scoring tools

As for the classification of financial crises, the views of Reinhart and Rogoff (2009b:4-14) are illuminating. The authors classify financial crises based on their causes as well as the environment that they affect. These are listed as follows:

- Government insolvency
- Banking crises
- Exchange rate crises
- Inflation crises
- Asset price bubbles (mainly housing and equity)

As further defined by Reinert (2012:308-313), financial crises relevant to government insolvency stem from the condition in which external and/or domestic debt of a government in terms of the principal or even the interest payment can no longer be serviced or refinanced. Inflation based financial crises may emerge when there is a sudden and hasty rise in the price level. In banking crises, banks may cease their operations, be taken over by the government or similarly may be transferred to a governmental fund or body. Asset price bubbles pertain to the continuous and steady increase in asset prices (overvaluation), most commonly with respect to housing and equity.

Financial crises of different types are closely related to each other in that they may have common qualities, preceding macroeconomic indicators as well as a

resembling time sequence (Reinhart & Rogoff, 2009b:248). They may emerge concurrently or follow each other (Reinert, 2012:324).

According to Allen and Gale (2007:19), there has been a shift in the perception of the cause and resolution of financial crises; in the 1930s, the market mechanism was regarded as the key reason for financial crises and the government was expected to intervene in the economy to maintain financial stability. On the contrary, in the course of time it was the improper application of fiscal policies of governments, which began to be held responsible for financial crises.

Carlin and Soskice (2015:189) refer to Reinhart and Rogoff (2009a) and report three common characteristics that follow a period of crisis which are severe declines in asset prices, unfavorable output and employment levels and considerable increases public indebtedness, respectively. One conclusion that can be drawn is that financial crises lead to contractions in the real economy.

Montiel (2011:10) focuses on the differences between industrialized countries and emerging economies with respect to the macroeconomic framework and identifies that emerging markets require capital inflows from industrialized countries. The author explains that the extent to which emerging economies have access to external funds determines the vulnerability of financial crises.

Pugel (2016:522,525) attracts the attention to the consequences of financial crises, especially for developing countries by explaining that financial crises are followed by declining economic growth and slow-down of economic activity. The author emphasizes the integration of the global financial system and the contagion impacts in which the default of one economy is likely to impede capital inflows to others, particularly to the lender of funds and which in turn lead to further crises in these nations as well.

Similarly, Gerber (2018:300-301) focuses on the pros and cons of financial integration; the author accepts the growth driving role of integration; however, warns against the contagion of financial crises. Furthermore, Gerber focuses on the reasons for financial crises by claiming that some are due to inappropriate macroeconomic policies; on the contrary, some occur even in countries with sound and stable economic conditions. The author underlines the importance of early warning indicators.

Moreover, taking the Asian Crises of 1997-98 as an example, Gerber (2018:314-315) enumerates three diverse vulnerabilities as for reasons which are high current account deficits, overvalued exchange rates and weak financial sectors, respectively. The author defends that such vulnerabilities do not certainly lead to crises; yet they increase their likelihood.

In the light of the reviews presented above, especially regarding the causes of financial crises, it can be inferred that considerable emphasis was given on fiscal policies and macroeconomic indicators.

1.3. Early Warning Indicators

In view of the adverse effects of financial crises on short-term economic activity and long-term economic growth, research in this area has focused on whether it would be possible to predict financial crises in advance. In this sense, early warning indicators can be defined as a particular set of (macroeconomic) variables that are analyzed for assessing the likelihood of incoming financial crises.

The growing interest of researchers on early warning indicators can be traced back to the mid-1990s especially subsequent to the financial crises in Mexico, 1994-1995 and Asia, 1997-1998 (Reinhart & Rogoff, 2009b:279).

Eichengreen (2003:237-238) regards the application of early warning indicators as a typical method for forecasting financial crises. The author refers to the former work of Bussiere and Mulder (1999) in which the current account to GDP ratio, export growth, the change in international reserves, the deviation of the real exchange rate from trend and short-term foreign debt relative to reserves were taken as the key macroeconomic variables.

Reinhart and Rogoff (2009b:280) focus on the early warning indicators that are related to banking and currency crises by referring to the former studies of Kaminsky et al. (1998), Kaminsky and Reinhart (1999), Goldstein et al. (2000) and their own. In these studies, the researchers studied various financial and macroeconomic variables that may precedently indicate signs of crises. Table 2 depicted below is a concise summary of the results of these studies in which the most significant early warning indicators for banking and currency crises are presented.

Table 2. Type of Crises and Early Warning Indicators

Type of Crises	Early Warning Indicator
Banking Crises	Real Exchange Rate Real Housing Prices Short Term Capital Inflow/GDP Current Account Balance/Investment Real Stock Prices
Currency Crises	Real Exchange Rate Current Account Balance/GDP Real stock Prices Exports Broad Money (M2)/International Reserves

Source: Adapted from Reinhart & Rogoff (2009b:280).

Salvatore (2013:712) refers to the standards for data distribution set by the International Monetary Fund (IMF) from 1996 onwards. The author explains that the budget deficit, current account balance, foreign debt as well as international reserves are the early-warning financial indicators for an economy, which may show indications for future financial vulnerability.

Gandolfo (2016:648) defines early warning systems as tools for mitigating the risks of possible crises, which comprise of a bundle of particular crises indicators. The author favors the application of such indicators to analyze the emergence of crises and clarifies that research aimed at forecasting possible crises has emphasized the application of these early warning systems (Gandolfo, 2016:405). On the other hand, Gandolfo also argues that there are no generally accepted identifiers that have the highest relevance for forecasting financial crises. In addition, the author refers to previous research pointing out that foreign exchange reserves, the real exchange rate, credit growth, real GDP growth and the current account balance were concluded as the indicators with most relevance with the illumination of financial crises (Gandolfo, 2016:648).

At this point, it can be stated that particular public and private bodies follow up on the aforementioned early warning indicators to promote financial stability in the economy. This is mainly incumbent on the central banks.

Published regularly by central banks, financial stability reports implement health checks against any possible economic instabilities and financial vulnerabilities through examining a set of standard variables (Gadanecz & Jayaram, 2009:365).

Oosterloo et al. (2007:94) state that it is common for most central banks to issue financial stability reports, the aims of which are to provide the public with transparent information on stability related issues, support the soundness of the financial system in general and to promote collaboration among concerned governmental and regulatory bodies.

Gadanecz and Jayaram (2009:372) inform that more than forty central banks periodically disseminate financial stability reports. Out of a sample selected thereof, they compile a table of sectors and indicators mainly included in the reports. This is summarized in Table 3.

Table 3. Sectors and Indicators used in Financial Stability Reports

Real Sector	**External Sector**
GDP	Exchange rates
Fiscal deficit	Exchange rate exposures
Inflation	Balance of payments
Household finance	Capital flows
Corporate finance	Reserves
Policy rate	
Monetary aggregates	
Financial Sector	**Financial Markets**
Profitability	Government Bonds
Capital ratios	Corporate Bonds
Credit (loans)	Money markets
Liabilities (deposits)	Equity prices
Liquidity	Real estate prices
Credit Risk	
Market risk	
Interest rate risk	
Asset quality	
Sectoral/Regional	
Systemic focus	

Source: Summary table based on Gadanecz & Jayaram (2009: 373-374).

The CBRT publishes semi-annually the Financial Stability Report (CBRT, 2018) which is aimed at providing information on local and international developments in the economic and financial environment. The report is structured in five main chapters where financial stability related issues are examined through a number of indicators. The chapters are made up of the main overview, macroeconomic outlook, financial and non-financial sector and special topics. Table 4 below summarizes the list of indicators presented in the overview and macroeconomic outlook sections of the report.

It may be derived from Table 4 that the indicators covered in the macroeconomics related sections are in principle relevant to capital flows, internal/external indebtedness, exchange rate, stock market performance, fiscal balance, trade balance and capital account, interest rates, price indices and economic growth.

Table 4. Overview of Macroeconomic Indicators in the Financial Stability Report of CBRT

Economic Policy Uncertainty Indices
Weekly Capital Flows to Emerging Economies
Share of Real Sector Financial Debt in GDP
Foreign Exchange Liabilities and Net Foreign Exchange Position of Real Sector Firms
Annual Loan Growth
Credit/GDP Ratio
Non-Performing Loan (NPL) Ratios
NPL Components
External Debt Roll-Over Ratio and Its Average Maturity
Cost of Syndicated Loans with a Maturity of 367 Days
Profitability Indicators
Capital Adequacy Indicators
Economic Policy Uncertainty Indices
The Federal Open Market Committee (FOMC) Members' Median Policy Interest Rate Forecasts and Market Expectations
Weekly Capital Flows to Emerging Countries
Credit Default Swap (CDS) Premiums in Emerging Economies
Exchange Rate Indices
Stock Market Indices
10-Year Treasury Bond Yields in Advanced Economies
10-Year Treasury Bond Yields in Emerging Economies
Annual Growth Rates in Advanced and Emerging Economies
Manufacturing Industry Purchasing Managers Index (PMI)
Commodity Indices
Contribution to Annual Growth from the Expenditure Side
Industrial Production Index
Labor Force
Central Government Budget Balance
Foreign Trade
Current Account Deficit
Financing Sources of Current Account Deficit
Price Indices
Interest Rates
Exchange Rate Basket and CDS

Source: Own illustration based on CBRT (2018).

1.4. Literature Review on Fragility Measurement

Starting from the 1990s onwards, the measurement of fragility has been a major focus of interest among academicians. Largely, studies of fragility measurement primarily focused on:

- Diverse variables or indicators to represent the fragility phenomena
- Various empirical methods as to construct composite measures or indexes

On the other hand, it is observed that the first endeavors of fragility measurement were pertaining to the banking sector. Nevertheless, towards the end of 2000s, fragility related indexes considering primarily macroeconomic indicators were proposed.

In this sense, the literature review presented in this section will focus on the variables that proxy financial fragility as well as the methods with regard to fragility measurement considering the aforementioned two mainstream fields.

Before going into the details of previous studies, the development of the literature on fragility measurement in the historical context are summarized in two separate tables with the aim of providing a concise overview. Accordingly, Tables 5 and 6 portray previous studies in terms of the subject and aim of the study, the data scope referring to the countries and the period in question as well as the empirical methods applied with specific coverage of the banking sector as well as the macroeconomic circumstances, respectively.

The first strand of research focuses on the financial fragility in the banking sector. González-Hermosillo et al. (1996) established a fragility index for the banking sector including three main group of variables, which were specific to the individual bank, the sector in general and macroeconomic conditions, respectively. In this context, the macroeconomic variables included the exchange rate depreciation, the real exchange rate, unexpected inflation and economic activity (GDP and industrial production). The authors concluded that banking sector related indicators determined the probability of bank failure and macroeconomic indicators explained its timing in which contagion had a considerable impact on both.

Table 5. Overview of Literature on Fragility with Primary Focus on the Banking Sector

Study	Subject/Aim	Data Scope	Method
González-Hermosillo et al. (1996)	Banking sector fragility index	Mexico, 1991-1995	Panel logit model
Ahumada & Budnevich (2002)	Banking sector fragility determination	Chile, 1990-1998	Longitudinal data regression
Kibritçioğlu (2002)	Banking sector fragility index	22 Countries	Weighted standardized average
Kibritçioğlu (2003)	Banking sector fragility index	22 Countries, 1961/1989 to 2002	Weighted standardized average
Pesola (2005)	Understanding banking sector fragility	Nordic and 5 European countries, 1983-2002	Panel data regression
Beck et al. (2006)	Bank concentration and banking sector fragility	69 countries including Turkey, 1980-1997	Panel logit model
Aspachs et al. (2007)	Banking sector fragility and economic welfare	7 European countries, 1990-2004	Vector autoregression model
Jones & Krause (2007)	Foreign bank presence and banking sector fragility	Latin America, 1983-2002	Panel logit model
Pesola (2007)	Banking sector fragility	9 European countries, 1980s-2002	Pool regression model
Ural & Balaylar (2007)	Financial pressure index for the banking sector	Turkey, 1987-2007	Weighted standardized average

Continued on the next page.

Table 5. Overview of Literature on Fragility with Primary Focus on the Banking Sector (Continued)

Study	Subject/Aim	Data Scope	Method
Tunay (2009)	Competition and banking fragility	Turkey, 1988-2007	Panel data and panel logit model
Singh (2010)	Banking sector fragility index and crises prediction	India, 2000-2009	Ordered probit model
Cheang & Choy (2011)	Banking sector stability index	Macao, 1996-2010	Equal-variance weighting method
Degryse et al. (2013)	Regional banking system fragility	19 Countries/Regions, 1994-2008	Multinomial logistic regression, Logit model
Barışık & Demirel (2014)	Financial fragility index for the banking sector	Turkey, 2002-2011	Weighted standardized average
Demirel et al. (2016)	Banking sector fragility	Turkey, 2010-2015	Multi cointegration method, Error correction model
Öztürk (2016)	Macroeconomic factors and bank performance	Turkey, 1970-2014	Time series regression
Varlık & Varlık (2016)	Banking soundness index	Turkey, 2004-2015	Factor analysis, Vector autoregression model
Bölükbaşı et al. (2018)	Economic activity and banking fragility index	Turkey, 2005-2016	Factor analysis, Vector autoregression model

Source: Own illustration.

Table 6. Overview of Literature on Fragility with Primary Focus on Macroeconomic Circumstances

Study	Subject/Aim	Data Scope	Method
Balakrishnan et al. (2009)	Financial stress index in emerging markets	26 developing countries including Turkey, 1997-2009	Variance-equal weighting
Cardarelli et al. (2009)	Financial stress index and real economy	17 developed countries, 1980-2009	Variance-equal weighting
Filho et al. (2009)	Public sector financial fragility Index	Brazil, 2000-2007	Minskyan approach
Hakkio & Keeton (2009)	Financial stress index	Kansas, 1990-2009	Principal component analysis
Elekdağ et al. (2010)	Financial stress index and economic activity	Turkey, 1996-2009	Vector autoregression model
Kliesen et al. (2012)	Comparison of diverse financial stress indexes	International, 2005-2012	Correlation analysis
Çakmak (2013)	Financial fragility index	Turkey, 1989-2011	Standardization and equal weighting
Çevik et al. (2013)	Financial stress index and economic activity	Turkey, 1997-2010	Principal component analysis
Ekinci (2013)	Financial stress index	Turkey, 2002-2013	Standardization and equal weighting
Öztürkler & Göksel (2013)	Financial stress index	Turkey, 1998-2012	Multivariate dynamic probit models, Principal component analysis

Continued on the next page.

Table 6. Overview of Literature on Fragility with Primary Focus on Macroeconomic Circumstances (Continued)

Study	Subject/Aim	Data Scope	Method
The Federal Reserve (FED) (2014)	Emerging market vulnerability index	15 emerging economies including Turkey, 2013-2014	
Kaplan & Yapraklı (2014)	Financial stress index	12 developing countries including Turkey, 2000-2012	Panel data regression
Şensoy et al. (2014)	Financial fragility index	Turkey, 2006-2014	Principal component analysis, Dynamic conditional correlations
Aklan et al. (2015)	Financial stress index and economic activity	Turkey, 2002-2014	Factor analysis, Vector autoregression model, Granger causality
Karakurt et al. (2015)	Macroeconomic fragility	Turkey & Shanghai Countries, 2008-2012	Basic comparison of indicators
Bayraktar & Elüstü (2016)	Macroeconomic fragility	19 emerging countries including Turkey, 2010-2014	Basic comparison of indicators
Çan & Dinçsoy (2016)	Financial crises and fragilities	5 emerging countries including Turkey, 2005-2013	Basic comparison of indicators
Mete et al. (2016)	Macroeconomic fragility	8 emerging countries including Turkey, 2004-2014	Basic comparison of indicators
Saraçoğlu & Sülkü (2016)	Composite crises indicators	Turkey, 1998-2012	Signals approach
Akın (2017)	Macroeconomic fragility	Turkey & 4 Balkan countries, 2007-2016	Basic comparison of indicators

Continued on the next page.

Table 6. Overview of Literature on Fragility with Primary Focus on Macroeconomic Circumstances (Continued)

Study	Subject/Aim	Data Scope	Method
Boğa (2017)	Financial fragility and international capital movements	Turkey, 1992-2014	Panel data regression
Kaya & Kılınç (2017)	Financial stress index and economic activity	Turkey, 2002-2015	Vector autoregression model, Granger causality
Bülbül & Akgül (2018)	Financial stress index	Turkey, 1990-2017	Variance-equal weighting, Markov regime-switching model
Chadwick & Öztürk (2018)	A composite financial stress indicator	Turkey, 2005-2016	Rolling correlation method

Source: Own illustration.

Ahumada and Budnevich (2002) focused on the estimation of the banking sector fragility in Chile with a panel regression model. The authors defined fragility with non-performing loans as a percentage of total loans and interbank spreads, where a diverse set of macroeconomic and bank-specific variables (mainly financial ratios) were employed as regressors in which macroeconomic variables were represented by an economic activity index, market interest rate and the real exchange rate. The proposed model provided an essential understanding of bank fragility with respect to the ratio of non-performing loans to total loans as well as interbank spreads.

Kibritçioğlu (2002) compiled monthly banking sector data from 22 countries to constitute a fragility index. The proposed index was composed of bank deposits, claims to private sector and foreign liabilities in which their average standardized values were used. Kibritçioğlu (2003) employed a similar method with 22 country data from 1961/1989 varying from country to country due to data availability reasons to 2002 in which banking sector variables were integrated as an average of standardized values into a fragility index similar to his previous study. The author concluded in both studies that the proposed indices constructed with monthly data could be used as a supportive tool for following up on the dynamics of the banking sector and facilitate the detection of periods of extreme risk exposure.

Pesola (2005) investigated the determinants of the banking sector financial fragility in the four Nordic countries and additional six European countries from 1983 to 2002. In the study, Pesola applied a panel data regression approach in which the change in GDP and real interest rates were used as the macroeconomic estimators. The author arrived at the conclusion that customer debt, macroeconomic difficulties with regard to income and real interest rates as well as loan losses adversely affected the banking sector fragility.

Beck et al. (2006) explored the effect of concentration in the banking sector on the sector's fragility where the authors used sector data from 69 counties covering a time period from 1980 to 1997. Their approach included the use of a panel logit model in which the GDP growth, terms of trade, inflation and real interest rates were picked up as the macroeconomics-related variables. The authors revealed that the concentration in the banking system reduced the likelihood of crises. Moreover, competition distortions were likely to elevate the fragility of the banking sector.

Aspachs et al. (2007) focused on financial fragility in the banking sector and its impact on economic prosperity in seven European countries between 1990 and 2004. The authors described fragility as the combination of "an increase in probability of default rates and a reduction in profitability"; in addition, they benefited from a panel vector autoregression model where the macroeconomic indicators integrated into to model were the inflation, GDP growth rate and interest rate. The authors concluded that the distress in the banking sector was associated with welfare losses in the nation as a whole.

Jones and Krause (2007) examined the relationship between the presence of foreign banks and banking sector fragility in the Latin American countries from 1983 to 2002. In their panel logit model, the GDP growth and interest rate were the regressors from macroeconomic point of view. The authors disclosed that free entry of foreign banks contributed to the stability of the domestic banking sector.

Pesola (2007) investigated the banking sector financial fragility with empirical data from nine European countries from mainly 1982 to 2002. In the econometric model, the author made use of pool regression with the change in GDP and real interest rates as the independent variables. The author revealed that the banking sector was likely to suffer from loan losses due to financial fragility and macroeconomic shocks.

Ural and Balaylar (2007) calculated a financial pressure index for the Turkish banking sector with monthly empirical data from 1987 to 2007. The method was an application of a weighted standardized average of banking sector specific parameters, which were the credit (indebtedness), foreign exchange, and interest and liquidity risks. The authors disclosed that the proposed index successfully detected the April 1994 crisis in Turkey, which was on the contrary not the case for November 2000 and February 2001 crises.

Tunay (2009) questioned the relationship between competition and banking sector fragility in Turkey with sector data covering from 1988 to 2007. In this study, panel logit models were employed where the exchange rate, inflation, economic growth and the real interest rates were used as the macroeconomic variables to explain the banking sector fragility. The author determined a positive relationship between bank concentration and fragility, especially with regard to private domestic banks.

Singh (2010) set up a banking sector fragility index for India with selected banking sector variables from 2000 to 2009. The author modified the former method of Kibritçioğlu (2002) and used the weighted averages of five banking sector specific variables such as deposits, credits, investments, reserves and assets/liabilities in foreign currencies. In addition, the author employed an ordered probit model to estimate the likelihood of banking crises. The estimators used in the model included the treasury bill yields, call money rate, stock prices, money supply, bank deposits and credits, reserves, exports, imports, real exchange rates, inflation and output. The proposed model was able to categorize in average 94% of the diverse crisis periods in India.

Cheang and Choy (2011) constructed a stability index for the banking sector in Macao with sector data from 1996 to 2010. The proposed index had three main components including financial soundness, financial vulnerability and regional economic climate, all of which were represented by nineteen diverse indicators in which the vulnerability section included the following macroeconomic variables:

- Current Account Balance/GDP
- Money Supply/International Reserves
- External Assets/Total Assets
- Foreign Currency Assets/Foreign Currency Liabilities
- Money Supply Multiplier
- Domestic Credit/GDP
- Fiscal Balance/GDP
- Inflation
- GDP Growth

The aggregate index was set up with a normalized weighted average method. The authors explained that the constructed index portrayed the development of fragility and stability in Macao in the given analysis years.

Degryse et al. (2013) studied the determinants of regional banking system fragility from 1994 to 2008 focusing on 17 countries from Asia and Latin America, the United States and Europe as a single entity. In the analysis, the stock market

volatility, change in the exchange rate and the interest rate were the macro variables used to uncover the banking fragility. Furthermore, the authors investigated the effect of macro factors through logistic regression and logit models. The authors mainly concluded that as the liquidity of bank assets, bank capitalization and competition increased, the fragility of the regional banking system and contagion affects decreased.

Barışık and Demirel (2014) constituted a fragility index for the banking sector in Turkey with market data from 2002 to 2011. The authors used sector specific data such as leverage ratios, liabilities in foreign currency etc. similar to the approaches of Singh (2010) and Kibritçioğlu (2002). The study revealed that CDS premiums and foreign exchange rate conditions were the main parameters amplifying the bank fragility in Turkey.

Demirel et al. (2016) analyzed the factors relevant to the banking sector fragility in Turkey for the period 2010 to 2015. The real exchange rates, inflation, industrial production index and interest rates were the main macroeconomic indicators employed in the study; in addition, the authors applied a time series analysis with Johansen cointegration method. The study underlined that the increase in non-performing loans as well as the adverse conditions in the global financial markets increased the banking sector fragility in Turkey mainly due to the dependence of the sector on foreign funds.

Öztürk (2016) examined the macroeconomic factors affecting the banking sector financial fragility in Turkey between 1970 and 2014. The author selected the GDP growth rate, inflation and saving deposits interest rate as the regressors in the proposed times series regression model. The study mainly disclosed that GDP growth was positively associated with the return on assets and return of capital in the Turkish banking sector.

Varlık and Varlık (2016) prepared a banking soundness index for Turkey with empirical data from 2004 to 2015. The proposed index included thirteen sector specific parameters standardized and then weighted based on the results of factor analysis. On the other hand, the authors employed a vector autoregression model to assess the risk perception towards the sector in which the ratio of capital and finance accounts of the balance of payments to GDP, the FED interest rates, oil prices and United States (US) treasury bills interest rates were used as external variables. The authors concluded that

the increase in the risk perception deteriorated the balance sheet structure of the banks; in addition, the balance sheet of the banks expanded with the increase in asset prices.

Bölükbaşı et al. (2018) studied the relationship between the banking sector fragility index and economic activity in Turkey from 2005 to 2016. Similar to the approach of Varlık and Varlık (2016), the authors standardized selected three sector related ratios and determined their relative weights through factor analysis. By means of a vector autoregression approach, the authors then focused on the relationship between the index and economic activity, which was represented by the industrial production index. The results revealed that economic activity had a major impact on the banking sector fragility index; whereas the effect of the latter on the former was not justified.

The second strand of research examines financial fragility in terms of macroeconomic circumstances. Balakrishnan et al. (2009) formed a financial stress index for 26 emerging countries for the years 1997 to 2009. The proposed stress index had five main dimensions, which were the banking sector beta derived from the capital asset pricing model, public debt spreads, an exchange market pressure index, stock market returns and their volatility, each of which was standardized and added up into a single index value. The authors concluded that the pass-through of financial distress from developed economies to emerging markets was quite rapid, especially to those characterized with high external debt to the advanced ones.

Cardarelli et al. (2009) proposed a financial stress index for 17 developed countries for the years starting from 1980 to 2009. The methodology included the application of equal-variance weighted averages of selected seven sector variables from the banking, securities exchange and foreign exchange markets, which mainly included spread rates, security yields, changes in stock prices and foreign exchange rates. The study put forward that the distress in the banking sector was frequently, if not always, associated with serious economic downturns especially caused by rapid expansion of credits, increasing borrowings and ascending asset prices such as housing.

Filho et al. (2009) developed a financial fragility index for the Brazilian public sector from 2000 to 2007. The authors applied a Minskyan approach and constructed the index as a ratio based on the public financial position considering government revenues, current expenses and financial expenses. The proposed index revealed that

Brazil experienced a speculative period in terms of financial fragility in the 2000s characterized with a rise in public debt.

Hakkio and Keeton (2009) set up a financial stress index for Kansas City in the United States for the years 1990 to 2009. The authors selected eleven variables mainly representing prices and returns in the financial markets such as treasury bills and swap spreads, bond yields, stock prices and yields. In order to integrate the selected indicators into a single index, the variables were standardized and their relative weights were calculated through principal component analysis. The authors concluded that the index constructed determined the periods of financial stress and provided an insight for future economic growth.

Based on the former studies of Cardarelli et al. (2009) and Balakrishnan et al. (2009), Elekdağ et al. (2010) compared the financial stress index of Turkey with that of 17 developed and 25 developing countries from 1996 to 2009. Through a vector autoregression model, the authors further investigated the relationship between financial fragility and economic activity in terms of the industrial production index. The study mainly concluded that financial stress had an apparent impact on economic activity.

Kliesen et al. (2012) surveyed 18 different financial stress indexes constructed between 2005 and 2012. Focusing on the definitions as well as component indicators of each, the authors pointed out that diverse stress indexes were strongly correlated with each other. The authors detected high correlations among diverse financial stress indexes.

Çakmak (2013) formulated a financial fragility index for Turkey in which eight diverse macroeconomic variables for the years starting from 1989 to 2011 were employed. As for the variables, the author incorporated the following indicators into a single index through standardization and equal weighting.

- The ratio of current account balance to gross national product (GNP)
- The real exchange rate index
- Exports to imports ratio
- The ratio of short-term foreign debt (STFD) to reserves
- Consolidated budget balance to GDP ratio

- Annual increase rate of Istanbul Stock Exchange Corporation (BIST) 100 Index
- The ratio of STFD to long-term foreign debt (LTFD)
- Net public debt stock to GDP ratio

The author concluded that the index succeeded in predicting the 1994 and 2001 crises in Turkey; on the contrary it did not produce any predictive signals before the 2008-2009 crises.

Çevik et al. (2013) set up a financial stress index for Turkey for the years between 1997 and 2010. The proposed index integrated stock market fluctuations, variations in exchange rates and international reserves, bond spreads, banking sector risk, trade finance and short-term foreign debt through a principal components analysis approach. The authors additionally employed a vector autoregression model to analyze the relationship between the stress index and level of economic activity, which was represented by the industrial production index, foreign trade statistics and gross fixed capital formation. The authors disclosed that the proposed index was capable of determining the recessionary periods in Turkey.

Ekinci (2013) posited a financial stress index for Turkey corresponding to the years 2002 to 2013. Utilizing a standardized equal weighting approach, the author integrated four different sub-indexes from the stock and foreign exchange markets as well as the public and banking sectors. The components of the sub-indexes mainly included the interbank cost of borrowing, United States dollars (USD) credit default swap spreads, stock market index and foreign exchange rates. The financial stress index determined six diverse stress periods in Turkey in which the public sector was highlighted as the main source of financial stress.

Öztürkler and Göksel (2013) presented a financial stress index for Turkey between 1998 and 2012. The indicators to be included in the index were determined by probit models, which included the emerging markets bond index, the ratio of trade deficit to international reserves and volatility in the foreign exchange rates, respectively. In addition, the selected indicators were standardized and weighted according to the results of a principal component analysis. The authors noted that the proposed index was able to capture three recessions in advance in Turkey in the given years.

The FED, the central bank of the United States, publishes a monetary policy report twice a year. In the report of February 2014, the bank presented an emerging market vulnerability index for 15 emerging economies including Turkey covering the years 2013 and 2014 (FED, 2014). The constructs of the index encompassed six macroeconomic indicators as summarized below (FED, 2014:28-29):

- Current account balance to GDP ratio
- Gross government debt to GDP ratio
- Three-years-average rate of inflation
- Deviation in bank credit to private sector as a percentage of GDP (five-year-scope)
- Total foreign debt to exports ratio
- International reserves to GDP ratio

It was disclosed that economies with higher index values were subject to higher currency devaluations as well as experienced higher yields of government securities.

Kaplan and Yapraklı (2014) studied financial fragility and foreign exchange rates in 12 developing countries between 2000 and 2012. The authors constructed a panel data regression model in which the variations in the real foreign exchange rate were analyzed with the fragility index proposed by the FED including the regressors of inflation, foreign debt to exports ratio as well as the ratios of current account deficit, gross public debt stock, international reserves and private sector credit debt to GDP. The results of the study suggested that the exchange rate was positively associated with the ratios of current account balance to GDP, domestic bank credits for the private sector to GDP and gross government debt to GDP as well as the rate of inflation. On the contrary, the relationship was negative in terms of the ratios of foreign exchange reserves to GDP and external debt to exports. The authors underlined the ratio of foreign exchange reserves to GDP as the most influential indicator on exchange rate development.

Şensoy et al. (2014) established a financial fragility index for Turkey between 2006 and 2014. The authors made use of five indicators; the stock market index, exchange rate, credit default swap, interbank overnight interest rate and bond yield, respectively. The variables converted into a single index value with principal

component analysis; in addition, a dynamic conditional correlation matrix was used to determine relative weights. The study revealed that all indicators integrated in the index excluding the overnight interest rate were nearly similarly influential while assessing the fragility conditions in the given years.

Aklan et al. (2015) examined financial stress and economic activity in Turkey for the years between 2002 and 2014. The stress index compiled the banking sector beta, five-year credit risk premiums, volatility of stock returns and fluctuation in real exchange rates with respect to international reserves where the indicators were standardized and weighted with the results derived from factor analysis. The researchers further investigated financial stress and economic activity by means of a vector autoregression model and Granger causality analysis where the change in industrial production, foreign trade balance and domestic loans represented economic activity. The authors revealed that uncertainty arising from domestic and external shocks gave rise to financial stress. In addition, the study concluded that financial stress caused a decline in economic activity.

Karakurt et al. (2015) dealt with macroeconomic fragility in Turkey and in Shanghai Five countries from 2008 to 2013. The authors selected five macroeconomic indicators to represent fragility, which were the domestic credit expansion, real exchange rate and the ratios of current account, international reserves and public debt to GDP, respectively. The authors determined the current account deficit and domestic credit expansion as the most influential factors of fragility in Turkey.

Bayraktar and Elüstü (2016) made a comparison of 19 emerging countries in Turkey in terms of macroeconomic fragility. Based on the indicators derived from the study of FED (2014), the comparison considered the ratios of current account balance, international reserves, gross public debt and domestic credits to GDP, the ratio of external debt to exports and three-year-average inflation. The study emphasized the current account deficit, inflation, high external debt and insufficient international reserves as for the main sources of fragility in Turkey.

Çan and Dinçsoy (2016) analyzed selected macroeconomic indicators for Brazil, India, Indonesia, South Africa and Turkey between 2005 and 2013. The authors compared these countries in terms of external, fiscal and financial fragility, the indicators of which are listed below:

- the ratio of current account balance to GDP (external fragility)
- the ratios of international reserves to short term foreign debt and to GDP (external fragility)
- the ratios of external debt to GDP and to exports (external fragility)
- the real exchange rate (external fragility)
- the ratios of budget deficit and fiscal deficit to GDP (fiscal fragility)
- the ratios of public debt, short term foreign debt and public sector foreign debt to GDP (fiscal fragility)
- the ratio of loan to deposit (financial fragility)
- the ratio of domestic credits to GDP (financial fragility)
- annual credit growth (financial fragility)

The authors concluded that the countries in question had a fragile economic structure making them considerably prone to external shocks.

Mete et al. (2016) focused on eight emerging countries including Turkey from 2004 to 2014 and assessed these with regard to macroeconomic fragility. In an effort to determine the level of fragility, the authors examined six diverse macroeconomic variables; the GDP growth rate, current account deficit to GDP ratio, inflation, unemployment rate, value of national currency and the ratio of budget deficit to GDP, respectively. The study concluded that high levels of current account deficits as well as the inability to finance such deficits, especially with external means elevated the risk of fragility.

Saraçoğlu and Sülkü (2016) explored composite crises indicators for Turkey between 1998 and 2012 in which they benefited from the former approach of Kaminsky et al. (1998). The authors started with 32 early warning indicators and reduced these to the most influential 18 variables through ratio and leading time analyses; consequently, the chosen measures were mainly relevant to real exchange rates, money supply, foreign portfolio investments, stock market index, GDP growth, current account items, foreign debt and fiscal balance. The study concluded that the Turkish economy was considerably fragile and the signaling indicators used in the index could be reviewed for anticipating possible crises.

Akın (2017) analyzed macroeconomic fragility in Bulgaria, Romania, Croatia, Greece and in Turkey from 2007 to 2016 and conducted a comparability analysis. The author compared these countries based on selected six indicators, which were the current account balance, international reserves, budget deficit and public debt, all expressed as percentage of GDP as well as the growth of domestic credits and loan to deposit ratio, respectively. The author marked the current account deficit and international reserves as the main factors that increased the fragility of the Turkish economy.

Boğa (2017) assessed the impact of financial fragility on international capital movements in selected six emerging counties including Turkey from 1992 to 2014. In the proposed panel data regression models, the regressors of financial fragility were represented with five indicators; the real exchange rate, the ratios of domestic credits to GDP, M2 money supply to international reserves, foreign debt to GDP and the trade balance to GDP. The study concluded on the one hand that the relationship between international capital inflows and financial fragilities in developing countries was weak. On the other hand, the real effective exchange rate and M2/Reserves ratio affected foreign direct investments negatively; whereas the real effective exchange rate and domestic credit were positively associated with incoming portfolio investments.

Kaya and Kılınç (2017) established a financial stress index for Turkey for the years 2002 to 2015 and analyzed its relationship with economic activity. The stress index posited included five components relevant to credit default swaps, stock market returns, cost of interbank borrowing and the change in real exchange rates in terms of international reserves, respectively. To analyze the relationship between financial stress and economic activity, the authors conducted a Granger causality test and set up a variance autoregression model in which the industrial production index, foreign trade and domestic credits were integrated as for the representatives of economic activity. The financial stress index proposed by the authors was evaluated as a successful reflector of financial crises. Moreover, the study concluded a significant relationship between financial stress and economic activity.

Bülbül and Akgül (2018) constructed a financial stress index for Turkey for the period starting from 1990 to 2017. The constructs of the index covered the foreign exchange volatility, international reserves, interest rates and stock price volatility that were integrated into a single value through standardization and variance equal

weighting. By means of applying a Markov regime-switching model, the authors further determined high fragile or crises years. The authors distinguished between low, normal and high stress periods through the studied index in which the crises years in the given years were successfully determined.

Chadwick and Öztürk (2018) proposed a uniform financial stress indicator for Turkey covering the years between 2005 and 2016. The authors compiled 14 different variables from the banking sector and money, bond, foreign exchange and equity markets, which were mainly pertaining to real exchange rates, the stock market index, bond index, banking sector beta and this sector's equity index. The authors applied and compared a number of diverse methods in order to aggregate the values into a composite indicator in which final weighting was based on a rolling-correlation method. The authors concluded that the proposed composite index was able to capture the corresponding stress periods in the sample years.

1.5. Measuring Financial Fragility in Turkey

1.5.1 Method

The method to attempt to measure financial fragility in Turkey will include the determination of the relevant indicators representing fragility, their integration into a single weighted index and an analysis of the development of the index values for the selected years.

In this respect, each determinant coined as macroeconomic indicators mainly in the form of ratios or index values will be defined and examined thoroughly. In addition, the development of these variables in Turkey for the given time period will be highlighted. This will be followed by the explanation of the direction of association between the given indicator and financial fragility. As for the subsequent step, the variables will be standardized and weighted as a single index value for the pre-determined analysis years. The last step will be the focus on the development of the financial fragility index values for the given time period.

The method to be applied is largely an extension of the study of Çakmak (2013). This will be elaborated in section 1.5.3 in which a detailed comparison of both approaches will be presented.

1.5.2 Data Set

The data set to be used in the analysis encompasses nine diverse ratios and indexes for Turkey covering a thirteen-year-time-period from 2005 to 2017. These are listed as follows:

- The real exchange rate of Turkish Lira (TRY)
- Borsa Istanbul (BIST) 100 index
- The ratio of short-term foreign debt (STFD) to long-term foreign debt (LTFD)
- The ratio of short-term foreign debt (STFD) to international reserves
- The ratio of current account deficit to gross domestic product (GDP)
- The ratio of budget deficit to gross domestic product (GDP)
- The ratio of net public debt to gross domestic product (GDP)
- The ratio of exports to imports
- The ratio of private sector foreign debt (PSFD) to gross domestic product (GDP)

The data set is derived from three main sources which are the Central Bank of the Republic of Turkey, General Directorate of Budget and Fiscal Control and the Ministry of Treasury of the Republic of Turkey. Table 7 presents a detailed overview of the data source for each relevant indicator. In addition, the two tables in the appendix portray the base data of the macroeconomic variables used in this study.

Table 7. Data Sources for Selected Fragility Relevant Variables

Data Set	Source
BIST100 Index	CBRT EVDS (2018a)
Real Exchange Rate	CBRT EVDS (2018b)
Short Term Foreign Debt	CBRT EVDS (2018d)
Long Term Foreign Debt	
Private Sector Gross Foreign Debt	
International Reserves	CBRT EVDS (2018e)
Exports	General Directorate of Budget and Fiscal Control (2018a)
Imports	
GDP	General Directorate of Budget and Fiscal Control (2018b)
Average USD Exchange Rate	
Current Account Deficit	
Budget Deficit	
Net Public Debt	Ministry of Treasury (2018)

Having provided the background information for the data set as well as the sources from which they are derived, the following sub-sections will investigate each of them in detail.

1.5.2.1 Real Exchange Rate

Exchange rate can be defined as the rate at which one item is exchanged (bought or sold) with another. In this study, exchange rate will refer to the currency exchange rate, which is the price of one currency in terms of another. When we have the currency exchange rate in focus, different terms enter into the scene; nominal, real and effective exchange rates, respectively.

What is defined above as the exchange rate is actually the nominal exchange rate; the price of one currency in terms of another. On the other hand, the real exchange rate considers in addition the general price level in one country with respect to another.

Williamson (2018:606) formulates the real exchange rate as follows:

$$\frac{eP^*}{P}$$

In this formulation, e denotes the nominal exchange rate that is the price of foreign currency in terms of local currency (let us say TRY price of USD); P refers to the price level in the local market and P^* represents the prices in the foreign country in terms of foreign currency. Hence, eP^* represents the foreign price level in terms of domestic currency.

Defining the real exchange rate, Salvatore (2013:477,738) uses the consumer price index (CPI) to represent the general price level in the respective countries.

Exchange rates, either nominal or real are measures of one currency in terms of another. On the other hand, when the objective is to have an idea of the price of one currency against that of a group of currencies, the calculation of the effective exchange rate is necessary. In other words, the effective exchange rate is represented as an index number such as 100 (Gandolfo, 2016:21). Krugman et al. (2018b:61) define this index as an average based on a given foreign currency basket.

As Blanchard (2017:352) suggests, whereas nominal exchange rates are easy to observe, the real exchange rates cannot be found directly in daily publications such as in newspapers. This is basically due to the fact that relative price levels in two countries for a specific period of time are additionally to be calculated to identify the real exchange rates.

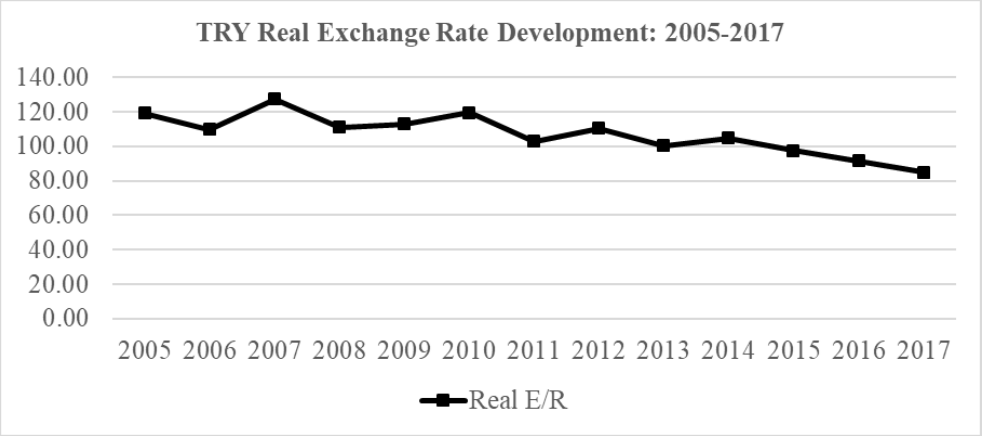
Gandolfo (2016:21) indicates that effective exchange rates are disclosed by international financial organizations such as the IMF as well as central banks. Likewise, the effective real exchange rate for TRY is calculated and published by the CBRT. The CBRT announces the real effective exchange rate of TRY as an index number representing the average value of TRY in terms of selected country weights (CBRT EVDS, 2018b).

As we shall see in the subsequent sections in detail, real exchange rates play a vital role in macroeconomic stability, especially with regard to the current account balance, sustainable external borrowing and capital inflows as well.

The effective real exchange rates for TRY declared by the CBRT encompass the value of local currency in terms of foreign, which is just the opposite as defined above. Therefore, it should be noted with caution that an increase in the effective real exchange rate of TRY will imply the appreciation of TRY against the foreign currency basket and vice versa.

Figure 1 below depicts the CPI based real exchange rate development of TRY between 2005 and 2017 in which the year 2003 is taken as 100 base points. The graph shows that the real exchange rate fell from 119.42 to 85.17 (depreciation of TRY) within the given time period in which the peak was observed in 2007 with 127.63. Moreover, TRY almost steadily lost its value in real terms from 110.59 to 85.17 from 2012 onwards.

Figure 1. Real Exchange Rate Development of TRY (2003=100), 2005-2017



Source: Based on data derived from CBRT EVDS (2018b).

1.5.2.2 BIST 100 Index

BIST is the abbreviation for Istanbul Stock Exchange Corporation (Borsa İstanbul A.Ş.) which can be thought of as an umbrella for securities exchange operations in Turkey on equities, precious metals, foreign currencies, contracts etc. (Borsa İstanbul A.Ş., 2018a).

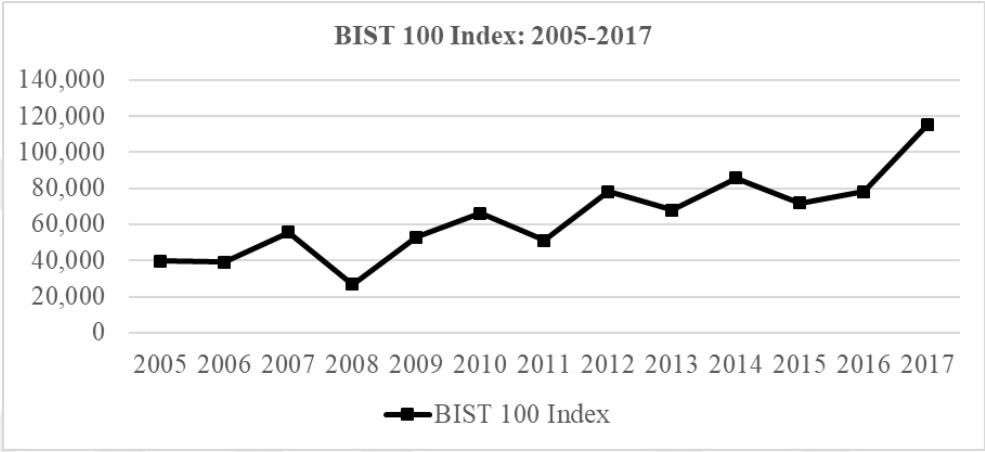
BIST 100 is the key stock index for equities traded in Turkey which is aimed at measuring the performance of selected 100 stocks traded in this equity exchange (Borsa İstanbul A.Ş., 2018b:4). The eligibility of equities for the BIST 100 index is based on two distinct criteria, which are the free float market value and daily average traded value, respectively (Borsa İstanbul A.Ş., 2018b:9).

In general, the share price of a company can be regarded as the present value of all future dividends (Melicher & Norton, 2016:284). With this respect, it can be concluded that the BIST 100 index is an indicator for the future profitability of 100 publicly held companies in Turkey with the highest market or trading value of share

price. In other words, an increase in the BIST 100 index can be interpreted as positive expectations on the future performance of major listed companies in Turkey.

The graph in Figure 2 portrays the development of the BIST 100 index from 2005 to 2017. Values in the index depend on closing prices at year ends in which the year 1986 is taken as "1" as the index value (1986 = 1). A closer look into this diagram reveals that the index value gradually rose from 39,778 to 115,333 as we move from 2005 to 2017. On the other hand, declining trends were observed in 2008, 2011, 2013 and 2015, respectively.

Figure 2. Development of the BIST 100 Index, 2005-2017



Source: Based on data derived from CBRT EVDS (2018a).

1.5.2.3 Short Term Foreign Debt/Long Term Foreign Debt

Foreign or external debt refers to the debt of a citizen, firm, institution or a government; hence, either the public or private sector that is owed to foreign parties (McConnell et al., 2018: 281).

Gerber (2018:229) underlines that foreign debt is to be serviced in foreign currency and clarifies that the distinction whether it is short-term or long-term is made based on the due date being less or more than 12 months, respectively.

The level of foreign indebtedness can be regarded as a macroeconomic risk factor. As external debt increases, economic actors may tend to keep their holdings in the form of foreign currencies either within the country (dollarization) or abroad (capital flight) which in turn leads to macroeconomic imbalances such as ascending interest rates, price instabilities, devaluation of the national currency and lower growth due to less funds being invested (Herr & Priewe, 2006:182).

Gandolfo (2016:203) argues that as foreign debt increases, the likelihood for insolvency rises in the event that foreign lenders take their funds back or even stop investing new funds in the country. In the same way, Pugel (2016:520-521) informs that since short-term debt is to be serviced at a relatively closer period of time, it may pose considerable risks of default due to the fact that it may not be easily refinanced unless paid in total. The author further supports this proposition by referring to the Mexican financial crises occurred in 1994-1995.

Considering the capital outflows mentioned above, the real exchange rates could also be considered as a determining factor. Montiel (2011:369) points out that possible disequilibria in real exchange rates may lead to adverse micro and macroeconomic conditions in that the resource allocation among national and foreign goods are distorted and nominal exchange rates fluctuate in such a way that the demand for assets priced in the local currency falls and in turn capital flights occur. Similarly, the author claims that an overvalued domestic currency together with adverse macroeconomic conditions such as high short-term indebtedness, solvency problems, overall economic recession imply high tendency for a capital outflow out of the country (Montiel 2011:453).

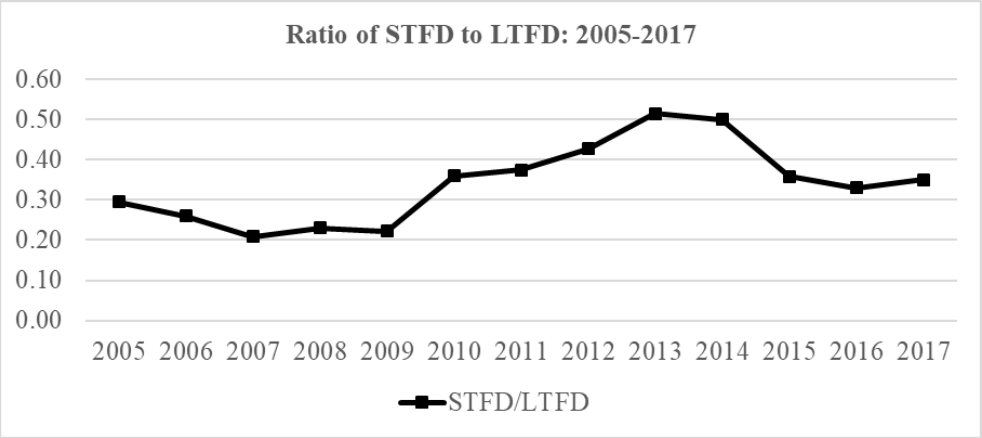
In this respect, the ratio of STFD to LTFD can be thought of a measure to what extent an economy is able to finance or re-finance its short-term foreign debt with respect to that of long term. One conclusion that can be drawn is that the higher this ratio is, the more likely the risk of fragility is.

The foreign debt statistics in the appendix suggest that as we move from 2005 to 2017, the gross external debt of Turkey including the public and private sectors as well as the CBRT rose from 38,914 million (M) USD to 117,854 M USD (short-term) and from 131,861 M USD to 336,430 M USD (long-term). This corresponds to a 203% increase for short-term indebtedness and a 155% rise in long-term amounting to a 166% growth of total external debt. Looking further at these statistics, it can be inferred that the composition of public/private share shows a vast change in that the share of the private sector in total foreign debt increased from 50% to 70%. That is, foreign indebtedness shifted from the public sector to the private sector as we move from 2005 to 2017.

Figure 3 presents the ratio of STFD to LTFD between 2005 and 2017 in Turkey. The line on the graph shows that Turkey experienced relative stable

STFD/LTFD ratios between 2005 and 2009 which was 0.24 on average. Starting from 2009, the ratio dramatically rose to 0.50 until 2014 which means an increase in short-term indebtedness relative to long-term. Following that year, the value dropped to 0.36 in 2015 and almost stayed at this level in the last three years of the given time span.

Figure 3. Ratio of Short-Term Foreign Debt to Long-Term, 2005-2017



Source: Based on data derived from CBRT EVDS (2018d).

1.5.2.4 Short Term Foreign Debt/International Reserves

International reserves can be defined as the foreign assets of central banks in order to provide protection against any adverse conditions in the domestic economy (Krugman et al., 2018b:50). They consist of all the resources in the form of money in terms foreign currency, gold etc. that are at the disposal of governments or regulatory bodies aimed at meeting the fiscal obligations and conducting operations in the market (Gandolfo, 2016:77).

Montiel (2011:730) highlights that there is an inverse relationship between the volume of international reserves and susceptibility of financial crises, especially in terms of developing and emerging countries, since these reserves can be thought of as potential coverage against unexpected stop of incoming capital and overvaluation of domestic currencies.

Gandolfo (2016:607-608) refers to the recent literature which emphasizes the role of international reserves as "self-insurance against sudden stops of capital inflows, currency crises" and as a tool for stimulating exports by stabilizing the exchange rates.

Krugman et al. (2018a:742) explain that insufficient reserves of foreign exchange increases the likelihood of default, since these reserves are used to service especially short-term external debt.

Gerber (2018:305) reviews that in the Debt Crises of 1980s, it was Mexico, which acknowledged that the country had insufficient international reserves to pay the foreign debt.

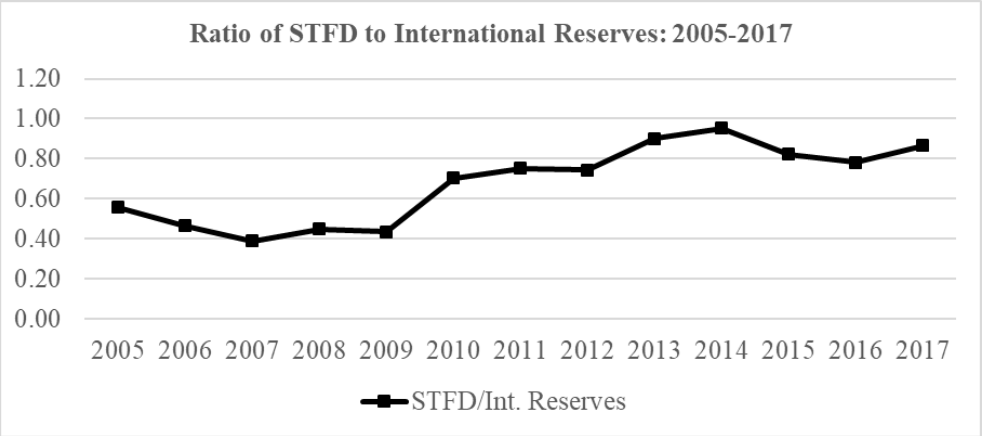
Hence, international reserves can be thought of as a source for servicing foreign debt. In this sense, the lack of international reserves may lead to financial crises. Incorporating these two indicators into a ratio, an increase in the STFD to international debt ratio will imply elevated fragility by definition.

As noted earlier, the short-term gross foreign debt of Turkey taking the public, private and the CBRT external indebtedness as a whole into consideration grew dramatically from 38,914 M USD to 117,854 M USD corresponding to a 203% increase from 2005 to 2017. Likewise, the international reserves represented by the gold reserves, foreign exchange reserves of the CBRT, banks correspondence accounts and foreign banknotes as well as overdrafts increased from 69,994 M USD (2005) to 136,169 M USD (2017) amounting to a positive change of 95% within the same thirteen-year-period.

The development of the ratio of STFD to international reserves in Turkey for the time period 2005 to 2017 is illustrated in Figure 4. The relative difference in the growth rates of both variables just expressed above is reflected in the figure.

According to this figure, the ratio showed relative stability between 2005 and 2009 with an average value of 0.46 in these five years. Afterwards, the ratio jumped to 0.70 in 2010 and stayed at this level in the three consecutive years. Another jump to 0.90 was observed from 2013 onwards with the peak in 2014 (0.95). From this year onwards, a slight declining trend was observed in the last three years of the given period from 0.95 (2014) to 0.87 (2017).

Figure 4. Ratio of Short-Term Foreign Debt to International Reserves, 2005-2017



Source: Based on data derived from CBRT EVDS (2018d, 2018e).

1.5.2.5 Current Account Deficit/Gross Domestic Product

By definition, the current account balance, often called just the current account, is the difference between exports of goods/services and imports of goods/services additionally encompassing the net unilateral transfers of income. Positive current account balances where exports are higher than imports imply a current account surplus; in contrast, the opposite is called a current account deficit (Krugman et al., 2018b:38).

Current account balance differs from the trade balance, which is the balance between exports and imports of goods or commercial balance in that it includes the net unilateral transfers above the trade balance; hence, the current account is a measure of changes in the economy's stock of foreign financial items (Gandolfo, 2016:81). On the other hand, Blanchard (2017:386) emphasizes that although being different by definition, the interchangeable usage of the terms trade balance and current account balance does not pose a key problem, since net income transfers tend to change gradually and both balances fundamentally alter in the same direction.

The current account balance in an economy is closely related to capital inflows/outflows, external borrowing, real exchange rates and international price competitiveness. Montiel (2011:29) regards the current account as a fundamental macroeconomic indicator pointing out that favorable current account balances would mean growing sales to the rest of the world, attracting more external funds and

investment and hence, leading to an increase in the welfare. Therefore, the author interprets that a current account surplus is also regarded as foreign investment.

On the contrary, Blanchard (2017:386) interprets that countries with negative current account balances are in such a position to raise funds from the rest of the world. This may give rise to an increase in external indebtedness. Likewise, Gerber (2017:226-227) underlines that countries with current account deficits feel compelled to close this gap with international borrowing and warns that an alteration in the confidence of foreign creditors may lead to capital flight out of the country in which official reserves are exhausted resulting in a financial crisis.

Krugman et al. (2018b:39) consider the current account as a fundamental macroeconomic indicator in that it gauges the magnitude and path of international borrowing. Countries incurring deficits are in such a position to close the gap by means of external debt. The authors also conclude that the fiscal policy of governments is mainly aimed at maintaining an internal and an external balance in which the latter is associated with pursuing a sustainable current account balance where debt servicing is secured in the long run (Krugman et al., 2018a:580).

It can be asserted that the current account balance is sensitive to changes in the level of real exchange rates. Gandolfo (2016:598) posits that an overvalued real exchange rate is closely related to the rise of foreign debt, since it worsens the current account deficit, which is in turn to be financed with external borrowing. The author mentions that the increase in the value of real exchange rates was one of the main factors causing the Asian Crises of 1997-1998.

Pugel (2016:562) considers the real exchange rate of a country as a parameter for international price competitiveness. The author argues that an increase in the price competitiveness of a country in the form of cheaper local products compared to foreign will tend to lead to an increase in exports and a decrease in imports.

On the contrary, Blanchard (2017:384) defends that a decrease in the value of the domestic currency would primarily have an impact on the prices of the exported and imported goods and services rather than the transaction volumes. Hence, this leads to a deterioration of the trade balance at first owing to declining exports, which is then followed by a gradual improvement of the balance eventually due to the fact that volume effect outweighs that of price afterwards.

Moreover, Krugman et al. (2018a:490) claim that the impact of real exchange rate on the current account may be uncertain in that an increase in the real exchange rate (price of foreign currency in terms of local currency-depreciation of local currency) is likely to increase exports; whereas it may increase or decrease imports, since the value of imports may still increase despite falling volume.

Gerber (2018:254-255) further emphasizes on the importance of inflation in relation to current account deficit. The author argues that an increase in the inflation rate will result in an increase in the real value of the currency leading to current account deficits due to increasing imports and decreasing exports. Gerber also regards an overvalued domestic currency as a risk factor for financial crises.

GDP is a widely accepted key indicator for a country's economic performance (Krugman et al., 2018b:35). It is a measure of the value of final goods and services produced within the borders of a country for a given time period (McConnell et al., 2018:124). Whereas the nominal GDP measures the total value at the prevailing prices in the market, the real GDP uses a reference set as for fixing the price level just as to gauge the volume expansion (Montiel 2011:29). Unless otherwise stated, the GDP figures used in this study will refer to nominal GDP values, the calculation of which are based on current prices.

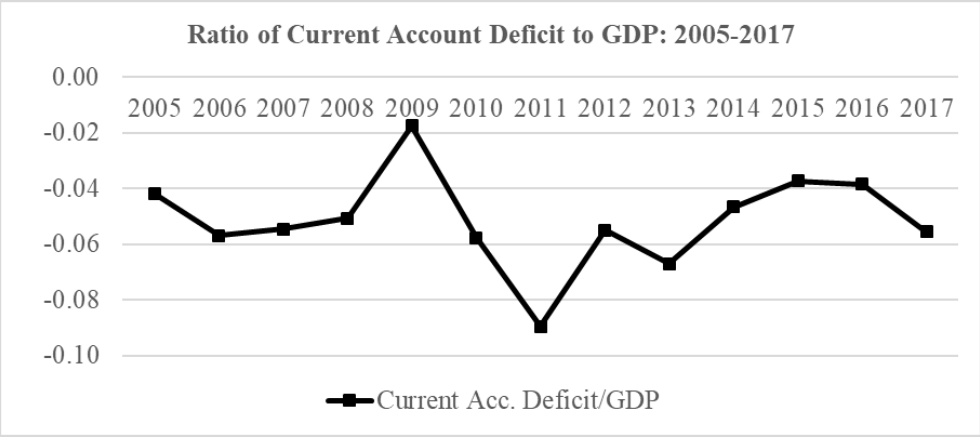
There is a close relationship between the GDP and the total income generated by a country. Having the GDP as the starting point, when we add the net factor income from the rest of the world and deduct depreciation and any statistical discrepancies, the remainder is the national income, which is the total income of a country (Case et al., 2017:110). Hubbard and O'Brian (2016:411) emphasize that practically GDP and national income can be used interchangeably.

In this sense, any ratio having the GDP as the denominator in general can be thought of as a measure of a given variable in terms national income.

Figure 5 below depicts the ratio of current account deficit to GDP from 2005 to 2017 in Turkey. Since deficit is associated with negativity, Turkey had an undesired current account balance in the given time period in which the value of imports exceeded that of exports including physical goods, services, income and current transfers by definition. As it may be reviewed from the table in the appendix, the current account deficit of Turkey deteriorated by 126% from -20,980 M USD to -

47,378 M USD from 2005 to 2017. On the contrary, the GDP rose from 673,703 M TRY to 3,104,907 M TRY in the same period corresponding to a 361% change on TRY basis; however, the rise is limited to only 69% on USD terms (502,388 M USD in 2005 to 851,199 M USD in 2017). Since the rate of increase is higher at the deficit side compared to the GDP growth, the ratio expressed as a percentage worsened from -4.2% to -5.6% in the given period. Of the illustrated years, the most favorable ratio was observed in 2009 with -1.8%; whereas the most unfavorable in 2011 with -8.9% in which the average deficit percentage for the total given years is -5.1%. Following an improving trend from 2006 to 2009, the ratio deteriorated sharply from 2009 to 2011 and showed recovering trends afterwards.

Figure 5. Ratio of Current Account Deficit to GDP, 2005-2017



Source: Based on data derived from General Directorate of Budget and Fiscal Control (2018b).

1.5.2.6 Budget Deficit/Gross Domestic Product

The budget deficit, in broader meaning the budget deficit of central governments, is the unfavorable difference between government revenues and expenditures. Montiel (2011:124) coins this term as fiscal deficit as well. It is an indicator how far governments are able to financially cover their spending through borrowing (Krugman et al., 2018b:42).

Hubbard and O'Brian (2016:644) explain that budget deficits come out during periods of shrinking economic growth. The authors add that this is characterized with declining real GDP in consecutive periods due to the fact that in such periods, government proceeds in the form of tax collections tend to fall; in contrast spending

tends to rise in an effort to stimulate economic activity with aids, incentive programs and so forth.

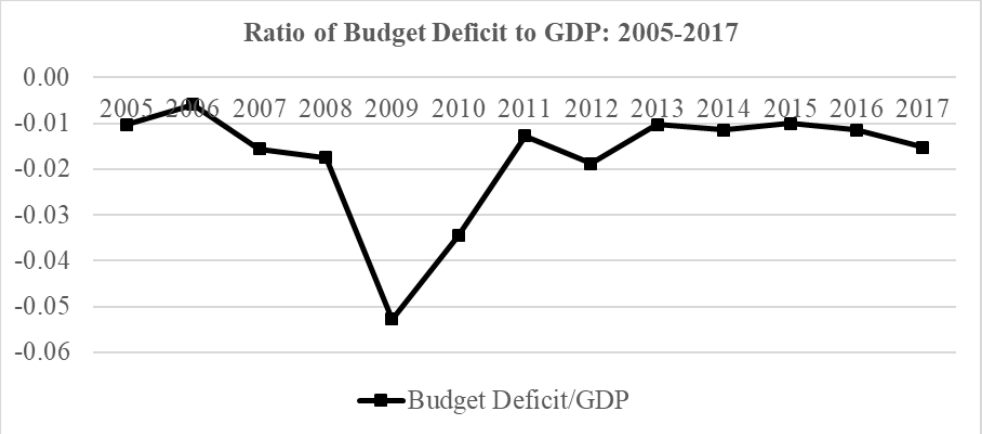
According to the provisions of the Maastric Treaty, which set the criteria for entering the European Monetary Union (EMU), the level of inflation, public debt and budget deficit were the main indicators (Blanchard, 2017:425). In addition, the member states are in such a position to maintain ratios of annual budget deficit to GDP and national debt to GDP below 3% and 60%, respectively, which is vital for the macroeconomic sustainability of the Union (Ihori, 2017:153).

Economic stability depends on sustainable budget deficits and external debt as well as a steady real exchange rate, which are likely to attract capital inflows and foster economic growth (Gerber, 2018:427). Therefore, it can be concluded that an increasing trend in the budget deficit to GDP ratio may signal for macroeconomic imbalances and vulnerability to crises.

According to the statistical figures in the appendix, the central government budget balance shows negative values between 2005 and 2017 meaning that Turkey suffered from continuous budget deficits in this time period. Indeed, a tremendous increase in budget deficit is obvious in that budget balance rose from -6,903 M TRY to -47,373 M TRY from 2005 to 2017 amounting to a budget gap increase of 586% in local currency. In the same time span, GDP growth was 361% in TRY terms as mentioned in section 1.5.2.5 above. Figure 6 depicts how these single values affect the ratio of budget deficit to GDP.

Figure 6 suggests that with an average deficit percentage of -1.7% in the thirteen-year-time-span, the ratio started worsening from 2006 onwards characterized with a sudden deterioration from 2008 (-1.8%) to 2009 (-5.3%). From that year onwards, an improving trend was observed and relative stable rates ranging from -1.0% to -1.5% were reported between 2013 and 2017.

Figure 6. Ratio of Budget Deficit to GDP, 2005-2017



Source: Based on data derived from General Directorate of Budget and Fiscal Control (2018b).

1.5.2.7 Net Public Debt/Gross Domestic Product

Public debt is the total value of all budget deficits and surpluses of governments accumulated in the previous periods (McConnell et al., 2018:278-280). In this sense, public debt and government debt can be used interchangeably, both of which correspond to the same term. On the other hand, public debt includes the claims of foreign and domestic lenders which encompass the credits to governmental bodies as a whole regardless of central, federal or local authorities (Reinhart & Rogoff, 2009b:9).

Whereas the deficit is a measure covering a particular time period, that is usually a calendar year, the public debt includes the deficits of previous years as well (Gruber, 2016:14).

The mismatch between government revenues and spending leading to deficits gives rise to growing public debt, which especially shows its adverse reflection as long-term macroeconomic imbalances (Blanchard, 2017:63). Referring to the previous studies of Calvo (1988) and Alesina et al. (1990), Montiel (2011:653) synthesizes that high volume of public debt to be serviced in the short or long run makes the economy prone to financial crises due to confidence concerns.

Gandolfo (2016:643-644) explains that the ratio of (foreign) debt to GDP is regarded as an indicator of solvency and economic sustainability. Besides, the author relates this ratio to trade surplus by pointing out that trade surplus is a prerequisite for

keeping the debt to GDP ratio at constant levels specifically during the times of increasing debt stocks.

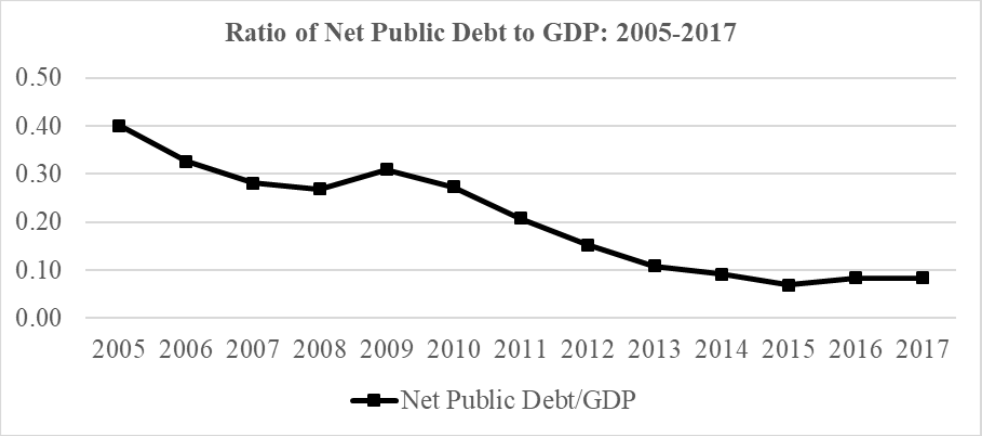
In the same way, Ihori (2017:149) underlines that governments cannot sustain budget deficits continuously, especially in the event that they already suffer from accumulated public debt. The author clarifies that future budget surpluses are needed in order to offset the current public debt from sustainability point of view. McConnell et al. (2018:278-280) further argue that an increase in the public debt may lead to an adverse situation with regard to income equality, an increase in taxes, thus a deterioration in government incentives as well as a decline in capital investment. Therefore, growing public debt is likely to damage economic growth.

Blanchard (2017:468) defines debt defaults as the inability of governments to pay back the total debt, which frequently occurs in part where the lenders are compensated not fully but based on a negotiated amount. The author highlights that defaults in general lead to adverse economic conditions such as cease of operations, bankruptcy, downgrade of international reputation especially depending on who the lending party is; e.g. the private sector, banks, pension funds or external creditors. To illustrate, the debt default of governments may further lead to banking crises in the event that the lenders are the domestic banks owning high volumes of government bonds or treasury bills (Montiel, 2011:637).

Williamson (2018:363) regards the public debt to GDP ratio as a convenient indicator for the indebtedness of a country. The basic idea behind this ratio is that a relatively productive, well-functioning and growing economy may maintain and sustain a large amount of public debt more easily (McConnell et al., 2018:280). As mentioned previously while interpreting the ratios with the GDP as the denominator, this ratio can be thought of as a measure of government indebtedness with regard to national income.

The data in the appendix explain that the reported net public debt of Turkey was 270,123 M TRY in 2005; whereas it was 262,237 M TRY in 2017 showing an improvement of 2.9% in the thirteen-year-period. If we recall from 1.5.2.5, the GDP growth percentage was 361% in TRY terms from 2005 to 2017. An improvement in the net public debt with increasing GDP should theoretically show a declining net public debt to GDP ratio. Whether this supposition is verified or not is illustrated in Figure 7.

Figure 7. Ratio of Net Public Debt to GDP, 2005-2017



Source: Based on data derived from Ministry of Treasury (2018).

Figure 7 confirms that the ratio of net public debt to GDP in Turkey, expressed as a percentage, shows an almost steady improvement trend from 40.1% (2005) to 8.4% (2017). However, a closer look into the net public debt dynamics will reveal interesting findings, which are summarized in Table 8.

Table 8 clarifies the components as well as the calculation logic of net public debt. Taking the gross public debt as a starting point, the total of net assets of the central bank, public sector assets and net assets of the unemployment insurance fund are deducted from this gross value, which eventually results in the net value of the public debt. Whereas the gross public debt grew by 172% from 2005 (351,169 M TRY) to 2017 (954,573 M TRY); its reflection on the net value was only -2.9% as earlier stated. The reason behind the opposite growth rates of gross and net public debt values is that the net assets of the public sector, the central bank and unemployment insurance fund improved substantially in this period in which the percentage change of the sum of these three amounted to 754%, led especially by the growth of central bank assets with 1,347%.

Table 8. Components of Net Public Debt (M TRY), 2005-2017

Year	Gross Public Debt	Net Assets of CBRT	Public Sector Assets	Net Assets of Unemployment Insurance Fund	Net Public Debt
2005	351,169	30,793	32,223	18,029	270,123
2006	365,601	45,685	38,256	23,748	257,912
2007	355,019	41,769	34,603	30,705	247,942
2008	407,305	60,371	41,516	38,352	267,066
2009	464,779	65,995	47,713	42,095	308,976
2010	496,792	86,216	47,166	45,939	317,472
2011	546,046	143,162	59,762	53,521	289,601
2012	562,738	189,502	71,610	61,162	240,465
2013	622,891	271,110	84,182	70,352	197,247
2014	649,936	304,360	77,372	81,393	186,811
2015	722,084	376,246	91,775	93,074	160,989
2016	819,784	397,053	100,346	103,202	219,182
2017	954,573	445,479	130,137	116,721	262,237
% Change	**172%**	**1,347%**	**304%**	**547%**	**-2.9%**

Source: Based on data derived from Ministry of Treasury (2018).

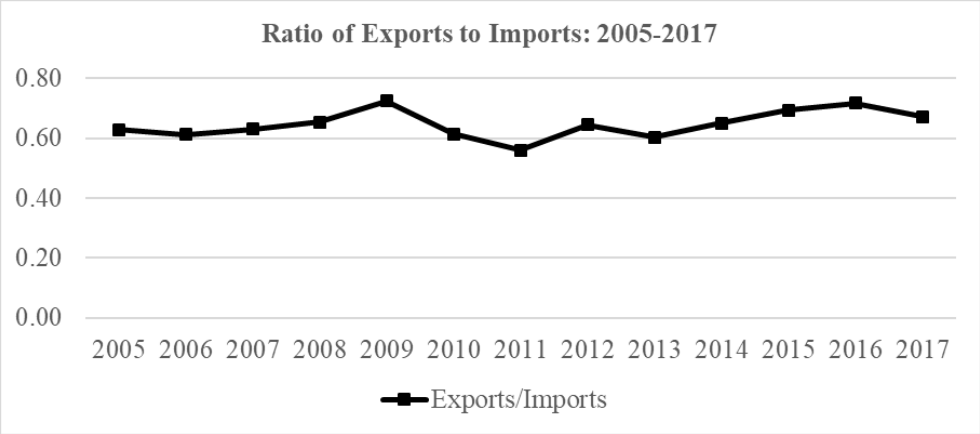
1.5.2.8 Exports/Imports

The ratio of the value of exports to imports for a country can be thought of as a measure for the country's trade balance, which implies to what extend a country is able to cover its imports with its exports. Countries with ratios greater than "1" should basically have an exports value in excess of that of imports leading to a trade surplus. In the event that this ratio takes a value between "0" and "1", then it can be said that the country is suffering from a trade deficit in which exports are surpassed by imports.

The exports and imports statistics in the appendix highlight that Turkey had a negative trade balance between 2005 and 2017 in which the total value of exports was always surpassed by that of imports leading to trade deficits in this thirteen-year-time-span. As for growth rates, exports grew by 114% from 73,476 M USD (2005) to 156,996 M USD (2017). Likewise, the expansion of imports was 100% from 116,774 M USD (2005) to 233,798 M USD (2017). This is reflected on the trade balance with

an increasing deficit of 77% from -43,298 M USD (2005) to -76,802 M USD (2017). Figure 8 shows the implication of foreign trade statistics on the exports to imports ratio.

Figure 8. Ratio of Exports to Imports, 2005-2017



Source: Based on data derived from General Directorate of Budget and Fiscal Control (2018a).

Figure 8 clarifies that the ratio of exports to imports took values less than "1" between 2005 and 2017 with a thirteen-year average of 0.65. In other words, the country continuously had deficits in the given period. Of the reported years, the highest ratio meaning the most favorable trade balance was observed in 2009 (0.72); on the contrary the worst in 2011 (0.56) corresponding to the highest trade deficit.

One of the major characteristics of Turkish foreign trade is the high dependence of exports on imports. Emphasis on this fact can be observed in the official development plans of the State, especially in the previous two plans which are the 9th (2007-2013) and 10th (2014-2018) Development Plans, respectively (Directorate for Strategy and Budget of the Presidency, 2018).

A correlation analysis of exports, imports, the real exchange rate, trade balance and the current account balance reveals that there is a very strong positive correlation between exports and imports in Turkey from 2005 to 2017 (0.945). This can be explained by the high import dependence of Turkish exports. On the other hand, the analysis shows that the real exchange rate and exports are negatively strongly correlated (-0.679). The same relationship exists between the real exchange rate and imports as well (-0.570) with less strength, though. Besides, the trade balance and the current account balance are strongly positively correlated (0.971) in line with the

definition. Their correlation with the real exchange rate is positive and weak which are 0.310 (trade balance) and 0.297 (current account balance). Results are summarized with the Table 9 below.

Table 9. Correlation Matrix of Real Exchange Rate, Exports, Imports, Trade Balance and Current Account Balance, 2005-2017

	Real Exchange Rate	Exports	Import	Trade Balance	Current Account Balance
Real Exchange Rate	1.000	-0.679	-0.570	0.310	0.297
Exports	-0.679	1.000	0.945	-0.691	-0.583
Import	-0.570	0.945	1.000	-0.889	-0.808
Trade Balance	0.310	-0.691	-0.889	1.000	0.971
Current Account Balance	0.297	-0.583	-0.808	0.971	1.000

Source: Calculated based on data derived from CBRT EVDS (2018b) and General Directorate of Budget and Fiscal Control (2018a).

It may be concluded based on the correlation analysis that a possible decrease in the real value of TRY may result in a slight improvement in the trade or current account balance, since both are positively correlated. Secondly, such an instance will result in an increase in exports, which may in turn stimulate imports comparatively at a lower rate due to the import dependence nature of Turkish exports.

1.5.2.9 Private Sector Gross Foreign Debt/GDP

As briefly touched upon in section 1.5.2.5, the weight of the private sector in external indebtedness of Turkey grew intensely from 2005 to 2017, which is actually characterized by a shift of external indebtedness from the government to the private sector. Another key point to be considered is that regardless of which party is indebted, either the public or the private sector, it’s the lenders who will have to give up their credits often in part in case of a default; in order words, on the way to a possible

financial crisis due to increasing debt stocks, the owing party is trivial (Montiel, 2011:654).

The following graph in Figure 9 depicts the growth of foreign debt in terms of the public (including that of CBRT) and private sectors separately.

Figure 9. Gross Foreign Debt of Public and Private Sectors (M USD), 2005-2017

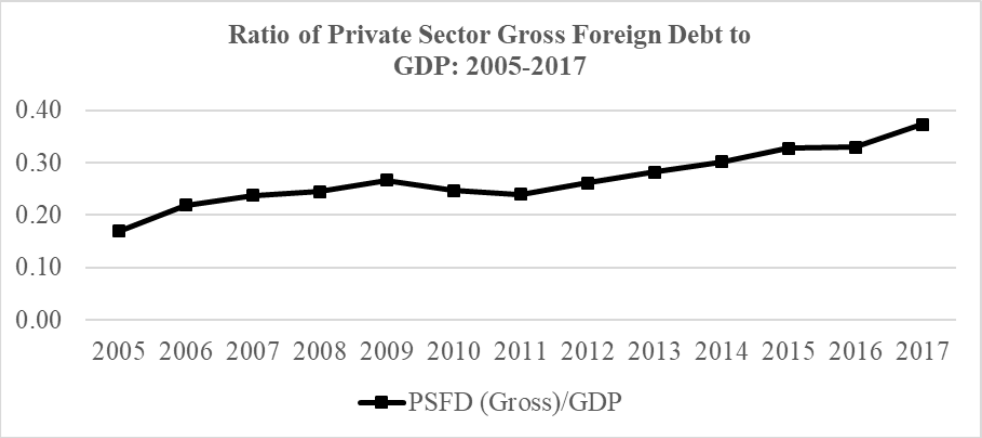
Source: Based on data derived from CBRT EVDS (2018d).

Figure 9 portrays the aforementioned debt shift from the public to the private sector. As the graph identifies, the gross external debt of the public sector including the central bank rose by 60% from 85,836 M USD (2005) to 137,109 M USD (2017). On the other hand, the growth of the private sector gross foreign debt was far-reaching in that starting with almost the same debt stock in 2005 which was 84,839 M USD, the debt volume reached 317,175 M USD in 2017 amounting to a percentage change of 273%.

Compared to the USD denominated GDP growth of 69% from 2005 to 2017 (section 1.5.2.5), 273% of private sector based foreign debt implies a deteriorating ratio of private sector external indebtedness to GDP as pointed out in Figure 10 below.

According to Figure 10, the aforementioned ratio rose gradually from 2005 (0.17) to 2017 (0.37) more than doubling in the thirteen-year period.

Figure 10. Ratio of Private Sector Gross Foreign Debt to GDP, 2005-2017



Source: Based on data derived from General Directorate of Budget and Fiscal Control (2018b) and CBRT EVDS (2018d).

1.5.3 Empirical Analysis and Results

Now that we have presented the detailed definitions of the selected key macroeconomic indicators and portrayed their development in Turkey from 2005 to 2017 in the preceding section, we will now construct a fragility index with the defined indicators.

The starting point of the analysis is the exploration of the direction of the relationship between financial fragility and the given macroeconomic indicators. This is briefly summarized in Table 10 below.

Table 10 is a list of each chosen macroeconomic indicator showing the impact of an increase in the given variable on financial fragility in which the direction of the relationship, whether positive or negative, between the indicator and fragility is explained.

Accordingly, an increase in the real exchange rate (appreciation of TRY) is assumed to have a positive relationship with financial fragility. In other words, the overvaluation of TRY is associated with a macroeconomic imbalance, hence increasing financial fragility.

Table 10. Relationship between Macroeconomic Indicators and Financial Fragility

Indicator	Change in Indicator	Impact on Fragility	Relationship
Real Exchange Rate	Increase	Increase	Positive
Delta BIST 100	Increase	Decrease	Negative
STFD/LTFD	Increase	Increase	Positive
STFD/International Reserves	Increase	Increase	Positive
Current Account Deficit/GDP	Increase	Increase	Positive
Budget Deficit/GDP	Increase	Increase	Positive
Net Public Debt/GDP	Increase	Increase	Positive
Exports/Imports	Increase	Decrease	Negative
PSFD (Gross)/GDP	Increase	Increase	Positive

Source: Own illustration.

The debt related ratios with the national income or reserves in the denominator which are the STFD to international reserves, net public debt to GDP and PSFD (Gross) to GDP are supposed to have positive association with financial fragility, since increasing debt stocks are considered as a macroeconomic risk. The same relationship is assumed to exist between STFD/LTFD and fragility, since it can be concluded that the closer the due date is, the higher the risk of default is.

Similarly, it is presumed that the current account and budget deficits in terms of GDP are positively related to financial fragility. Again, increasing deficits are regarded as increased riskiness for the economy.

On the other hand, increases in the value of the BIST 100 index and exports to imports ratio are assumed to have a negative association with financial fragility. Higher BIST 100 index values imply an increase in the value of the listed companies in Turkey, which may be coupled with increasing corporate profits, hence reduced fragility. In addition, a rise in the exports to imports ratio indicates an improvement in the trade balance, which is supposed to decrease fragility.

Following the evaluation of the direction of relationship between financial fragility and macroeconomic indicators, the values of the variables are presented in Table 11 for each year from 2005 to 2017. As it may be inferred from this table, the ratios of current account deficit and budget deficit to GDP are negative due to the fact

that deficits are associated with negative values as earlier stated. The column showing the delta BIST 100 index partly includes negative values, which denotes that in those years the index value fell compared to the previous year leading to an unfavorable change.

Followed right after, Table 12 is the identical table of Table 11 in which the coefficients of the columns are adjusted based on the direction of relationship between the indicator and financial fragility. In this sense, while making the adjustments, the columns for *Current Account Deficit/GDP* and *Budget Deficit/GDP* are multiplied by "-1", since these deficits are associated positively with financial fragility. Other two "-1" multiplications are applied to the indicators of *Real Exchange Rate* and *Exports/Imports* due to their negative relationship with financial fragility. Adjusted columns are depicted in bold letters in Table 12.

The next step includes the standardization of the indicators in which the average value of each indicator for the given time period is subtracted from the indicator itself and then divided by its standard deviation. With this procedure, a new table is generated with mean value "0" and standard deviation "1" for each column, hence each indicator. Macroeconomic indicators with standardized values are portrayed in Table 13.

As it may be inferred from Table 13, following the standardization procedure, the observations now take the value between "+1" and "-1". The last column in the table is the arithmetic weight of indicators for each year in which each indicator in the respective year is multiplied with "1/9" and then summed up. The average value of the weighted index for the analysis year from 2005 to 2017 is 0.301 as depicted in Table 13.

Table 11. Macroeconomic Indicators (2005-2017), Nominal Values

Year	Real Exchange Rate	Delta BIST 100 Index	STFD/ LTFD	STFD/Int. Reserves	Current Acc. Deficit/GDP	Budget Deficit/GDP	Net Public Debt/GDP	Exports/ Imports	Gross PSFD/ GDP
2005	119.420	0.593	0.295	0.556	-0.042	-0.010	0.401	0.629	0.169
2006	109.790	-0.017	0.259	0.464	-0.057	-0.006	0.327	0.613	0.219
2007	127.630	0.420	0.209	0.389	-0.055	-0.016	0.282	0.631	0.237
2008	111.050	-0.516	0.230	0.449	-0.051	-0.018	0.268	0.654	0.245
2009	113.140	0.966	0.223	0.436	-0.018	-0.053	0.309	0.725	0.266
2010	119.670	0.249	0.360	0.702	-0.058	-0.035	0.274	0.614	0.247
2011	103.050	-0.223	0.374	0.752	-0.089	-0.013	0.208	0.560	0.240
2012	110.590	0.526	0.428	0.745	-0.055	-0.019	0.153	0.645	0.261
2013	100.560	-0.133	0.515	0.901	-0.067	-0.010	0.109	0.603	0.282
2014	104.770	0.264	0.500	0.953	-0.047	-0.011	0.091	0.651	0.301
2015	97.570	-0.163	0.358	0.823	-0.037	-0.010	0.069	0.694	0.328
2016	91.780	0.089	0.330	0.783	-0.038	-0.011	0.084	0.718	0.330
2017	85.170	0.476	0.350	0.865	-0.056	-0.015	0.084	0.672	0.373

Source: Adapted from/own calculation based on data presented in the appendix.

Table 12. Macroeconomic Indicators (2005-2017), Adjusted Values Based on Fragility Relationship

Year	Real Exchange Rate	Delta BIST 100 Index	STFD/ LTFD	STFD/Int. Reserves	Current Acc. Deficit/GDP	Budget Deficit/GDP	Net Public Debt/GDP	Exports/ Imports	Gross PSFD/ GDP
2005	119.420	**-0.593**	0.295	0.556	**0.042**	**0.010**	0.401	**-0.629**	0.169
2006	109.790	**0.017**	0.259	0.464	**0.057**	**0.006**	0.327	**-0.613**	0.219
2007	127.630	**-0.420**	0.209	0.389	**0.055**	**0.016**	0.282	**-0.631**	0.237
2008	111.050	**0.516**	0.230	0.449	**0.051**	**0.018**	0.268	**-0.654**	0.245
2009	113.140	**-0.966**	0.223	0.436	**0.018**	**0.053**	0.309	**-0.725**	0.266
2010	119.670	**-0.249**	0.360	0.702	**0.058**	**0.035**	0.274	**-0.614**	0.247
2011	103.050	**0.223**	0.374	0.752	**0.089**	**0.013**	0.208	**-0.560**	0.240
2012	110.590	**-0.526**	0.428	0.745	**0.055**	**0.019**	0.153	**-0.645**	0.261
2013	100.560	**0.133**	0.515	0.901	**0.067**	**0.010**	0.109	**-0.603**	0.282
2014	104.770	**-0.264**	0.500	0.953	**0.047**	**0.011**	0.091	**-0.651**	0.301
2015	97.570	**0.163**	0.358	0.823	**0.037**	**0.010**	0.069	**-0.694**	0.328
2016	91.780	**-0.089**	0.330	0.783	**0.038**	**0.011**	0.084	**-0.718**	0.330
2017	85.170	**-0.476**	0.350	0.865	**0.056**	**0.015**	0.084	**-0.672**	0.373

Source: Own calculation based on data presented previously in Table 11.

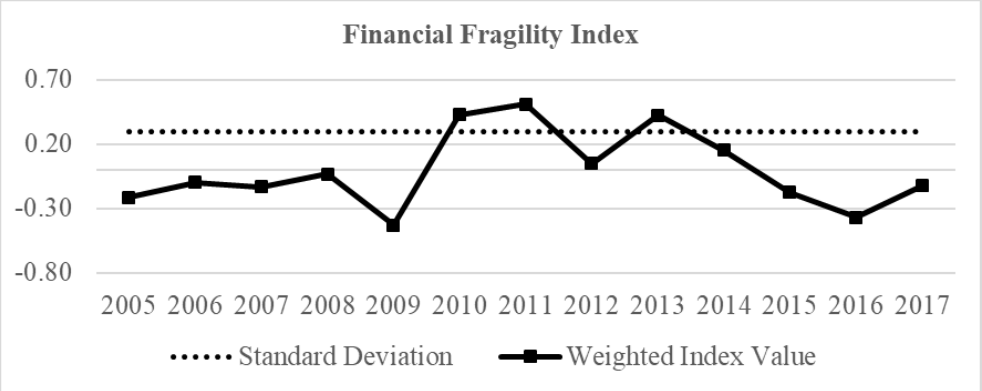
Table 13. Macroeconomic Indicators (2005-2017), Standardized Values

Year	Real Exchange Rate	Delta BIST100 Index	STFD/ LTFD	STFD/Int. Reserves	Current Acc. Deficit/GDP	Budget Deficit/GDP	Net Public Debt/GDP	Exports/ Imports	Gross PSFD/ GDP	Weighted Index
2005	1.031	-0.982	-0.462	-0.626	-0.561	-0.565	1.749	0.374	-1.863	-0.212
2006	0.215	0.521	-0.822	-1.097	0.322	-0.908	1.089	0.724	-0.934	-0.099
2007	1.726	-0.555	-1.336	-1.483	0.183	-0.146	0.686	0.340	-0.590	-0.130
2008	0.322	1.754	-1.120	-1.173	-0.041	0.008	0.569	-0.150	-0.450	-0.031
2009	0.499	-1.903	-1.193	-1.238	-2.006	2.783	0.932	-1.670	-0.048	-0.427
2010	1.052	-0.135	0.194	0.121	0.373	1.347	0.616	0.704	-0.410	0.429
2011	-0.355	1.031	0.335	0.377	2.248	-0.368	0.028	1.851	-0.546	0.511
2012	0.283	-0.816	0.878	0.341	0.213	0.103	-0.458	0.046	-0.150	0.049
2013	-0.566	0.808	1.756	1.141	0.916	-0.565	-0.851	0.930	0.235	0.423
2014	-0.210	-0.172	1.611	1.405	-0.285	-0.472	-1.008	-0.088	0.601	0.154
2015	-0.819	0.883	0.173	0.739	-0.840	-0.580	-1.209	-1.014	1.093	-0.175
2016	-1.310	0.260	-0.109	0.535	-0.772	-0.468	-1.074	-1.517	1.130	-0.369
2017	-1.869	-0.694	0.096	0.958	0.249	-0.171	-1.070	-0.531	1.931	-0.122
Standard Deviation of the Weighted Index										**0.301**

Source: Standardization of the values in Table 12 presented previously.

The calculated weighted index basically implies that an increase in the index value shall be interpreted as a rise in financial fragility and vice versa. The development of this financial fragility index within the given years is visualized in Figure 11.

Figure 11. Financial Fragility Index of Selected Macroeconomic Indicators, 2005-2017



Source: Own illustration based on data in Table 13.

The bold line in Figure 11 presents the fragility index values between 2005 and 2017; whereas the constant dotted line refers to the standard deviation of the index corresponding to 0.301 for the given time period. Of the given years, the peaks implying that the years with the highest fragility index values were observed in 2010 (0.429), 2011 (0.511) and in 2013 (0.423), respectively. Conversely, the index suggests that 2009 and 2016 were the most favorable years with respect to macroeconomic stability with index values of -0.427 and -0.369, respectively. Moreover, moving from 2016 to 2017, the fragility index seems to start an increasing trend.

The proposed index presented in this section can be thought of as a further extension of the study of Çakmak (2013). In his research, Çakmak used eight macroeconomic indicators covering a twenty-three-year-time period from 1989 to 2011. The indicators were standardized and weighted with a factor of 0.125 (1/8) and added up for each year in an effort to provide an index value for the respective year. Çakmak explained that the standard deviation of the index value for the total time period was 0.40. As for similarities, our approach almost included the same eight indicators used in Çakmak's study, standardized and weighted them equally in the same way.

On the other hand, apart from the years of coverage, there are several points handled in a different way comparatively. Firstly, an additional indicator, namely the *Gross PSFD/GDP* used in the index due to the fact that the composition of foreign indebtedness shifted considerably from public to private sector (section 1.5.2.5). The inclusion can be considered as an effort to represent this shift in the fragility index. Needless to say, the difference in the number of indicators caused an alteration in the weighing factor, which was 1/9 above and 1/8 in the aforementioned study.

Secondly, Çakmak used the GNP as the denominator in the current account ratio instead of the GDP, which the author applied in the budget and public debt ratios. In our study, the GDP was the denominator in each relevant case.

As for another difference, Çakmak applied the ratio of current account balance and consolidated budget balance to GNP and GDP, respectively; on the contrary, in our method the indicators were named as deficits instead of balance due to their negative character in the analysis years as a whole. Due to their association with financial fragility in the same direction, in our analysis these two ratios were multiplied with "-1". On the other hand, Çakmak explained in his work that of these two indicators, only the current account balance to GNP ratio was multiplied with "-1". When Çakmak's calculation was reworked, it was found out that the consolidated budget balance to GDP ratio was indeed converted with "-1" although not mentioned in the text.

As a last remark, unlike our approach, Çakmak did not multiply the Delta BIST 100 index with "-1". This situation deserves criticism on the grounds that an improvement in the BIST 100 index is associated with financial fragility in the opposite direction. It was found out that following the multiplication of the Delta BIST 100 index indicator with "-1", Çakmak's calculated standard deviation of the fragility index drops slightly from 0.40 to 0.35.

1.6. Concluding Remarks

This chapter explored the main concepts relevant to the study of financial fragility by providing a detailed insight into the terms of financial stability, instability, financial crises, and early warning systems to assess vulnerabilities to crises.

Indeed, another focal point was the measurement of financial fragility. Following a thorough review of the literature on fragility measurement, selected key macroeconomic indicators were introduced as well as their development in Turkey were analyzed covering a thirteen-year-time-period from 2005 to 2017. These variables were then integrated into a fragility index with equal weights in which the standard deviation of the index resulted in 0.301 for the research period. The index showed that 2010 (0.429), 2011 (0.511) and 2013 (0.423) were the years above standard average. On the other hand, 2009 (-0.427) and 2016 (-0.369) were the years determined to be the most favorable in terms of financial fragility. The index signaled for an increasing trend from 2016 onwards.

2. CHAPTER FIRM PERFORMANCE

Corporate performance is a multi-dimensional aspect; in addition, the environment of a business enterprise includes a number of parties with differing expectations or criteria in terms of performance. The aim of this chapter is to investigate the components of firm performance and analyze the performance of companies based on real market data.

In this respect, this chapter will firstly examine the firm performance constructs in the literature. Taking financial performance as a basis, the chapter will then focus on three main concepts, which are the profitability, market-based and the survival dimensions of financial performance.

Elaborating on value creation, firm life cycle and corporate distress, three variables representing financial performance will be introduced. In this sense, the earnings before tax (EBT), Altman Z-Score and share price analysis of selected companies will be presented.

The data set to be employed in the analysis will include the year-end financial statements of listed companies on Borsa Istanbul, which can be alternatively defined as BIST companies for the time period from 2005 to 2017. The data set excludes those that are related to the banking, insurance, factoring, asset management and rent certificates fields due to the fact that the financial statements of these companies are not comparable with the rest of the listed companies. On the other hand, the starting year is chosen as 2005 due to again data comparability reasons in that it was the year 2005 in which financial reports of listed companies on Istanbul Stock Exchange were published based on the International Financial Reporting Standards (IFRS) for the first time (Capital Markets Board of Turkey, 2003: Art. 2, 726).

The chapter will end with concluding remarks.

2.1. Introduction to Firm Performance

Firm performance can be thought of as the degree to what extent the firm is successful or unsuccessful. In this sense, firm success can be evaluated by the attainment of particular pre-determined objectives. These objectives constitute the success or therefore the performance criteria of a firm. Moreover, the realization of

business objectives has a time component in line with the going concern principle; operating and remaining in the market continuously.

The assessment whether a firm is performing well implying whether everything is well on track with the preset objectives obviously necessitates a method for measurement. From a quantitative point of view, firm performance can be measured by accounting-based or market-based models (Pozzoli & Paolone

, 2017:25). Table 14 below is a concise comparison of both.

Table 14. Models of Firm Performance Measurement

Accounting-Based Models	Market-Based Models
Use information in the financial statements	Utilize market data such as fair values
Historical data	Daily values may be available, hence relatively less information lag
Classify firms either as sound or distressed based on a particular threshold point	Market prices encompass wide-ranging information
Variables used are related to firms' profitability, liquidity and solvency	Enhanced power of prediction
Data are comparatively highly available	Comparatively less availability

Source: Own illustration compiled from Pozzoli & Paolone (2017:25-26).

As Table 14 suggests, the evaluation whether a firm is successful or not can be made through the firm-specific financial statement data and market indicators. The questions that may arise at this point are whether all firm-related parties have common expectations from the firm and there are generally accepted performance criteria for firms.

Chief Executive Officers (CEOs) of companies deal with a number of internal and external parties which are mainly the shareholders, especially when the company is listed (its shares of stocks are traded on stock exchange markets), board of directors, stock exchange analysts, investors, creditors and banks and other stakeholders, each of whom is characterized with differing expectations and criteria for success assessment (Leon, 2016:3).

On the other hand, there is no agreement on generally accepted or uniform firm performance indicators in the literature. Diverse stakeholder groups as well as shareholders are likely to have differing expectations from the for-profit company in terms of firm performance; for this reason, performance or success evaluation criteria are to be rather determined within the relevant context. (Carton & Hofer, 2007:1-6).

2.2. Literature Review on Firm Performance Constructs

Organizational performance has a complex nature in that it has a variety of dimensions and these dimensions are further represented by a high number of indicators.

To illustrate, Carton and Hofer (2007:25-35) reviewed 1,045 different articles published in five highly esteemed journals from 1996 to 2001. The authors found out that out of the examined articles, 138 of them empirically analyzed organizational performance as the dependent variable, which were represented by 88 diverse indicators. These indicators were further grouped into nine diverse performance segments based on previous researches of Helfert (1994), Higgins (1995), Brealey, Myers and Marcus (2001) and Penman (2001). The corporate performance dimensions and their brief explanations are summarized in Table 15 below.

Consequently, the findings of Carton and Hofer's study revealed that:

- The *profitability* dimension covered 28% of the total variables in 70% of the total number of articles.
- The *operational* dimension with 21% of the variables in 18% of total articles.
- The *marked-based* dimension with 15% of the variables in 17% of total articles.
- The *growth* dimension with 14% of the variables in 27% of total articles.
- The rest five dimensions (*efficiency*, *liquidity*, *size*, *survival* and *other*) included 22% of the variables in total with 26% article coverage.

Table 15. Dimensions of Organizational Performance

Dimension	Description with Examples
Profitability	Accounting-based indicators or ratios relevant to corporate income such as earnings before interest and tax (EBIT), net operating income etc.
Operational	Mainly non-financial measures like market share, quality awards received etc.
Marked-Based	Measures and ratios relevant to the market value of the firm
Growth	Indicators of organizational growth e.g. number of employees, sales growth etc.
Efficiency	Measures related to resource utilization e.g. sales or costs per employee, blue-collar productivity etc.
Liquidity	Ratios related to debt paying ability of the firm e.g. cash flow ratio etc.
Size	Refers to indicators regarding the size of the firm e.g. number of branches, employees, assets etc.
Survival	Includes the assessment of continuation or cease of operations e.g. Altman Z-Score etc.
Other	Mainly subjective or qualitative performance measures

Source: Own illustration compiled from Carton and Hofer (2007:28-35).

Referring to previous studies[1], Carton and Hofer (2007:56-57) conclude that firm performance is a many-sided phenomenon which can be mainly divided into three components, which are the financial performance, operational performance and stakeholder performance, respectively.

The term firm performance used in this study implies financial performance. Financial performance can be defined as the degree representing "the change of the financial state of an organization or the financial outcomes that result from management decisions and the execution of those decisions by members of the organization" (Carton & Hofer, 2007:2-3).

In this sense, of the given performance dimensions in Table 15 above, it can be argued that financial performance is relevant to the profitability, market-based, growth, efficiency, liquidity, size and survival dimensions of overall corporate

[1] Drucker (1954), Steers (1975), Cameron (1980), Chakravarthy (1986), Venkatraman & Ramanujam (1986, 1987), Kaplan & Norton (1992), Murphy et al. (1996)

performance, on the grounds that the components of these dimensions have an impact on the financials of the organization.

Despite the fact that financial performance is a function of a variety of determinants, practically the first and foremost indicator can be stated as profitability. In other words, the success of a company is mainly evaluated based on the extent to which it generates profits, generally for large enterprises and partly for public companies (Kaymaz et al., 2015:5).

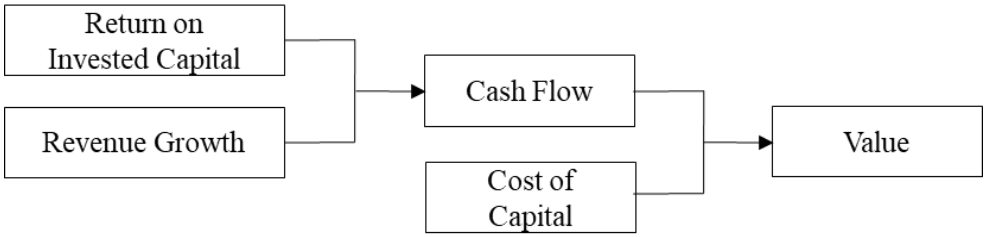
Mazumdar (2013:128-129) explains that there are two mainstream views concerning the determinants of firm profitability. Represented by Bain (1951, 1956), the first view considers the industry-specific attributes as the primary determinant of firm profitability. In contrast, the second view, put forward by the Chicago School of Economics, emphasizes firm-specific characteristics referring to the efficiency of the firm as the primary factor for firm profitability. Referring to the related former studies[2], Mazumdar illuminates that both firm and industry specific parameters jointly determine firm profitability.

From a value-based perspective, the reason why firms come into existence is to create value for its shareholders; therefore, the assessment whether a firm is successful or not is measured considering to what extent the wealth of the shareholders changes in a favorable way (Lu, 2009:67). On the other hand, a key aspect of creating value is the long-term sustainability of generated cash flows. Long-term value creation includes the consideration of the interests of not just the shareholders but the various stakeholders of the company as a whole (Koller et al., 2015:6).

As for how value is created, Koller et al. (2015:3) argue that firms basically create additional value as long as their return on capital exceeds the cost capital which the authors elaborate through the flow chart depicted below in Figure 12.

[2] Scott & Pascoe (1986), Kessides (1986, 1987), Cubbin & Geroski (1987), McGahan (1999), Amel & Froeb (1991), Rumelt et al. (1991)

Figure 12. Value Creation of Firms



Source: Koller et al. (2015:18).

As illustrated in Figure 12, the authors explain that owners make a cash investment in the company with the expectation that they receive more cash in the future. In this sense, additional value is expressed as the difference between future cash flows and the amount of capital investment made. In addition, future cash flows may emanate from revenue growth and return on invested capital (Koller et al., 2015:17).

On the other hand, the earnings of shareholders are twofold; firstly, the increase in the share price which are the capital gains and secondly, the dividend payments, respectively (Koller et al., 2015:17). In other words, shareholder value is maximized by appreciating share prices and dividend payments. A further remark to be noted here is that the decision whether to make dividend payments depends on the year-end profitability condition of the firm. For this reason, profitability expressed in the form of earnings after taxes can be considered as a parameter for shareholder earnings and their value as well.

To sum up, the change or increase in the share price can be regarded as a fundamental financial performance indicator with regard to especially public companies along with profitability.

In the course of their operations, firms may experience successful and unsuccessful time periods. No doubt, this is an ordinary process as long as the firm operates. In addition, negative or downturn periods are described by a variety of ways depending on their severity.

Ratner et al. (2009:1) describe four distinctive phases that are typical to observe in the life cycle of companies; “the start-up or development phase, the growth phase, the maturity or stabilization phase and the disruption or decline phase”, respectively.

Similarly, Pozzoli and Paolone (2017:3-7) emphasize that business enterprises have a life cycle and explain the order of consecutive negative phases as “decline, crises, financial distress and bankruptcy”.

Quoting from Damodaran (2009), Pozzoli and Paolone (2017:4) explain the characteristics of a decline as follows:

- Stagnant or declining revenues
- Shrinking or negative margins
- Asset divestitures
- Big payouts; dividends and stock buybacks
- Financial leverage; the downside

Altman and Hotchkiss (2006:4) explain that firms that do not prove to be successful can be classified by four ways, which are failure, insolvency, default and bankruptcy, respectively. Hence, they can be thought of as the incidents that are relevant to corporate distress. According to Altman and Hotchkiss (2006:4-7), failure occurs when the return on investment falls short of the existing investment alternatives in the market. Insolvency refers to inability to service debt therefore implies illiquidity. Defaults emerge when liabilities against creditors are not met and bankruptcy encompasses a legal procedure in which firms approach to a court for asset liquidation or for restructuring.

Regardless of how distress is conceptually defined, there are quite a number of parties that are particularly interested in this phenomenon and especially in its prediction. Altman and Hotchkiss (2006:281) list down these as the lending specialists, accounts receivable managers, investors, security analysts, regulators, auditors, bankruptcy lawyers, legal direction (e.g., deepening insolvency), bond raters, risk management consultants, restructuring advisers and turnaround managers, government agencies and other purchasers, mergers and acquisitions analysts and managers of distressed firms.

Firms may have ups and downs in terms of financial performance as long as they operate; in addition, it is crucial to foresee that unfavorable periods do not end up with cease of operations (Altman et al., 2013:128).

Hence, financially distressed firms may indeed avoid going bankrupt by taking the appropriate counter measures (Ratner et al., 2009:3). Agostini (2018:18,31) points out that financially distressed firms are on the verge of either recovery or failure implying bankruptcy and explains that once distress is recognized, the firm may enter into the recovery path through corrective measures. The author adds that in the event that possible distress situations are detected earlier, the interested parties will be in such an advantageous position to act accordingly to mitigate any negative consequences that are likely to occur.

Accordingly, financial distress prediction models can be used as management tools to monitor the financial improvement of a company, especially during times of distress and reorganization (Altman & Hotchkiss, 2006:306).

In the light of the aforementioned explanations, the prediction of bankruptcy can be thought of a risk assessment whether the firm is in an unfavorable phase in its life cycle and if so, prediction modeling may help to understand how severe the situation is and it may guide for taking action plans and restructuring.

According to Altman and Hotchkiss (2006:234-35), the endeavors aimed at assessing the bankruptcy risk of companies can be traced back to 1850s in the US, where financial institutions conducted risk assessment of their potential debtor clients, which are the firms and their owners, based on qualitative data rather than quantitative models. Following the establishment of credit rating agencies such as Moody's and Standard & Poor's in 1900s, univariate ratio analyses were introduced as for first quantitative tools. The quantitative models of bankruptcy risk prediction have been mainly based on "static single-period models which seek to identify unique characteristics that discriminate between distressed and non-distressed firms" (Pozzoli & Paolone, 2017:11).

Table 16 summarizes the development of risk assessment models with examples in the literature.

Table 16. Methods for Corporate Distress Assessment with Examples from the Literature

Method	Examples
Qualitative	Commercial banks in the US in 1850s
Univariate	Rating agencies in early 1900s Beaver (1966, 1968)
Multivariate	Altman (1968)
Quadratic-discriminant	Altman et al. (1977)
Probit	Ohlson (1980) Zmijewski (1984) Zavgren (1985)
Recursive partitioning	Frydman et al. (1985)
Neural networks	Fletcher & Goss (1993) Altman et al. (1994) Wilson & Sharda (1994) Leshno & Spector (1996) Trippi & Turban (1996) Etheridge & Sriram (1997) Yang et al. (1999) Zhou et al. (2015)
Option/contingent claims	Moody's Expected Default Frequency Model McQuown (1993) Caouette et al. (1998) Kealhofer (2000) KMV (2000)
Genetic algorithms	McKee & Lensbergn (2002)
Decision trees	Gepp et al. (2010)
Hybrid models	CreditSights' BondScore Cho et al. (2010) Verikas et al. (2010) Divsalar et al. (2011)
Fuzzy theory	Chen et al. (2011) Ko et al. (2013)

Source: Illustration based on information compiled from Altman & Hotchkiss (2006:234-239), Pozzoli & Paolone (2017:24) and Agostini (2018:23-26).

As Table 16 depicts, multivariate models for assessing firm distress were first introduced towards the end of 1960s and various variations were developed thereafter. In addition, advanced statistical models have been observed in the literature since the 1990s, which are based on artificial intelligence systems such as neural network methods, decision trees, genetic algorithm etc. (Agostini, 2018:24). Altman and Hotchkiss (2006:233-234) note that the assessment of bankruptcy risk particularly gained special attention starting from the 2000s. The authors mention two main

reasons. Firstly, the introduction of the Basel II Accord which was proposed in 1999 and concluded in 2004 that brought about the application of an "advanced internal rating-based approach" by financial institutions so as to assess such risks, and secondly due to the growing number of firm failure cases in 2001 and 2002 in the US. Agostini (2018:30) concludes that the academic literature evolved in such a way from predicting financial distress to understanding and explaining its causes.

In general, it can be argued that the statistical models for assessing the risk of bankruptcy encompass the use of "quantifiable financial indicators of firm performance with, perhaps, a small number of additional variables" to estimate probability of default (Altman & Hotchkiss 2006:237-238).

The Z-Score approach of Altman is the first multivariate statistical approach to assess the risk of firm failure. It is a measure showing the "financial likelihood of organizational survival" (Carton & Hofer, 2007:94). Altman criticizes the use of single ratios to evaluate bankruptcy risk due to their comparatively lower statistical significance and evaluates ratio analysis as a comparatively rudimentary method (Altman, 1968:609). In his model, Altman indeed utilizes a multiple discriminant statistical methodology based on empirical data of selected firms operating in the real sector (Altman, 1968:589).

The model is illustrated with the equation as follows (Altman, 1968:594):

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$$

where

X_1: =Working Capital/Total Assets

X_2: = Retained Earnings/Total Assets

X_3: = Earnings before Interest and Taxes/Total Assets

X_4: = Market Value Equity/Book Value of Total Debt

X_5: = Sales/Total Assets

Z = Overall Index

As a compound measure of five diverse ratios, the overall index value is made up of the components reflecting the ability of the company to utilize its assets to meet

its short-term obligations (X_1), accumulate earnings (X_2), generate profits or returns (X_3) and turnover (X_5) and as well as to finance its growth (X_4). In the context of organizational performance dimensions, besides being a survival dimension itself, it can be asserted that the Z-Score encompasses profitability, market-based, liquidity and growth dimensions as well.

According to the calculated Z-Score value, the model classifies firms in three groups, which are the non-bankrupt class ($Z > 2.99$), the bankrupt class ($Z < 1.81$) and the gray area ($1.81 < Z < 2.99$), respectively (Altman, 1968:606).

When first introduced, it was empirically found out that the model estimated bankruptcy with 95% accuracy with regard to classification in the bankrupt and non-bankrupt classes (Altman, 1968:609). In the following years from 1969 to 1999, Altman further tested his static model three times and concluded that the initially developed model was still accurate and relevant nearly forty years following its introduction (Altman & Hotchkiss, 2006:244).

As mentioned above, the Z-Score model made use of the data set relevant to the listed companies operating in the production sector. In 1983, the model was further modified for the companies not traded in the stock exchange in which X_4 included the book value of equity instead of the market value, which can be portrayed as follows (Altman, 1983:122):

$$Z' = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.420X_4 + 0.998X_5$$

X_1: =Working Capital/Total Assets

X_2: = Retained Earnings/Total Assets

X_3: = Earnings before Interest and Taxes/Total Assets

X_4: = Book Value Equity/Total Equity

X_5: = Sales/Total Assets

Z' = Overall Index for Private Firms

Similar to the initial model, the private firm Z-Score model classifies the firms again in three groups which are the non-bankrupt class ($Z' > 2.90$), the bankrupt class

($Z' < 1.23$) and the gray area ($1.23 < Z' < 2.90$) now with altered threshold values (Altman, 1983:122).

According to Altman et al.(1995:3), an additional revision on the model was conducted in 1995 in which X_5 was completely removed with the aim of making it more applicable for the firms outside the real sector on the grounds that the ratio of sales to total assets was assumed to be considerably influenced by the sector in which the firms operated. The model is depicted below:

$$Z'' = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

In addition, the authors added a constant value of "3.25" in order to provide standardization where values below zero would correspond to the default situation. Altman (2005:312-313) defines this model as the emerging market score model.

The Z-Score approach developed by Altman is a widely accepted model for bankruptcy risk evaluation, which is accessible on Bloomberg across the globe; in addition, similar discriminant models are in use in diverse countries (Zhang et al., 2010:223-224).

2.3. Financial Performance Evaluation of BIST Companies (2005-2017)

In the light of the findings of the literature review on firm performance constructs, this section will evaluate the financial performance of selected listed companies on Istanbul Stock Exchange for the time period from 2005 to 2017.

The evaluation will be based on the three main performance dimensions, which are the profitability, market-based and probability of survival performance dimensions, respectively. The selected dimensions refer to the very fundamental objectives of a for-profit organization, which are profit maximization, maximizing the market value, operating continuously and hence, remaining in the business. In this context, selected parameters for the dimensions are the EBT for profitability; the share price for the market-based profitability dimension; and the Altman Z-Score for probability of survival.

The reason why EBT is chosen as a proxy for profitability is that it encompasses the operating as well as the non-operating performance of a firm. Since

firms may have differing tax bases even in the same country (due to the possibility of deduction of previous years' losses, research and development incentives, export incentives, other tax regulation-based deductions etc.) the net result before taxes is picked up to present better comparability among firms.

Considering that, all firms subject to analysis are listed companies and in line with the value-based approach, the share price is selected as a proxy for the market-based firm performance dimension. Share price is a measure for firm value and the appreciation in share price indicates an increase in the shareholder value as well.

The Altman Z-Score implies the level of financial distress representing the risk of bankruptcy. This indicator presents the degree to which a firm is close to failure, hence offering the possibility of an overall performance and risk assessment.

Table 17 below provides an overview of the data set employed in the financial performance analysis of the listed companies on BIST for each year from 2005 to 2017. The data set consists of the financial statements of listed companies, which are derived from the Borsa Istanbul Historic and Reference Data Platform (Datastore) for the years from 2005 to 2008 and Public Disclosure Platform (PDP) for the years from 2009 to 2017. The financial statements include the balance sheet and the income statement of a given company. In other words, each observation portrayed in the table for each year, in principle corresponds to one listed business enterprise[3].

Following the year input, the second column in Table 17 displays the total number of BIST companies listed on Borsa Istanbul each year from 2005 to 2017, the financial statements of which were derived from the PDP and Datastore. In this sense, 5,325 can be thought of as the total number of observations in the data set in the given thirteen-year period. On the other hand, as the table suggests, some of the companies were excluded from the analysis each year, which is approximately 21% of the total number of observations. In other words, out of the 5,325 observations, 4,193 of them were integrated in the analysis (79%).

[3] The values in the required accounts in the financial statements such as current assets, current liabilities, sales revenues, EBT, EBIT etc. were derived through an excel macro program coded by the author with visual basic for applications (VBA).

Table 17. Overview of BIST Companies in the Data Set, 2005-2017

Years	Number of Companies in BIST	Number of Companies in Analysis	Percentage of Coverage
2005	319	269	84%
2006	330	278	84%
2007	338	281	83%
2008	326	278	85%
2009	333	275	83%
2010	367	298	81%
2011	392	322	82%
2012	436	360	83%
2013	495	372	75%
2014	516	380	74%
2015	504	373	74%
2016	480	352	73%
2017	489	355	73%
Total	**5,325**	**4,193**	**79%**

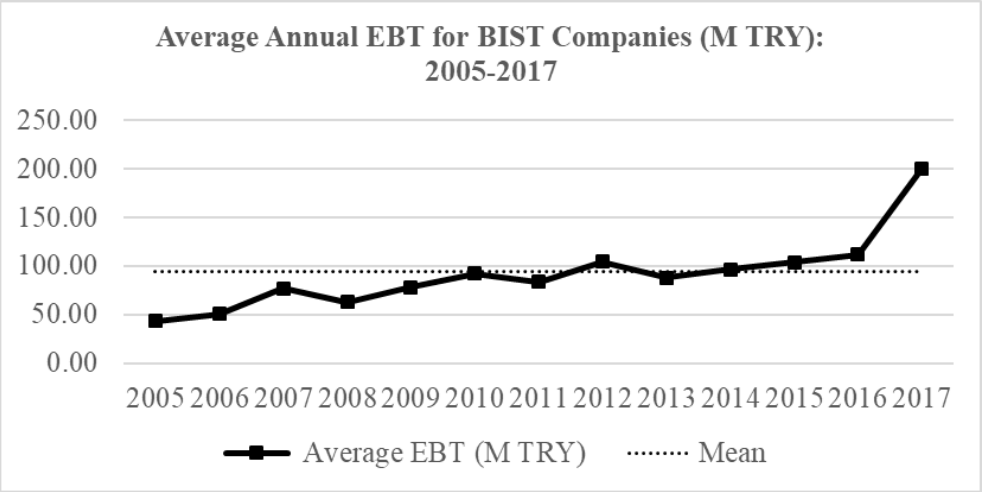
Source: Own illustration based on data derived from PDP (2018) and Datastore (2018a).

There are two main reasons why a number of observations were excluded from the analysis. Firstly, in an effort to provide comparability, the BIST companies operating in particular sectors were removed from the analysis due to the fact that the structure of their balance sheets and income statements differ from that of the rest. The excluded sectors are mainly related to the companies operating in the finance-related business; banks, insurance, factoring, asset management, rent certificates and other finance companies. Secondly, companies with a special fiscal period other than the calendar year were also excluded from the data set due to consistency reasons.

2.3.1 Evaluation of Profitability

With the aim of evaluating the profitability of the BIST companies in the sample, Figure 13 below depicts the average annual profitability of BIST companies in terms of EBT between 2005 and 2017.

Figure 13. Average Annual EBT Values (M TRY) for BIST Companies, 2005-2017

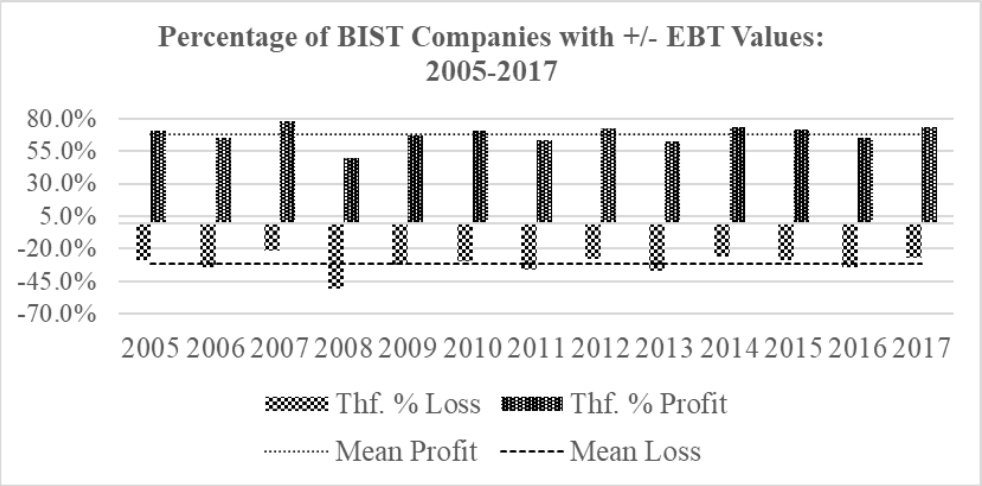


Source: Based on data derived from PDP (2018) and Datastore (2018a).

As the graph suggests in Figure 13, the average EBT value of the analyzed BIST companies for the thirteen-year period as a whole is 94.71 M TRY, which is portrayed as the constant dotted line on the figure. Annual average profitability rose from 43.49 M TRY to 200.78 M TRY from 2005 to 2017. On the other hand, compared to the total average of thirteen-years, below-average annual EBT values were observed between 2005 and 2011. Conversely, annual average profitability started increasing continuously, especially from 2013 onwards in which the thirteen-year average was surpassed starting from 2014 to 2017. The graph points out a sharp increase in annual average EBT from 2016 to 2017 with 111.93 M TRY to 200.78 M TRY.

EBT is an aggregate measure of profitability as well as loss. In order to present a more detailed picture, a separation of generated positive results and incurred losses would be appropriate. In this sense, Figure 14 below points out the profit and loss conditions separately.

Figure 14. Percentage of BIST Companies with Positive (Profit) and Negative (Loss) EBT, 2005-2017



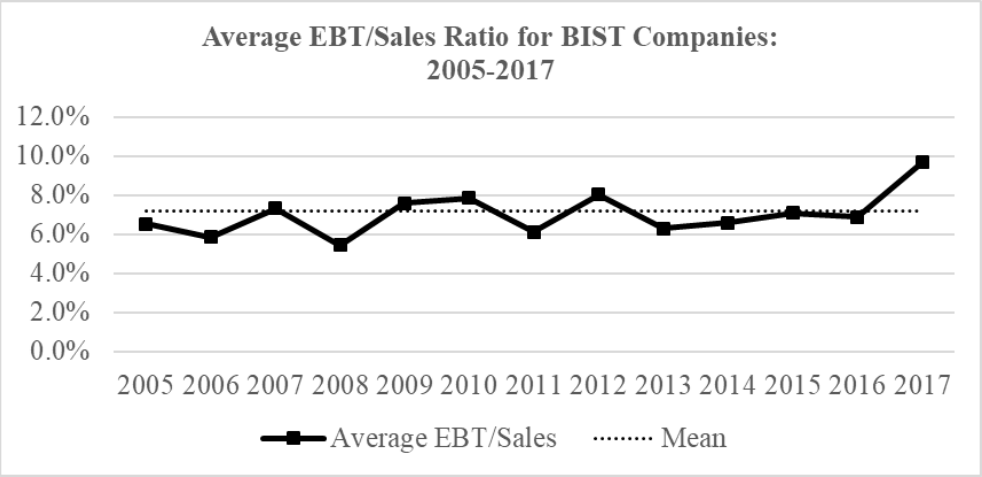
Source: Based on data derived from PDP (2018) and Datastore (2018a).

The chart in Figure 14 illuminates that 68% of the BIST companies on average closed the year with positive profits between 2005 and 2017. On the contrary, those incurred losses in their year-end income statements were averagely 32% of the total. These two constants are represented with dashed and dotted lines on the graph above. The positive profitability percentage fluctuated between 50% and 78%, correspondingly loss percentage between 22% and 50% within the presented time period. Of the given years, 2008 can be marked as the most unfavorable year for BIST companies in that half of the listed companies subject to analysis ended up with losses in this year. In contrast, the most favorable was 2007 in which averagely 78% of the companies generated positive profits. Apart from 2007, the figure suggests that 2005, 2010, 2012, 2014, 2015 and 2017 were the years in which the number of companies generating positive earnings were above the average of the given thirteen-year period.

When represented as a percentage of sales revenues, the EBT figure can be thought of as a measure indicating to what extent a company is able to convert one unit of sales revenue into pre-tax earnings. In this sense, it can be said that the ratio of EBT to sales revenues is an indicator of profit margin.

Figure 15 presented below informs on the development of EBT values of BIST companies in term of their sales revenues on annual average terms.

Figure 15. Average Annual EBT/Sales Revenues Ratio for BIST Companies, 2005-2017



Source: Based on data derived from PDP (2018) and Datastore (2018a).

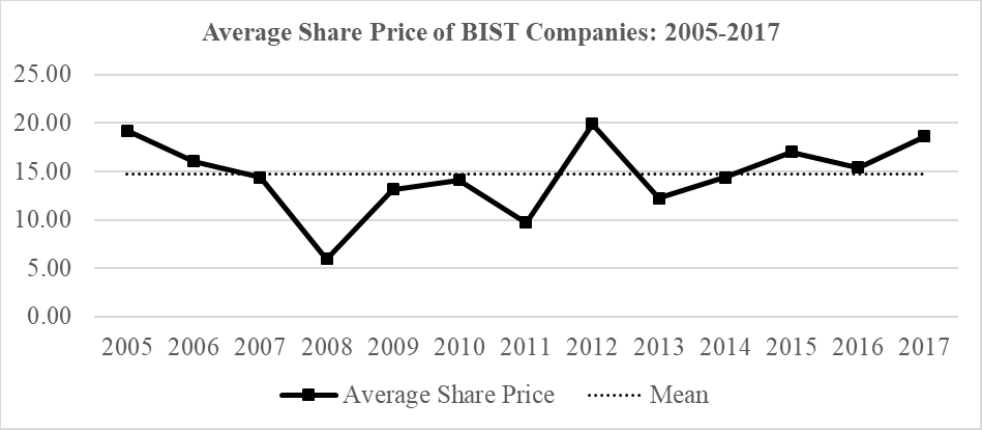
Figure 15 points out that the average value of EBT to sales revenues ratio of BIST companies subject to analysis altered between 5.44% and 9.65% between 2005 and 2017 in which it was 7.20% on average in the presented time period. Similar to the most unfavorable year in terms of firm profitability explained in the preceding chart, 2008 was indeed the year with the lowest profitability ratio (5.44%). In addition, 2007, 2009, 2010, 2012 and 2017 were the years where the ratio surpassed the thirteen-year average.

2.3.2 Evaluation of Share Price

The average annual share price development of given BIST companies for the period from 2005 to 2017 is depicted in Figure 16 below.

The dotted line in Figure 16 stands for the thirteen-year-average share price of the BIST companies which is 14.75 TRY. In the given years, the average share price deviated between 5.98 and 19.92 TRY, where the least was observed in 2008 and the highest in 2012. The graph depicts two visible trends in that the average share price steadily fell from 2005 (19.21) to 2008 (5.98) and almost gradually rose from 2013 (12.25) to 2017 (18.64).

Figure 16. Average Annual Share Price of BIST Companies, 2005-2017



Source: Based on data derived from Datastore (2018b).

2.3.3 Evaluation of Altman Z-Score

The Altman Z-Score values of the BIST companies that are subject to analysis are calculated based on the initial Z-Score model of Altman, which is relevant to listed companies in the manufacturing sector. The model is depicted as follows:

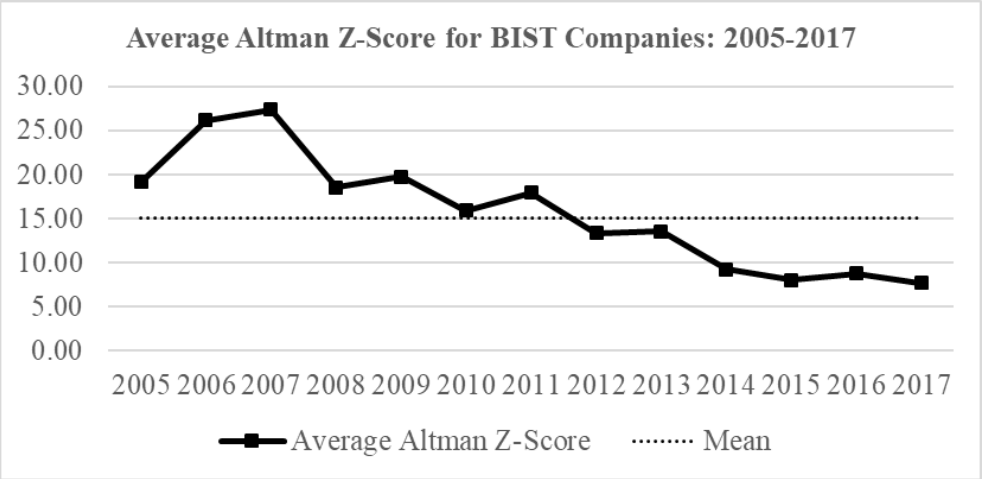
$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$$

Compared to the original model (Altman, 1968:594), the first four coefficients are rephrased and the latter is rounded to "1.0" for convenience reasons in which the cutoff points of 1.81 and 2.99 are kept unchanged (Altman, 2000:13).

In addition, while calculating the X_4, the book value of equity is used which is principally the difference between total assets and total liabilities instead of the market value of equity due to simplicity and data accessibility reasons.

Figure 17 illustrates the development of the average annual Altman Z-Score values of BIST companies subject to analysis from 2005 to 2017.

Figure 17. Average Annual Value of Altman Z-Scores for BIST Companies, 2005-2017



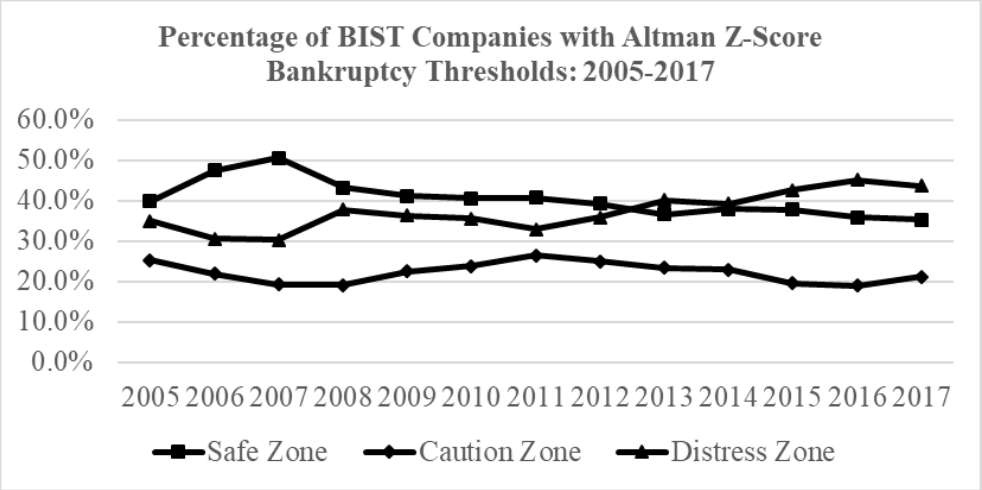
Source: Based on data derived from PDP (2018) and Datastore (2018a).

According to the above chart in Figure 17, the average Altman values rose from 19.17 to 27.39 within the first two years of the analysis and an almost continuously decreasing trend occurred from 2007 onwards, where the Z-Score dropped gradually from 27.39 to 7.67. The average Z-Score value of the total analysis period is 15.12 described by the dotted line. Having this average value as a basis, the chart divides the analysis period into two sub-periods; once 2005-2011 and 2011-2017, in which above-average Z-Scores were observed in the former and below average in the latter sub-period. In terms of corporate credit risk, it can be concluded that the riskiness increased in general on average terms as we move especially from 2007 to 2017 due to decreasing score values.

A further analysis of BIST companies in terms of Altman Z-Score includes the assessment of firms concerning the threshold values for bankruptcy, which are lower than 1.81 for implied bankruptcy risk and greater than 2.99 for safeness. This is portrayed in Figure 18, which displays the percentages of companies falling into the safe zone (Altman Z-Score > 2.99), distress zone (Altman Z-Score < 1.81) and caution zone (in between 1.81 and 2.99) in each given year from 2005 to 2017. On a thirteen-year average, 40.0% of the firms fell into the safe zone; 22.3% into the caution zone and 37.7% into the distress zone, respectively. Similar to the trend in Figure 17 presented previously, the percentage of those in the safe zone category rose from 2005 to 2007 and almost steadily fell from 2007 onwards. In addition, as we move from

2013 to 2017, the percentage of those in the caution zone surpassed that of in the safe zone.

Figure 18. Percentage of BIST Companies in Safe, Caution and Distress Zones, 2005-2017



Source: Based on data derived from PDP (2018) and Datastore (2018a).

A common interpretation of Figure 17 and 18 implies that from especially 2011 onwards, the bankruptcy risk of given BIST companies gradually increased, which is supported by the empirical findings of decreasing average Altman Z-Score values and increasing number of firms moving out of the safe zone into the caution area.

2.4. Overall Evaluation of Financial Performance of BIST Companies

As an attempt to present an overall picture of the financial performance evaluation of BIST companies, the EBT, share price and Altman Z-values will be integrated into a combined index.

The data in Table 18 can be used as a starting point for analysis, in which the individual annual average values of EBT, share price and Altman Z-Scores of BIST companies are depicted from 2005 to 2017.

Table 18. Annual Average EBT, Share Price and Altman Z-Score Values of BIST Companies, 2005-2017

Year	EBT (M TRY)	Share Price	Altman Z-Score
2005	43.490	19.206	19.166
2006	50.874	16.044	26.148
2007	76.941	14.406	27.392
2008	62.839	5.984	18.532
2009	78.088	13.126	19.749
2010	91.938	14.098	15.925
2011	83.660	9.703	17.955
2012	104.744	19.922	13.383
2013	87.735	12.248	13.538
2014	96.603	14.365	9.228
2015	103.669	17.038	8.025
2016	111.925	15.423	8.805
2017	200.776	18.640	7.672

Source: Based on data derived from PDP (2018) and Datastore (2018a, 2018b).

In an effort to construct a common index with these three variables, the data in Table 18 are standardized and weighted equally, where the standard values in each row are multiplied with ⅓ and added up. The results are illustrated in Table 19 below.

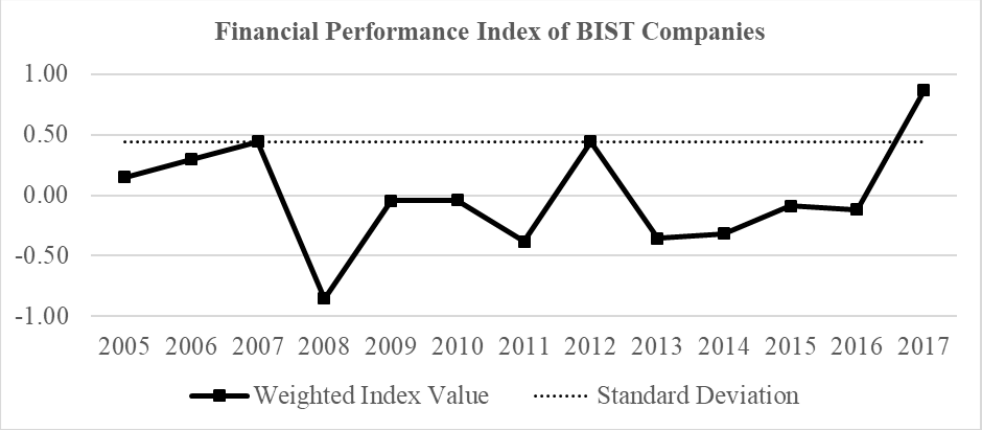
As it may be inferred from Table 19, the standard deviation of the calculated financial performance index for the 13-year-period is 0.446. This standard deviation value is surpassed only in 2017 where it was nearly equal to the average in 2007 and 2012, respectively. Therefore, these years can be stated as the most favorable years in terms of financial performance of the BIST companies. On the other hand, 2008, 2011 and 2013 are determined to be the most unfavorable, though. The development of the index is visualized in Figure 19 below.

Table 19. Annual Average EBT, Share Price and Altman Z-Score Values of BIST Companies as Standardized Values, 2005-2017

Year	EBT	Share Price	Altman Z-Score	Weighted Index
2005	-1.249	1.179	0.515	0.148
2006	-1.058	0.364	1.586	0.297
2007	-0.384	-0.058	1.777	0.445
2008	-0.749	-2.228	0.418	-0.853
2009	-0.354	-0.388	0.604	-0.046
2010	0.004	-0.137	0.018	-0.039
2011	-0.210	-1.269	0.329	-0.384
2012	0.335	1.363	-0.372	0.442
2013	-0.105	-0.614	-0.348	-0.356
2014	0.124	-0.069	-1.009	-0.318
2015	0.307	0.620	-1.194	-0.089
2016	0.521	0.204	-1.074	-0.117
2017	2.818	1.033	-1.248	0.868
Standard Deviation of Weighted Index				**0.446**

Source: Based on standardization of values presented in Table 18.

Figure 19. Financial Performance Index of BIST Companies, 2005-2017



Source: Own illustration based on data in Table 19.

2.5. Concluding Remarks

This chapter focused on the components of financial performance of business enterprises. Despite the facts that there is no generally accepted agreement on uniform

and standard firm performance indicators and firms are surrounded by a number of heterogeneous interest groups with diverse expectations, it can be stated that the very basic targets of a business firm are to grow profitably, to sustain its operations continuously so to remain in the business in the future and to maximize its value. In the light of these objectives, the financial performance of firms was described by highlighting three main indicators, which were profitability, risk of bankruptcy implying sustainability of its operations unceasingly and share price development as for value maximization.

The selected indicators were represented by the EBT for profitability, the Altman Z-Score for risk of bankruptcy and the share price. In addition to providing a detailed description of these variables and elaborating on their relevance with firm performance, this chapter empirically analyzed the performance of firms listed on Istanbul Stock Exchange from 2005 to 2017.

The analysis concluded that 2008 was the most unfavorable year in terms of firm performance of the thirteen-year period. This was followed by the years 2011 and 2013, respectively. This can be explained by the impacts of the global financial crises of 2007-2008 and European sovereign debt crisis of 2010 in Turkey. On the other hand, an improving trend with regard to share price development, EBT and the ratio of EBT to sales revenues was observable from the end of 2016 onwards for BIST companies. However, this trend was not justified with the Altman Z-Score values of the same companies, which portrayed an almost continuous worsening trend from 2011 onwards where the number of firms moving towards the distress zone increased.

3. CHAPTER THE RELATIONSHIP BETWEEN FINANCIAL FRAGILITY AND FIRM PERFORMANCE

After investigating financial fragility in terms of selected macroeconomic variables as well as examining the essence of firm performance by focusing on profitability, bankruptcy likelihood and share price in the preceding two chapters, the scene is now ready to focus on the impact of financial fragility on firm performance based on empirical analyses.

In this context, the chapter will start with briefly summarizing the research aim and the research questions as well. Afterwards, the selected method for analysis will be explained, which will be then followed by the introduction of the empirical models. Subsequently, the findings of the empirical analysis will be discussed in detail. Finally, the chapter will end with concluding remarks and implications for further research.

3.1. Aim

As the final chapter of this study as well as suggested by its definition, this episode is aimed at investigating the relationship between financial fragility and firm performance, in which the impact of macro level economic indicators on a micro level unit, namely the business enterprise will be in depth analyzed.

In an effort to attain this objective, we will employ two diverse data sets that were already introduced in the previous two chapters. The first data set consists of the selected nine annual macroeconomic indicators presented in the first chapter covering the years from 2005 to 2017. The latter is derived from the year-end annual financial statements of appropriate BIST companies for the same given years, the scope of which was explained in the second chapter.

3.2. Research Questions

In line with the aim of this chapter and with the objective of this study as a whole, the main research questions are firstly to unearth whether financial fragility significantly affects firm performance and if so, which of the given macroeconomic indicators have the most influence on firm profitability, risk of bankruptcy and share price, respectively.

3.3. Method

The method is aimed at analyzing the relationship between financial fragility and firm performance with linear regression models, in which financial fragility will be represented by macroeconomic indicators as independent variables and firm performance by the Altman Z-Score, EBT and share price as dependent variables, respectively. In other words, having the firm performance indicators as the dependent variables, three diverse linear regression models will be generated.

Gujarati (2011:5) explains that linear regression models in general make use of three different sorts of data, which can be defined as follows:

- *Time Series Data* include repetitive time-bounded instances, hence can be thought of as variables taking values at particular time periods such as on daily, weekly, monthly etc. basis.
- *Cross-Sectional Data* are the variables observed at a given time period, hence do not possess a variable time component.
- *Panel Data* carry the characteristics of both time series and cross-sectional data, therefore can be regarded as the mixture of the former two data types defined above.

Therefore, an empirical study making use of data collected for "same units repeatedly over time is called a panel" (Andreß et al., 2013:1).

In the light of the definitions above, the empirical data subject to the analysis in this study can be classified as panel data in that the data set possesses both cross-sectional (BIST companies) and times series (annual time dimension, years from 2005 to 2017) characteristics. For this reason, the data at hand combine both the time-based and spatial measurements at the same time. (Biørn, 2017:1)

Gujarati (2011:293) emphasizes the benefits of panel data by explaining that panel data include comparatively more observations, enable the analysis of "dynamic changes in cross-sectional units over time and more complicated behavioral models".

Wooldridge (2016:33) points out that having repetitive values of the identical cross-sectional variable enables focusing on specific unobserved features of the given variable.

Verbeek (2017:382) explains that using panel data is advantageous, since it allows for structuring models that are more advanced; on the other hand, the author warns that altering values of identical variables over time may cause independency problems.

3.4. Data

The data set includes 492 BIST companies with a period of thirteen years from 2005 to 2017 amounting to 4,193 observations in total. The data set at hand can be classified as an unbalanced short panel, since each single BIST firm does not have an observed value in all given years (unbalanced), and the number of cross-sectional instances exceed the number of observation years (short) (Gujarati, 2011:280). The reason why the data set is an unbalanced panel is that new firms may have been listed on BIST or may have ceased operations, gone bankrupt or failed to fulfill the requirements of related governmental authorities, hence become unlisted. In this sense, the linear regression approach to be employed can be better defined as a panel data regression model in which the regression model will have two dimensions, which are specific to cross-sectional units such as the firm and time-based units such as the calendar year, respectively.

Biørn (2017:14) illuminates that the intercepts and coefficients in the panel data regression model will vary between given cross-sectional as well as time-driven units. The author defines these variations as individual-specific and/or time-specific heterogeneity and points out that these heterogeneities can be represented either with unknown fixed parameters or random variables with specific properties (Biørn, 2017:14, 65).

Accordingly, panel data regression models can be divided into two main types, which are the fixed effects models and random effects models, respectively.

The basic difference between a fixed effects and a random effects model is that in fixed effects models, each single cross-sectional unit has its own intercept value; whereas in random effects models, these values are arbitrary selections from a bigger population of cross-sectional units (Gujarati, 2011:281).

Pesaran (2015:634) formulates the general panel data regression model as follows:

$$y_{it} = \alpha_i + \beta' x_{it} + u_{it}$$

In this equation, the author clarifies that *i* refers to the cross-sectional units such as the firm, *t* stands for the time component such as the calendar year, x_{it} is the independent variable observed for the i^{th} individual unit for the given t^{th} time unit, u_{it} is the error term, β represents unknown parameters and finally α_i is the time-invariant unit-specific effect (Pesaran 2015:634).

In addition, the fixed effects model can be formulated as follows (Verbeek, 2017:386):

$$y_{it} = \alpha_i + x'_{it}\beta + u_{it}, u_{it} \sim IID(0, \sigma_u^2)$$

In fixed effects models, "the unobserved effects are allowed to be arbitrarily correlated with the explanatory variables in each time period" (Wooldridge, 2016:760). Here, each single cross-sectional unit has its individual intercept value (Gujarati, 2011:281).

Secondly, below is the mathematical expression of the random effects model (Verbeek, 2017:391):

$$y_{it} = \beta_0 + x'_{it}\beta + \alpha_i + u_{it}, u_{it} \sim IID(0, \sigma_u^2), \alpha_i \sim IID(0, \sigma_\alpha^2)$$

In random effects models, "the unobserved effect is assumed to be uncorrelated with the explanatory variables in each time period" (Wooldridge, 2016:766). In these models, intercept values are arbitrary selections from larger cross-sectional units (Gujarati, 2011:281).

When the aforementioned two equations for fixed effects and random effects models are compared, it can be stated that the α_i representing "the effects of omitted individual-specific variables" denotes fixed measurements over time in fixed effects models; in contrast the α_i stands for random measurements similar to u_{it} in random effects models (Hsiao, 2014:39).

In panel data regression models, a decision is to be made whether to construct the model with fixed or random effects, hence with fixed or random α_i values (Hsiao

2014:47). In this context, the choice between the application of a fixed and a random effects model can be made with the Hausman test. Basically, the Hausman test evaluates whether the fixed effects and random effects estimators significantly differ from each other (Verbeek, 2017:395).

The Hausman test can be formulated as follows (Biørn, 2017:168):

$H_0: \lambda = 0$ (Random effects are acceptable)

$H_1: \lambda \neq 0$ (Fixed effects are acceptable)

Based on the hypotheses expressed above, the rejection of the Hausman test implies that the panel data regression model is to be constructed based on the fixed effects model (Wooldridge, 2016:444).

3.5. Regression Models

The panel regression models to be employed in the assessment of the impact of financial fragility on firm performance are listed below. In addition, Table 20 following the models depicts the full description of each variable included in the equations.

Model 1: $$Altman = RealER + BIST + ST\_LT + ST\_Res + CA\_GDP + BD\_GDP + PD\_GDP + Ex\_Im + PFD\_GDP$$

Model 2: $$EBT = RealER + BIST + ST\_LT + ST\_Res + CA\_GDP + BD\_GDP + PD\_GDP + Ex\_Im + PFD\_GDP$$

Model 3: $$Log(SharePrice) = RealER + BIST + ST\_LT + ST\_Res + CA\_GDP + BD\_GDP + PD\_GDP + Ex\_Im + PFD\_GDP$$

Table 20. Representation of Variables in Panel Regression Models

Variable	Representation
Year	Year
Company Code	Company
Altman Z-Score	Altman
EBT	EBT
Share Price	SharePrice
Real Exchange Rate	RealER
Change in BIST 100 Index	BIST
Ratio of STFD to LTFD	ST_LT
Ratio of STFD to Int. Reserves	ST_Res
Ratio of Current Account Deficit to GDP	CA_GDP
Ratio of Budget Deficit to GDP	BD_GDP
Ratio of Net Public Debt to GDP	PD_GDP
Ratio of Exports to Imports	Ex_Im
Ratio of Private Sector Gross Foreign Debt to GDP	PFD_GDP

Source: Own illustration.

As it may be inferred from the equations presented above, the independent variables in the three models are common, which are the selected nine different annual macroeconomic indicators. Having identical independent variables, each model includes the Altman Z-Scores, EBT values and share prices of BIST companies as dependent variables. In other words, identical nine macroeconomic indicators are regressed onto Altman Z-Scores, EBT values and share prices of BIST companies for the time period from 2005 to 2017.

Whereas the dependent variables include both firm specific (cross-sectional) and time series (years) components, the independent variables can be thought of as time series data, since annual macroeconomic indicators are identical for each firm in the given years.

3.6. Empirical Results

The presentation of the empirical results in this section will start with the illustration of the descriptive statistics and the correlation matrix of the variables.

Secondly, the choice between the fixed effects or random effects models will be explained. As for the third step, the results of the panel regressions based on the selected model type will be elaborated. Finally, the conclusions of the empirical analysis will be presented.

The descriptive statistics of the variables used in the models are presented in Table 21 on the next page.

In addition to the descriptive statistics, Table 22 illustrates the correlation matrix of the variables. A closer examination of the correlation values between the independent variables reveals that the following variables are strongly correlated with each other, where the correlation coefficient is either greater than +0.80 or less than -0.80:

- RealER and PFD_GDP (-0.83)
- ST_LT and ST_Res (+0.89)
- ST_Res and PD_GDP (-0.85)
- CA_GDP and Ex_Im (-0.89)
- PD_GDP and PFD_GDP (-0.88)

As formerly explained in detail, panel data regression models can be fixed effects or random effects models depending on the treatment of omitted individual-specific variables. Since the independent variables in the models are composed of annual macroeconomic indicators, which are identical across all firms in each given year, the intuitive expectation for the model type can be said to be the fixed effects model. In order to verify this expectation, Hausman tests were run for each model. The common outcome of the Hausman tests was that the cross-section test variance was invalid which set the Hausman statistic to zero. This was interpreted in the way that the estimate of the random effects variance was zero leading to the conclusion that no random effects were visible. As for an additional verification step, the redundant fixed effects were evaluated by the likelihood ratio. When the tests were run, the probability value was below 0.05 for each model. Based on the outcomes of the Hausman and redundant fixed effects tests, the decision was to go on with the fixed effects models in the panel regression analysis.

Table 21. Descriptive Statistics

	N	Range	Min.	Max.	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Altman	4,193	1,223.66	-151.87	1,071.79	15.12	0.86	55.45	3,074.49	8.12	0.04	99.38	0.08
EBT	4,193	10,516.65	-1,298.66	9,217.99	94.71	7.10	459.48	211,118.55	9.42	0.04	120.27	0.08
SharePrice	4,193	3,719.89	0.11	3,720.00	14.75	1.58	102.14	10,433.13	21.10	0.04	569.32	0.08
RealER	4,193	42.46	85.17	127.63	106.20	0.17	11.29	127.44	-0.07	0.04	-0.57	0.08
BIST	4,193	1.48	-0.52	0.97	0.19	0.01	0.38	0.14	0.12	0.04	-0.55	0.08
ST_LT	4,193	0.31	0.21	0.51	0.35	0.00	0.10	0.01	0.24	0.04	-0.90	0.08
ST_Res	4,193	0.56	0.39	0.95	0.70	0.00	0.19	0.03	-0.42	0.04	-1.25	0.08
CA_GDP	4,193	0.07	0.02	0.09	0.05	0.00	0.02	0.00	0.32	0.04	0.94	0.08
BD_GDP	4,193	0.05	0.01	0.05	0.02	0.00	0.01	0.00	2.12	0.04	3.70	0.08
PD_GDP	4,193	0.33	0.07	0.40	0.19	0.00	0.11	0.01	0.39	0.04	-1.24	0.08
Ex_Im	4,193	0.16	0.56	0.72	0.65	0.00	0.04	0.00	0.05	0.04	-0.57	0.08
PFD_GDP	4,193	0.20	0.17	0.37	0.27	0.00	0.05	0.00	0.12	0.04	-0.35	0.08
Valid N (listwise)	4,193											

Table 22. Correlation Matrix of Variables

	Altman	EBT	SharePrice	RealER	BIST	ST_LT	ST_Res	CA_GDP	BD_GDP	PD_GDP	Ex_Im	PFD_GDP
Altman	1	-.043**	-.024	.087**	.009	-.069**	-.096**	.017	.019	.095**	-.047**	-.090**
EBT	-.043**	1	.002	-.059**	.015	.022	.047**	.002	-.002	-.056**	.026	.070**
SharePrice	-.024	.002	1	-.005	.021	.005	.008	-.011	-.005	-.005	.010	.007
RealER	.087**	-.059**	-.005	1	.252**	-.388**	-.691**	-.043**	.336**	.790**	-.325**	-.832**
BIST	.009	.015	.021	.252**	1	-.152**	-.171**	-.476**	.552**	.249**	.341**	-.039*
ST_LT	-.069**	.022	.005	-.388**	-.152**	1	.892**	.347**	-.320**	-.654**	-.269**	.327**
ST_Res	-.096**	.047**	.008	-.691**	-.171**	.892**	1	.230**	-.354**	-.848**	-.015	.647**
CA_GDP	.017	.002	-.011	-.043**	-.476**	.347**	.230**	1	-.415**	-.052**	-.889**	-.191**
BD_GDP	.019	-.002	-.005	.336**	.552**	-.320**	-.354**	-.415**	1	.337**	.315**	-.077**
PD_GDP	.095**	-.056**	-.005	.790**	.249**	-.654**	-.848**	-.052**	.337**	1	-.292**	-.877**
Ex_Im	-.047**	.026	.010	-.325**	.341**	-.269**	-.015	-.889**	.315**	-.292**	1	.551**
PFD_GDP	-.090**	.070**	.007	-.832**	-.039*	.327**	.647**	-.191**	-.077**	-.877**	.551**	1

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

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

While forming the panel regression models, variables were added and removed based on the findings of the correlation values presented in Table 22. Testing diverse models with the addition and removal of correlated independent variables did not lead to significant differences; for this reason, the decision was to include all dependent variables in the final models.

If we recall from Table 10 in the first chapter, the change in the BIST 100 index and the ratio of exports to imports were explained to have a negative relationship with fragility; whereas the remaining seven macroeconomic variables to have a positive association. On the other hand, it will be convenient to assume a negative relationship between financial fragility and firm performance; namely the Altman Z-Score, EBT and share price. In this sense, Table 10 can be expanded as follows by adding the firm performance dimension, which is illustrated in Table 23.

Table 23. Expected Direction of Association with Independent and Dependent Variables in Panel Regression Models

Variable	Direction of Association with		
	Fragility	Firm Performance	
		Altman Z-Score	EBT Share Price
RealER	Same	Opposite	
BIST	Opposite	Same	
ST_LT	Same	Opposite	
ST_Res	Same	Opposite	
CA_GDP	Same	Opposite	
BD_GDP	Same	Opposite	
PD_GDP	Same	Opposite	
Ex_Im	Opposite	Same	
PFD_GDP	Same	Opposite	

Source: Own illustration, expansion of Table 10.

Table 23 is aimed at illuminating the expected direction of relationship between the independent and dependent variables in the panel regression models. As summarized in this table, the coefficients of the change in the BIST 100 index and the ratio of exports to imports are expected to have a positive sign in the equations; in contrast, the rest is expected to have a negative sign.

Figure 20 summarizes the results of the first panel regression model, in which the Altman Z-Score of BIST companies according to year-end financial statements is the dependent variable.

Figure 20. Model 1 Panel Regression Results: Altman Z-Score as Dependent Variable

Variable	Coefficient	t-Statistic
C	219.65 ***	2.92
REALER	-0.19 **	-2.49
BIST	4.84 ***	2.86
ST_LT	1.37	0.09
ST_RES	-36.87 ***	-5.92
CA_GDP	-300.90 *	-1.88
BD_GDP	-34.90	-0.88
PD_GDP	-57.34 **	-2.49
EX_IM	-185.52 **	-2.37
PFD_GDP	-45.37	-1.50
Effects Specification		
Cross-section fixed (dummy variables)		
R-squared	0.59	
Adjusted R-squared	0.53	
Durbin-Watson stat	1.85	
F-statistic	10.47	
Prob (F-statistic)	0.00	

***, **and * represents statistical significance at 1%, 5% and 10% respectively.

The results suggest that of the selected variables, the coefficients of the real exchange rate, the change in the BIST 100 index, the ratio of STFD to international reserves, the ratio of current account deficit to GDP, the ratio of net public debt to GDP and the ratio of exports to imports are significant at the 0.1 level. In addition, the coefficients of the change in the BIST 100 index and the ratio of STFD to LTFD are positive; whereas that of the rest are negative. When the coefficient signs are compared with the expectations set out in Table 23 presented previously, it can be concluded that all coefficient signs excluding the ratio of STFD to LTFD and the ratio of exports to imports are in line with what's expected. As the R-squared suggests, the independent

variables explain 58.6% of the variability in Altman Z-Score. The Durbin-Watson statistic shows no signs of autocorrelation and the model as a whole is significant at the 0.01 level.

In an effort to analyze further, the model was then modified by replacing the real exchange rate value of the current year with that of the previous year. In other words, the panel regression model covered in this case the time period from 2006 to 2017, in which the real exchange rate values had one-year time lag as they started from 2005 and ended in 2016 instead of 2017. The lagging variable of real exchange rate is denoted by RealER(-1) in the model. Findings are depicted in Figure 21.

Figure 21. Model 1 Panel Regression Results: Altman Z-Score as Dependent Variable with RealER Time Lag

Variable	Coefficient	t-Statistic
C	105.63 ***	3.29
REALER(-1)	-0.15	-1.33
BIST	1.36	0.50
ST_LT	47.94 ***	2.79
ST_RES	-47.53 ***	-4.00
CA_GDP	-141.13 *	-1.84
BD_GDP	-149.49 ***	-2.83
PD_GDP	-4.86	-0.55
EX_IM	-80.56 **	-2.08
PFD_GDP	17.42	0.55
Effects Specification		
Cross-section fixed (dummy variables)		
R-squared	0.61	
Adjusted R-squared	0.55	
Durbin-Watson stat	1.80	
F-statistic	10.47	
Prob (F-statistic)	0.00	

***, **and * represents statistical significance at 1%, 5% and 10% respectively.

The inclusion of the real exchange rate with one-year time lag reduced the total number of observations from 4,193 to 3,701, since the observations for one year were sacrificed in the data set. On the other hand, the comparison of the two models reveals

that the R-squared rose from 58.6% to 60.9% with 2.3% improvement. As for the change in the significance of regressors, the ratio of STFD to international reserves, the ratio of current account deficit to GDP and the ratio of exports to imports are significant in both models at the 0.1 level. Conversely, the coefficients of the real exchange rate, the change in the BIST 100 index and the ratio of net public debt to GDP became insignificant. Moreover, the ratio of budget deficit to GDP and the ratio of STFD to LTFD turned into significant in the modified model. The ratio of private sector gross foreign debt to GDP remain insignificant in both models at the 0.1 level. Another finding of the comparison is that the coefficient of private sector gross foreign debt to GDP ratio changed from (-) to (+) in the modified model, which in this case contradicts with the expectation.

The findings of the second panel regression model are revealed in Figure 22. In this model, the year-end EBT values of the BIST companies are the dependent variables.

According to Figure 22, the coefficients of the change in the BIST 100 index, the ratio of STFD to international reserves, the ratio of budget deficit to GDP and the ratio of private sector gross foreign debt to GDP are significant at the 0.1 level. Moreover, all coefficients of the independent variables except for the ratio of budget deficit to GDP are positive. With this respect, it can be stated that only the change in the BIST 100 index, the ratio of budget deficit to GDP as well as the ratio of exports to imports meet the expectations as for the direction of association with the EBT. The R-squared portrays that the independent variables explain 74.5% of the variability in EBT. The Durbin-Watson statistic shows no signs of autocorrelation and the model as a whole is significant at the 0.01 level.

Figure 22. Model 2 Panel Regression Results: EBT as Dependent Variable

Variable	Coefficient	t-Statistic
C	-845.73	-1.45
REALER	0.73	1.36
BIST	39.63 ***	4.24
ST_LT	29.17	0.20
ST_RES	84.63 *	1.79
CA_GDP	2,053.37	1.63
BD_GDP	-984.45 **	-2.49
PD_GDP	230.43	1.20
EX_IM	571.77	0.97
PFD_GDP	1,029.45 ***	4.11
Effects Specification		
Cross-section fixed (dummy variables)		
R-squared	0.75	
Adjusted R-squared	0.71	
Durbin-Watson stat	0.83	
F-statistic	21.63	
Prob (F-statistic)	0.00	

***, **and * represents statistical significance at 1%, 5% and 10% respectively.

The model was further modified by replacing the RealER with RealER(-1) in which the outcome is presented in Figure 23 below.

When the models presented in Figures 22 and 23 are compared, it can be derived that the modification of RealER(-1) led to the change of R-squared from 74.5% to 76.7% corresponding to an improvement of 2.2%. Leaving the ratio of private sector gross foreign debt to GDP aside, the rest of the regressors became insignificant at the 0.1 level in the transformed model.

On the other hand, the aforementioned transformation had a major impact on the signs of the coefficients of the independent variables in that the coefficient signs of the real exchange rate, the ratio of STFD to international reserves, the ratio of budget deficit to GDP as well as the ratio of exports to imports changed the other way around. With this change, the real exchange rate and the ratio of STFD to international reserves

seem to move in the expected direction with EBT; whereas the ratios of exports to imports and budget deficit to GDP not.

Figure 23. Model 2 Panel Regression Results: EBT as Dependent Variable with RealER Time Lag

Variable	Coefficient	t-Statistic
C	37.94	0.13
REALER(-1)	-1.88	-1.53
BIST	2.36	0.10
ST_LT	83.77	0.59
ST_RES	-84.27	-0.98
CA_GDP	1,020.48	1.30
BD_GDP	235.67	0.64
PD_GDP	7.39	0.06
EX_IM	-60.40	-0.16
PFD_GDP	985.07 ***	4.41
Effects Specification		
Cross-section fixed (dummy variables)		
R-squared	0.77	
Adjusted R-squared	0.73	
Durbin-Watson stat	0.92	
F-statistic	22.14	
Prob (F-statistic)	0.00	

***, **and * represents statistical significance at 1%, 5% and 10% respectively.

What follows next is Figure 24 in which the outcomes of the third panel regression model are disclosed. In this model, the logarithm of the year-end share price of the BIST companies is the dependent variable.

According to Figure 24, the coefficients of the change in the BIST 100 index, the ratio of STFD to LTFD, the ratio of STFD to international reserves and the ratio of budget deficit to GDP are significant at the 0.1 level. As for the signs of the coefficients of the independent variables, the real exchange rate, the change in the BIST 100 index and the ratio of STFD to international reserves are positive and the rest is negative. The coefficient signs lead to the conclusion that the real exchange rate, the ratio of STFD to international reserves and the ratio of exports to imports do not

correspond to the expected direction of relationship with the share price. The R-squared shows that the independent variables explain 83.9% of the variability in the share price. The Durbin-Watson statistic displays no signs of autocorrelation and the model as a whole is significant at the 0.01 level.

Figure 24. Model 3 Panel Regression Results: Logarithm of Share Price as Dependent Variable

Variable	Coefficient	t-Statistic
C	7.17	1.18
REALER	0.00	0.18
BIST	0.69 ***	4.61
ST_LT	-4.30 ***	-3.40
ST_RES	2.36 ***	3.55
CA_GDP	-12.00	-1.06
BD_GDP	-5.82 *	-1.81
PD_GDP	-0.98	-0.48
EX_IM	-8.12	-1.45
PFD_GDP	-1.09	-0.41
Effects Specification		
Cross-section fixed (dummy variables)		
R-squared	0.84	
Adjusted R-squared	0.82	
Durbin-Watson stat	0.86	
F-statistic	38.37	
Prob (F-statistic)	0.00	

***, **and * represents statistical significance at 1%, 5% and 10% respectively.

Figure 25 shows the results with the RealER(-1) replacement in the third model.

Figure 25. Model 3 Panel Regression Results: Logarithm of Share Price as Dependent Variable with RealER Time Lag

Variable	Coefficient	t-Statistic
C	10.41 ***	5.23
REALER(-1)	-0.03 ***	-3.90
BIST	0.31 *	1.91
ST_LT	-4.47 ***	-3.85
ST_RES	2.73 ***	3.36
CA_GDP	-14.62 ***	-2.70
BD_GDP	-4.55	-0.97
PD_GDP	0.61	0.59
EX_IM	-8.04 ***	-3.85
PFD_GDP	-3.64 ***	-2.80
Effects Specification		
Cross-section fixed (dummy variables)		
R-squared	0.86	
Adjusted R-squared	0.84	
Durbin-Watson stat	0.88	
F-statistic	40.54	
Prob (F-statistic)	0.00	

***, **and * represents statistical significance at 1%, 5% and 10% respectively.

As summarized in Figure 25, the switch of REALER with REALER(-1) again improved the significance of the total model from 83.9% to 85.8% by 1.9%. An examination of the change in the significance of regressors reveals that the real exchange rate, the ratio of current account deficit to GDP, the ratio of exports to imports and the ratio of private sector gross foreign debt to GDP became significant at 0.1 level with the RealER(-1) modification. Conversely, the ratio of budget deficit to GDP turned out to be insignificant with the modification. The ratio of net public debt to GDP is still insignificant in both cases. Additionally, the replacement of REALER(-1) caused the signs of the real exchange rate and the ratio of net public debt to GDP to change the other way around. With this change, the real exchange rate is now associated with the share price in the expected direction; in contrast the ratio of net public debt to GDP contradicts with the expected direction of association.

The empirical results derived from the six different panel regression equations can be basically interpreted in terms of the significance of the regressors as well as the signs of the coefficients. Tables 24 and 25 make a comparison of the models based on these two criteria; the tables portray whether the regressors are significant at the 0.1 level (represented by "Yes" or "No") and whether the signs of the coefficients meet the expected direction of association (denoted as "Exp." or "Unexp." meaning expected or unexpected) as set forth in Table 23.

Table 24. Comparison of Panel Regression Models Based on Coefficient Signs and Significances

Variable	Model 1: Altman Z-Score		Model 2: EBT		Model 3: Log(Share Price)	
	Significant	**Sign**	**Significant**	**Sign**	**Significant**	**Sign**
RealER	**Yes**	**Exp.**	No	Unexp.	No	Unexp.
BIST	**Yes**	**Exp.**	**Yes**	**Exp.**	**Yes**	**Exp.**
ST_LT	No	Unexp.	No	Unexp.	**Yes**	**Exp.**
ST_Res	**Yes**	**Exp.**	Yes	Unexp.	Yes	Unexp.
CA_GDP	**Yes**	**Exp.**	No	Unexp.	No	Exp.
BD_GDP	No	Exp.	**Yes**	**Exp.**	**Yes**	**Exp.**
PD_GDP	**Yes**	**Exp.**	No	Unexp.	No	Exp.
Ex_Im	Yes	Unexp.	No	Exp.	No	Unexp.
PFD_GDP	No	Exp.	Yes	Unexp.	No	Exp.

Source: Own illustration based on E-Views output.

As Table 24 disseminates, the real exchange rate, the change in the BIST 100 index, the ratios of STFD to international reserves, current account deficit to GDP and net public debt to GDP are significant independent variables in the first model in which their association with the Altman Z-Score is in the expected direction. In the second model, the change in the BIST 100 index and the ratio of budget deficit to GDP are the two regressors which are both significant and associated expectedly with the EBT. As for the third model, there are three independent variables which are both significant and moving in the expected direction with the share price which are the change in the

BIST 100 index, the ratio of STFD to LTFD and the ratio of budget deficit to GDP, respectively.

Table 25. Comparison of Panel Regression Models (Real Exchange Rate with Time Lag) Based on Coefficient Signs and Significances

Variable	**Model 1: Altman Z-Score**		**Model 2: EBT**		**Model 3: Log(Share Price)**	
	Significant	**Sign**	**Significant**	**Sign**	**Significant**	**Sign**
RealER(-1)	No	Exp.	No	Exp.	**Yes**	**Exp.**
BIST	No	Exp.	No	Exp.	**Yes**	**Exp.**
ST_LT	Yes	Unexp.	No	Unexp.	**Yes**	**Exp.**
ST_Res	**Yes**	**Exp.**	No	Exp.	Yes	Unexp.
CA_GDP	**Yes**	**Exp.**	No	Unexp.	**Yes**	**Exp.**
BD_GDP	**Yes**	**Exp.**	No	Unexp.	No	Exp.
PD_GDP	No	Exp.	No	Unexp.	No	Unexp.
Ex_Im	Yes	Unexp.	No	Unexp.	Yes	Unexp.
PFD_GDP	No	Unexp.	Yes	Unexp.	**Yes**	**Exp.**

Source: Own illustration based on E-Views output.

Table 25 makes the same comparison this time with the models in which the regressor RealER is substituted with the RealER(-1). When the real exchange rate is included with one-year time lag, the ratios of STFD to international reserves, current account deficit to GDP and budget deficit to GDP are the significant independent variables observed to be in the expected way of association with the Altman Z-Score. Secondly, it can be concluded that the modification is irrelevant for the second model in that no regressor in the modified second model is significant and showing the expected direction of association with the EBT. With regard to the third panel regression model, the number of the variables realizing both of the criteria rises from three to five with the addition of the real exchange rate, the ratio of current account deficit to GDP and the ratio of private sector gross foreign debt to GDP, where the ratio of budget deficit to GDP is no more eligible in contrast to the unmodified model.

There are several conclusions that can be drawn in the light of the findings of the empirical analysis.

Firstly, it can be asserted the real exchange rate can be regarded as an influential indicator for firm performance in terms of share price development for the coming period. In other words, a decrease in the real exchange rate meaning depreciation of TRY in terms of foreign currencies in real terms is likely to signal for an increase in share prices for the coming year. One explanation that can be proposed is that depreciated or undervalued TRY may also mean undervalued share prices in the stock exchange market which may attract the attention of especially foreign investors leading to an increase in share prices due to increased demand.

Secondly, being eligible for each of the three dependent variables based on the given two criteria which are the significance of the regressors and the signs of the coefficients, the change in the BIST 100 index can be concluded as an influential indicator for firm performance. An improvement in the BIST 100 index is therefore highly likely to affect the Altman Z-Score, EBT and share price of firms in a positive way. Yet another influential indicator is the ratio of budget deficit to GDP, which fulfills the evaluation criteria for the EBT and share price. In this sense, a deteriorating budget deficit to GDP ratio is likely to signal for worsening firm performance in terms of EBT and share price.

As for a third implication, it can be posited that the riskiness of a firm to go bankrupt represented by the Altman Z-Score can be estimated by investigating especially the development of five main macroeconomic indicators which are the real exchange rate, the change in the BIST 100 index, the ratios of STFD to international reserves, current account deficit to GDP and net public debt to GDP, respectively.

Fourthly, the change in the BIST 100 index and the budget deficit to GDP ratio are found to be the most significant macroeconomic parameters that can be monitored to estimate the EBT development of firms.

What can be mentioned as a fifth conclusion is that the share price of companies is likely to be most affected by the current developments in the change in the BIST 100 index, STFD to LTFD ratio as well as the budget deficit to GDP ratio.

Lastly, it was found out that changes in the real exchange rate in one period do not significantly affect firm profitability in terms of EBT in the next period. What can

be concluded here is that fluctuations in the real exchange rate have an instant impact on firm profitability in the concurring or closer time period.

3.7. Concluding Remarks and Future Implications

Literally speaking, this chapter constructed the bridge between financial fragility and firm performance. The focal point was to provide insights into the question to what extend financial performance of business enterprises is affected from macroeconomic conditions.

Answers to this question were sought by utilizing annual financial reporting figures of 492 diverse companies listed on Borsa Istanbul as well as nine macroeconomic indicators in Turkey for a thirteen-year period from 2005 to 2017 in Turkey.

The empirical analysis included the use of panel data regression models formulated separately for diverse firm performance indicators, namely the Altman Z-Score, EBT and share price, respectively. Accordingly, macroeconomic indicators were regressed on three different firm performance variables.

Empirical findings primarily suggested that a significant relationship existed between financial fragility and firm performance based on selected representative parameters.

Secondly, the macroeconomic variables having the most influence on the Altman Z-Score, EBT and share price development were determined. In this context, the real exchange rate, the change in the BIST 100 index, the ratios of STFD to international reserves, current account deficit to GDP and net public debt to GDP were regarded as the key determinants of Altman Z-Score. In addition, the change in the BIST 100 index and the budget deficit to GDP ratio were proposed to be the most significant factors for EBT. On the other hand, the change in the BIST 100 index, the ratio of STFD to LTFD as well as the budget deficit to GDP ratio were posited to be the most influential elements for share price development.

Taking the extreme volatility in the value of TRY very recently in 2018 into consideration, the impact of the real exchange rate on firm performance was further analyzed. Two conclusions that were drawn with this regard were that the real

exchange rate in the current year significantly affected the share price development in the coming year; whereas this was not the case for EBT of firms leading to the conclusion that fluctuations in the real exchange rate had an instant impact on firm profitability in the same year.

It can be argued that the conclusions drawn above may be of fundamental importance for economic policy makers and company managers. Being aware of which macroeconomic indicator has the most significant impact on profitability, bankruptcy risk or share price value, company managers may determine a set of economic variables to be primarily followed-up and take relevant measures according to their development. On the macroeconomics side, policy makers may formulate to the point actions to flourish company growth and performance.

There are a number of restrictions that should be taken into consideration while reviewing the findings of the empirical analysis. Firstly, the data set of BIST companies excluded those that were mainly operating in the finance sector due to the fact that their financial statements were constructed in such a way that firm performance related indicators could not be extracted properly. Secondly, the company data set contained different number of companies each year leading to an unbalanced panel, since the number of companies being listed or unlisted altered in different years. Lastly and more importantly, the proposed models included a pre-selected set of parameters that represented firm performance and financial fragility. In other words, the choice on the variables as for proxy factors for firm performance and financial fragility is likely to affect the significance of the relationship between these two.

The restrictions stated above can be on the other hand regarded as implications for future research. Future research in this area may be primarily directed at employing an extended set of variables that may represent financial fragility and firm performance. Such an effort may provide additional insights for understanding the impact of macroeconomic policies on the future of business enterprises. Furthermore, the impact of macroeconomic conditions on firms may be evaluated firm by firm or a group of firms in the same industry or belonging to the same group. These future endeavors may guide company managers with regard to strategy formulation for future business success.

CONCLUSION

The aim of this study was to examine the impact of financial fragility on firm performance in Turkey for the years 2005 to 2017. With this respect, the study investigated the main concepts underlying financial fragility and its measurement, the characteristics of firm performance, the quantification of the impact of financial fragility on firm performance as well as the key macroeconomic indicators to be followed up on to assess financial performance.

The thesis utilized empirical data derived from 4,193 observations of 492 diverse listed companies on Istanbul Stock Exchange between 2005 and 2017; in addition, the study analyzed a variety of macroeconomic indicators in the given years.

The study firstly explored the main concepts relevant to the study of financial fragility by providing a detailed insight into the terms financial stability, instability, financial crises, early warning systems to assess vulnerabilities to crises. An in-depth analysis of the literature suggested that financial fragility be represented with nine macroeconomic indicators, which were the real exchange rate, change in the BIST 100 index, STFD/LTFD, STFD/international reserves, current account deficit/GDP, budget deficit/GDP, net public debt/GDP, exports/imports and private sector gross foreign debt/GDP, respectively. Covering the years from 2005 to 2017, these variables were then integrated into a fragility index with equal weights, in which the standard deviation of the index resulted in 0.301 for the total research period. The index showed that 2010 (0.429), 2011 (0.511) and 2013 (0.423) were the years, in which the index values were above the standard deviation of the whole analysis period. Conversely, 2009 (-0.427) and 2016 (-0.369) were the years determined to be the most favorable in terms of financial fragility. The index signaled for an increasing trend from 2016 onwards.

Secondly, the study looked into the components of financial performance of business enterprises. In consideration of the previous studies in the literature, profitability, risk of bankruptcy and share price were selected as the performance constructs, which were represented by the EBT for profitability, the Altman Z-Score for risk of bankruptcy and the share price. Having determined the corresponding variables, the financial performance of the firms listed on Borsa Istanbul from 2005 to

2017 were analyzed. The analysis concluded that 2008 was the most unfavorable year followed by the years 2011 and 2013 in terms of financial performance, where the signs of the global financial crises of 2007-2008 and European sovereign debt crisis of 2010 were also evident in Turkey. On the other hand, an improving trend with regard to share price development, EBT and the ratio of EBT to sales revenues was observable from the end of 2016 onwards for BIST companies. However, this trend was not justified with the Altman Z-Score values of the same companies, which portrayed an almost continuous worsening trend from 2011 onwards characterized with an increasing number of firms moving towards the distress zone.

Following the exploration of the insights of financial fragility and firm performance separately, the study then established the fit between these two concepts. To do so, panel data regression models were formulated where macroeconomic indicators were regressed on three different firm performance variables.

First and foremost, empirical findings suggested that a significant relationship existed between financial fragility and firm performance based on selected representative parameters. In this context, the real exchange rate, the change in the BIST 100 index, the ratios of STFD to international reserves, current account deficit to GDP and net public debt to GDP were regarded as the key determinants of Altman Z-Score. In addition, the change in the BIST 100 index and the budget deficit to GDP ratio were proposed to be the most significant factors for EBT. On the other hand, the change in the BIST 100 index, the ratio of STFD to LTFD as well as the budget deficit to GDP ratio were posited to be the most influential elements for share price development.

The study further analyzed the impact of the real exchange rate on firm performance in consideration of the recent extreme volatility of TRY in 2018. Two conclusions that were drawn with this regard were that the real exchange rate in the current year significantly affected the share price development in the coming year; whereas this was not the case for EBT of firms leading to the conclusion that fluctuations in the real exchange rate had an instant impact on firm profitability in the same year.

Policy makers and company managers may benefit from the findings of this study by following up on the particular indicators having the most significant impact on profitability, bankruptcy risk or share price value. In such a way, company

managers may take relevant measures or counter-actions according to their development and policy makers may formulate strategies to flourish company growth and performance.

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APPENDIX

Table 26. Macroeconomic Data Set Basis for Indicators (2005-2017) (1)

Year	Real Exchange Rate (2003=100)	STFD (M USD)	LTFD (M USD)	International Reserves (M USD)	GDP (M TRY)	Average USD Exchange Rate (TL)	Private Sector Gross Foreign Debt (M USD)
2005	119.420	38,914.00	131,861.00	69,993.70	673,702.94	1.341	84,939.00
2006	109.790	42,852.00	165,149.00	92,335.60	789,227.56	1.431	120,737.00
2007	127.630	43,142.00	206,783.00	110,991.90	880,460.88	1.302	160,599.00
2008	111.050	52,512.00	228,323.00	116,915.90	994,782.86	1.293	188,435.00
2009	113.140	48,977.00	219,808.00	112,225.20	999,191.85	1.547	172,109.00
2010	119.670	77,232.00	214,486.00	110,009.80	1,160,013.98	1.500	191,044.00
2011	103.050	83,107.00	222,221.00	110,503.60	1,394,477.17	1.670	200,164.00
2012	110.590	102,439.00	239,517.00	137,492.50	1,569,672.11	1.793	228,561.00
2013	100.560	133,273.00	258,997.00	147,880.10	1,809,713.09	1.901	268,100.00
2014	104.770	135,138.00	270,166.00	141,829.10	2,044,465.88	2.188	281,553.00
2015	97.570	105,364.00	294,351.00	128,051.60	2,338,647.49	2.720	281,750.00
2016	91.780	101,419.00	307,286.00	129,534.20	2,608,525.75	3.021	284,617.00
2017	85.170	117,854.00	336,430.00	136,168.90	3,104,906.71	3.648	317,175.00

Source: Based on references summarized in Table 7.

Table 27. Macroeconomic Data Set Basis for Indicators (2005-2017) (2)

Year	BIST100 Index[4] (1986=1)	Current Account Deficit (M USD)	Budget Deficit (M TRY)	Net Public Debt (M TRY)	Exports (M USD)	Imports (M USD)
2005	39,777.70	-20,980.00	-6,902.70	270,123.48	73,476.00	116,774.00
2006	39,117.46	-31,168.00	-4,642.74	257,911.94	85,535.00	139,576.00
2007	55,538.13	-36,949.00	-13,707.91	247,941.78	107,272.00	170,063.00
2008	26,864.07	-39,425.00	-17,432.09	267,065.61	132,028.00	201,964.00
2009	52,825.02	-11,358.00	-52,760.84	308,975.66	102,143.00	140,929.00
2010	66,004.48	-44,616.00	-40,081.29	317,471.89	113,883.00	185,544.00
2011	51,266.62	-74,402.00	-17,783.19	289,601.26	134,906.00	240,839.00
2012	78,208.44	-47,962.00	-29,411.79	240,464.58	152,462.00	236,544.00
2013	67,801.73	-63,621.00	-18,542.58	197,247.07	151,803.00	251,661.00
2014	85,721.13	-43,597.00	-23,369.55	186,810.85	157,610.00	242,178.00
2015	71,726.99	-32,118.00	-23,525.19	160,988.59	143,839.00	207,234.00
2016	78,138.66	-33,137.00	-29,931.93	219,182.16	142,530.00	198,619.00
2017	115,333.01	-47,378.00	-47,373.25	262,236.57	156,996.00	233,798.00

Source: Based on references summarized in Table 7.

[4] Index value for 2004: 24,971.68

CURRICULUM VITAE

Tolga TUZCUOĞLU graduated from Dokuz Eylül University, Faculty of Business, Department of Economics in 2003. Afterwards, he did his master's degree study in International Business Administration at Hamburg University, Germany from 2003 to 2005. He received his PhD degree in Business Administration with this thesis from Yaşar University in 2019.

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