



Macroeconomic Determinants of Financial Distress in Turkey: An Econometric Analysis

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Abstract

Purpose

The purpose of this paper is to investigate the possible links between macroeconomic factors and financial distress in Turkey.

Design/methodology/approach

Based on the 2009/1-2016/2 quarterly data of macroeconomic factors and the number of filings for bankruptcy postponement, econometric models are developed using forward stepwise regression and classical regression methods to determine the factors influencing financial distress. A vector error correction model is also developed using macroeconomic factors found significant in both methods to investigate the interactions of financial distress with them.

Findings

In the stepwise regression implementation, performed with 16 independent variables, statistically significant variables entered into the model are industrial production index with negative sign as expected and the unemployment rate with negative sign against the expectations. In the classical regression implementation, performed with 7 independent variables, statistically significant variables are ex ante real interest rate with positive sign and gross domestic product with negative sign as expected and money supply with negative sign against the expectations. The impulse response graphics of a vector error correction model involving bankruptcy postponement, industrial production index and nominal interest rate indicates that bankruptcy postponement is influenced by the shocks both in itself and in industrial production index.

Originality/value

This is the first study in Turkey investigates macroeconomic determinants of financial distress.

JEL classification: C32, E32, G33

Keywords: Bankruptcy Postponement, Financial Distress, Business Failure, Macroeconomic Determinants

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1. Introduction

Firms operate within a layer formed by suppliers, competitors, consumers etc. surrounded by an outer layer of economic, technological, political, legal and social factors. Any change that takes place in the mentioned factors of these layers which form the external environment of the firms, directly affect them since they are open systems. If they cannot keep pace with the changes in these factors, then, the economic and financial structure of the firms may deteriorate and when cannot recover may go into bankruptcy and may disappear via liquidation, take over or merging. This implies that financial distress (failure) is a costly process. In this process, administrative and legal expenditures are high. Many costly consequences such as losses due to fire sales, damage to relationships with customers and creditors, plant closings, layoffs etc. happen during this period.

Due to these facts, the prediction of financial distress and the determination of the factors causing financial distress are among the subjects that researchers have long been interested in.

In this context, the studies in the literature have been mainly at the micro level. Researchers tried to predict firm bankruptcies or financial difficulties by using company specific financial ratios. The success of such models has reached a particular level when predicting financial distress one year ahead of its occurrence, but the level of success has been shown to fall considerably beyond one year.

Johnson (1970, p. 1166) asserts that for ratios to predict failure, they should be derived from a model of the underlying economic and decision processes because financial ratios do not contain information about the intervening economic conditions confronting management and investors. Rose *et al.* (1982, p. 21) states that the postmortem equations utilizing financial ratios have not proved successful in forecasting which going concern will become bankrupt in the near future may be due to the influence of general economic conditions. Maksimovic and Phillips (1998, p. 1496) finds that in declining industries the proportion of plants in Chapter 11 is as much as three times higher than in high growth industries. Mensah (1984, p. 381) indicates that the rise in bankruptcies in recessionary periods would be unexplainable if the factors leading to the bankruptcy were internal to all companies. Demirgüç-Kunt and Detragiache (1998, p. 1)'s findings reveal that crises tend to erupt when the macroeconomic environment is weak, particularly when the growth is low and inflation is high.

Subsequent to Johnson (1970)'s assertion, Altman (1971; 1983) have done the pioneering empirical works examining the relationship between macroeconomic variables and firm failure. The variables used in Altman's (1983) study for the health of the economy, credit market conditions (liquidity), capital market performance and the rate of new firm establishment together with inflation and interest rate variables were the most frequently used variables in the empirical studies.

According to the common results obtained in these studies, financial distress has a negative relation with the variables reflecting growth in the economy, such as aggregate demand (real GDP), manufacturing industry capacity utilization, annual employment, industrial production index, and has a positive relation to cost generating variables such as nominal interest rates, real interest rate, inflation rate, growth in real wages and raw material costs. The rate of new firm establishment is also a variable having a positive relationship with financial distress.

In this study, it is aimed to investigate the relationship between macroeconomic factors and financial distress in Turkey. The fact that the studies in the literature are predominantly in the United States and United Kingdom origin, the reflections of a developing economy like Turkey when compared with the results obtained in the mentioned economies may contribute to the literature.

The study is organized in four sections. The first section is the introduction section. In the second section, an overview of previous studies and macroeconomic factors of financial distress is given. In the third section, data and econometric analysis are presented. In the fourth section, conclusions are summarized.

Overview of the Previous Studies and Macroeconomic Factors

Many empirical researches following Altman (1971; 1983)'s pioneering studies proves the relation between financial distress and macroeconomic factors. To this end, macroeconomic factors most frequently used in the studies are presented below.

Nation's Economic Health

Altman (1971, p. 342), by analyzing 1946-1970 post-war railroad bankruptcies in the United States, reports that during this 300-month period there have been 5 relatively mild recessions covering approximately 60 months where two-thirds of the post-war bankruptcies occurred in that period.

Altman (1983, p. 16) states that GNP growth is traditionally regarded as an indicator of a nation's economic health and the relationship between corporate profits and failures is well documented in business cycle measurement. He argues that conditions leading to a change in profits are logically related to failures since a slight drop in profits to the marginal firm is often critical to its survival.

Empirical researches, e.g. Altman (1983), Liu (2009), Liu and Wilson (2002), demonstrate that in the periods of rising firm profits and GNP, firm failure decreases.

Credit Availability (Liquidity) and Credit Market Conditions

Altman (1983, p. 17) asserts that the firm's vulnerability is often magnified by relatively high financial and/or operating leverage structures, because, the capital markets are usually unavailable to firms whose solvency is threatened. Therefore, the propensity to fail can be expected to rise during periods of relatively tight credit conditions.

Liu (2009, p. 51), quotes from Gordon (1988) that tight monetary policy and an increase in the effective interest rate can sharply alter the costs of borrowing and production for firms, and such cost pressures turn out to be detrimental to the survival of the corporate sector.

Vlieghe (2001, p. 11) states that the financial position of the corporate sector matters because it influences banks' willingness to lend which can lead to a higher probability of failure.

The studies of e.g. Altman (1971; 1983), Melicher and Heart (1988), Salman *et al.* (2011) supports the argument that in the periods of rising money supply and credit availability, firm failure diminishes.

Price Level Changes

According to Mensah (1984, p. 383), changes in the rate of inflation can influence firms either by increasing the costs of production and marketing which cannot be passed on with higher selling prices or, if passed on, result in a drop in demand. Wadhvani (1986, p. 120)'s argument supports Mensah (1984) by attracting the attention to indexed debt that when debt is not indexed inflation depresses the firm's cash flow and therefore, one may expect higher inflation to increase the number of firm bankruptcies.

Altman (1983, p. 19) discusses the positive effect of inflation and argue that despite the weakening overall effect of stable and large increases in inflation, it may positively affect a firm's propensity to survive in the short run. Inflation may mask the inefficiency of a poorly managed firm and if such firm has a high debt burden, this firm may survive longer than expected since it has a chance to repay its debt with "cheaper" money.

Capital Market Activity (Investor Expectations)

Altman (1983, pp. 17-18) argues that investor expectations are reflected in the prices paid for financial assets. The fact that observed co-movement of common stock prices and business failures does not mean a direct relationship between them, but they are likely related due to expected economic conditions. He further argues that since a drop in the stock prices decreases the economic value of the firm assets, then this fact may be crucial to the existence of a marginal firm if the firm liabilities exceed its economic value.

Altman (1971; 1983) finds a negative relationship between stock market performance and bankruptcy.

New Firm Establishment

According to Altman (1983, p. 18), young firms are usually marginal operations and vulnerable entities such that an increase in their establishments can be considered as coincident with positive profit expectations. He finds in his study involving the United States that with respect to the age of the firm, over one-half of all failures occur within a firm's first 5 years and almost one-third within 3 years. Hudson (1987, p. 207) in his study concerning the United Kingdom finds that more than half of the 1830 firms liquidated when under age 7. Chava and Jarrow (2004, p. 543)'s study supports these findings such that 1461 failed firms in the United States have a bankruptcy age, average 9.23 years and median 7 years.

Exchange Rate

Salman *et al.* (2011, p. 22) state that if a country's economic activity is primarily based on international trade, then, equilibrium in that economy, depends mainly on the conditions abroad. Within this context, the crucial factor for such country is the ability of that country's industrial sector to adapt itself to changes in foreign market conditions.

Vlieghe (2001, p. 20) points out that a real appreciation in exchange rate negatively affects the tradable goods sector, and firms in this sector are likely to be affected to varying degrees according to their reliance on exports, the level of import penetration in the sector, and the particular countries to which the firm export. Besides, a real depreciation in the exchange rate may also adversely affect the firms having foreign currency debt.

In their studies concerning the United Kingdom Bhattacharjee *et al.* (2009) and Goudie and Meeks (1991) find that Sterling appreciation due to sharp changes in exchange rate increases the probability of firm failure.

Data and Econometric Analysis

Quarterly data ranging from 2009/1 to 2016/2 in Turkey are used and where necessary the variables are deflated by the gross domestic product (GDP) deflators.

Because the number of bankruptcy filings for some quarters are missing, the number of bankruptcy postponement filings are used to proxy the financial distress. Filing numbers are obtained from the Ministry of Justice, National Judiciary Informatics System database.

In the literature, the dependent variable failure is generally represented in ratio. For example, Altman (1971; 1983) and, Rose *et al.* (1982) use bankruptcies per ten thousand active firms, Wadhvani (1986) and Vlieghe (2001) use the number of liquidations divided by the number of active firms. On the other hand, Melicher and Heart (1988), Salman *et al.* (2011) and, Zhang *et al.* (2013) use failure in numbers. Chava and Jarrow (2004, 542) state that percentage bankruptcies mimic the time series behavior of the number of bankruptcies. To this end, since the number of active firms in Turkey were not accessible at that time, bankruptcy postponement numbers are used in place of ratios in the study.

To proxy nation's economic health; Altman (1971), Dewaelheyns and Hulle (2007), Santoro and Gaffeo (2009) use real GDP; Rose *et al.* (1982), Altman (1983), Levy and Bar-Niv (1987) use real gross national product; Davis (1987), Vlieghe (2001), Sharabany (2004) use output gap; Rose *et al.* (1982), Hol (2007) use the industrial production index. In this study, real GDP and industrial production index are used to capture the changes in Turkey's economic health. Expected relations between financial distress and nation's economic health is negative in accordance with the literature.

Altman (1971), Rose *et al.* (1982), Hol (2007) use M1 money supply to proxy credit availability (liquidity) while Altman (1983) uses M2 money supply, Turner *et al.* (1992) use M3 money supply and, Rose *et al.* (1982), Melicher and Heart (1988) use bank free reserves. In this study, M1 money supply and bank free reserves are used to proxy credit availability. Commercial credit volume, which is the sum of credits granted by the banking sector to the real sector, is another proxy variable used in the study assuming that it is also appropriate to reflect the liquidity. Negative relationship is expected between credit availability and financial distress in line with the literature.

In the literature, real interest rate (Liu, 2009; Vlieghe, 2001; Wadhvani, 1986) and nominal interest rate (Davis, 1987; Vlieghe, 2001; Wadhvani, 1986) are used to proxy credit market conditions. Wadhvani (1986, 123) uses, ex post real interest rate because under Rational Expectations it differs from ex ante real interest rate by a white noise forecast error. Hudson (1986,

p. 228) states that one can calculate the real interest rate by subtracting expectations from the nominal interest rate, however, he uses an ex post real interest rate since there is no reliable survey data on inflationary expectations. In this study, nominal interest rate, ex ante real interest rate and ex post real interest rate are used to proxy credit market conditions. Positive relationship is expected between credit market conditions and financial distress, consistent with the literature.

To proxy inflation and to deflate variables, Rose *et al.* (1982), Dewaelheyns and Hulle (2007) use consumer price index; Wadhvani (1986) uses wholesale input price index; Vlieghe (2001) and, Liu and Wilson (2002) use GDP deflator, Levy and Bar-Niv (1987) use GNP deflator, Jones (2013) uses the retail price index; Zhang *et al.* (2013) use producer price index. In this study, GDP deflators are used as the measure of inflation and for the deflation of variables. It is expected to have a positive relationship between inflation and financial distress, in line with the literature.

Stock market indexes are used in the literature to capture the changes in investor expectations. In this study, İstanbul Stock Exchange 100 Index, which is the principal index, is used to proxy investor expectations. Negative relationship between investor expectations and financial distress is expected consistent with the literature.

It has been shown in the literature that a significant portion of newly established firms are experiencing financial failure in their first years of life. Therefore, new firm establishment has been widely used in the literature as a relevant variable increasing failure (e.g. Altman (1983), Cuthbertson and Hudson (1996), Vlieghe (2001), Liu and Wilson (2002), Sharabany (2004), Dewaelheyns and Hulle (2007)). Empirical studies use this variable as the ratio of newly established firms to the number of active firms. However, since the responsible organization, The Union of Chambers and Commodity Exchanges of Turkey, does not publish active firm numbers, in this study, newly established firm numbers are used in place of the ratio. It is expected to have a positive relationship between new firm establishment and financial distress in line with the literature^[i].

Goudie and Meeks (1991), Hunter and Isachenkova (2006), Bhattacharjee *et al.* (2009) use exchange rate instability in their studies as a macroeconomic factor affecting financial distress. Salman *et al.* (2011) use exports as a measure of the openness of the economy. Exports and imports are closely related to the exchange rate and their movements may be influential on the economy. Therefore, real effective exchange rate index, export and import volume indexes are used in this study as the macroeconomic factors in anticipation of influencing financial distress. It is expected a negative relationship between the real exchange rate and financial distress, consistent with the literature. The relationships of export and import quantity indexes with financial distress are uncertain.

To examine the relationship between financial distress and employment, Rose *et al.* (1982), and Hudson (1987; 1997) use unemployment rate as a macroeconomic variable while Hudson (1986) uses unfilled vacancies/unemployment ratio, Platt and Platt (1994) use annual growth rate of employment, Robson (1986) uses unemployment rate and number of unfilled vacancies. In this study, the unemployment rate is used as a macroeconomic variable expecting a positive relationship between it and financial distress in line with the literature.

As a macroeconomic factor affecting financial distress, labor cost is used in the studies by Rose *et al.* (1982), Wadhvani (1986), Davis (1987), Platt and Platt (1994) and Vlieghe (2001). In this study, the hourly labor cost index is used in anticipation of positive relationship between it and financial distress, consistent with the literature.

Protested bill numbers and amounts are also included in this study to examine their possible relation with financial distress. During periods of financial distress, the number and amount of debt bills overdue are expected to increase, implying a positive relationship with financial distress.

Examination of Data from 2009/1 to 2016/2

The definitions and the source of the variables are reported in the Appendix. The course of some macroeconomic factors from the first quarter of 2009 to the second quarter of 2016 are depicted in Figure 1.

2009-2016 is a distinctive period because it coincides with the United States mortgage post-crisis period that erupted in 2008 and rapidly spread to the world. In the years preceding the 2008 crisis, Turkey's GDP grows by 8.4% and 9.4%. However, in the crisis year, the growth declines to 0.7% and a year after it turns to negative (shrinks by -4.8%). Moreover, considering 2009-2016 period, major macroeconomic factors are at their worst levels in the first quarter of 2009. In this quarter, nominal interest rate is 19.7%, ex ante real interest rate is 11.8%, the number of protested bills is 418,617, the unemployment rate is 13.1% and the inflation rate is 13.1%. In the subsequent years, these figures are often not reached or exceeded.

During the period, totally 4,592 bankruptcy postponements are filed in Turkey (Figure 1/A) ^[ii]. Two sharp increases are realized in the beginning of 2013 and in the middle of 2014. Since, the available failure data does not cover the pre-2009 period, it is not possible to compare the mortgage pre and post crisis periods in regard to its influence on the failure.

The variables related to the nation's economic health, i.e. the GDP and the industrial production index, display an upward trend in this period (Figure 1/B). Figure 1/C shows the apparent negative relationship between the GDP and the postponement of bankruptcy, so that when the GDP rises, the number of bankruptcy postponement falls and vice versa.

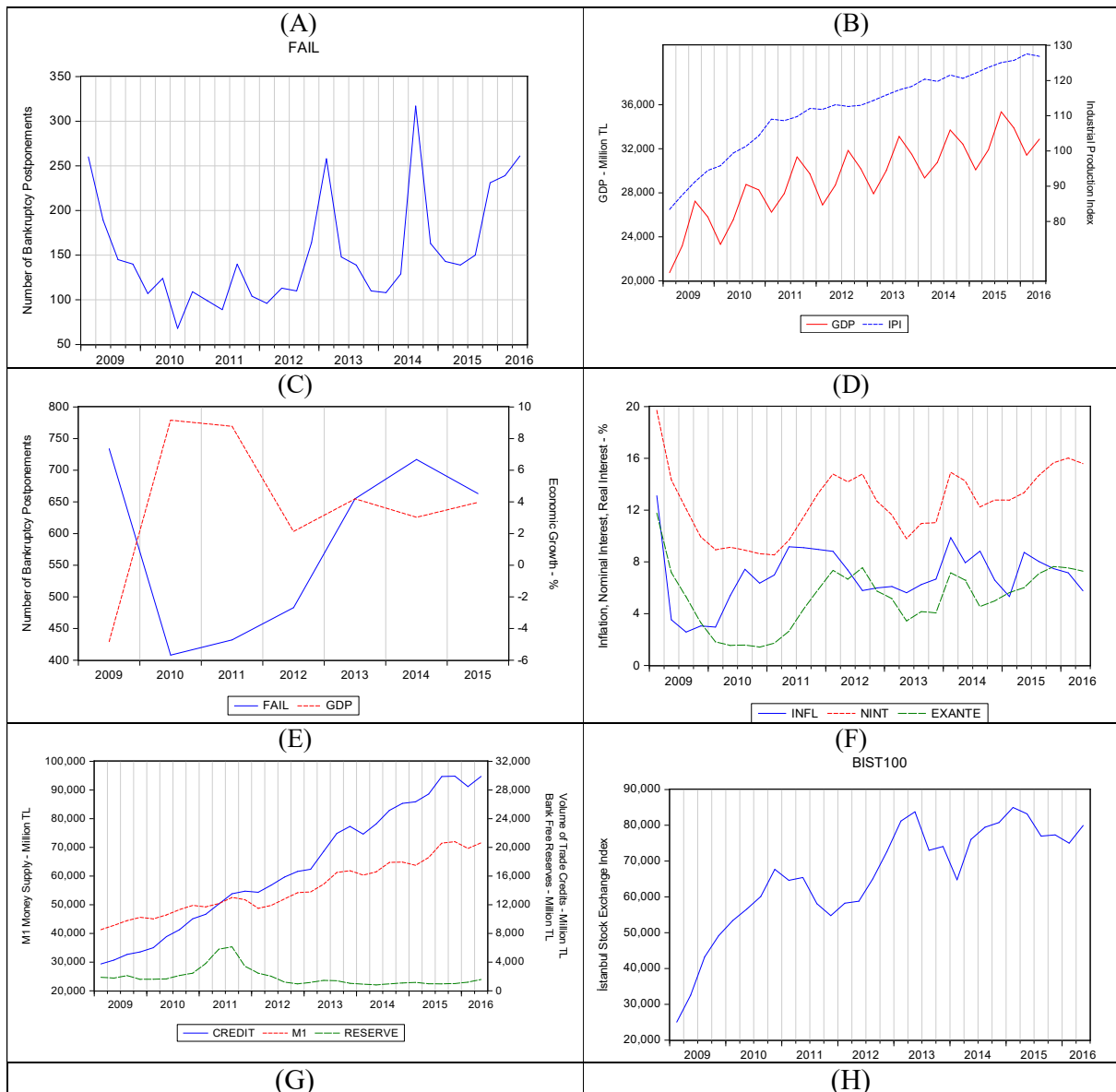
The ex ante real interest rate, the inflation rate and the nominal interest rate follow a volatile course during this period (Figure 1/D).

Market liquidity indicators, the credit volume and the money supply exhibit upward trends parallel to the increase in economic growth (GDP) while showing only reactionary contractions to the highest increases in the interest rates in 2011, 2013 and 2015 (Figure 1/E). However, the bank free reserves show an ambiguous movement and its real amount even decreases in 2016 compared to 2009. This suggests that the bank free reserves variable does not adequately reflect the market liquidity.

İstanbul Stock Exchange 100 index falls by 24% in 2011, 15% in 2013 and 29% in 2014 when compared to the highest level reached in that year (Figure 1/F). These drop periods coincide with the periods where interest rates rise sharply.

New firm establishment has an upward tendency in the period, however, it experiences a 27% sharp decline in 2012 compared to the previous year (Figure 1/G).

The volume of export trends upward together with imports which may show the dependence of exports to imports. The real exchange rate index trends downward showing depreciation of Turkish Lira against a basket of 45 foreign currencies. (Figure 1/H). A real depreciation may adversely affect the firms having foreign currency debt. (Vlieghe, 2001, p. 20).



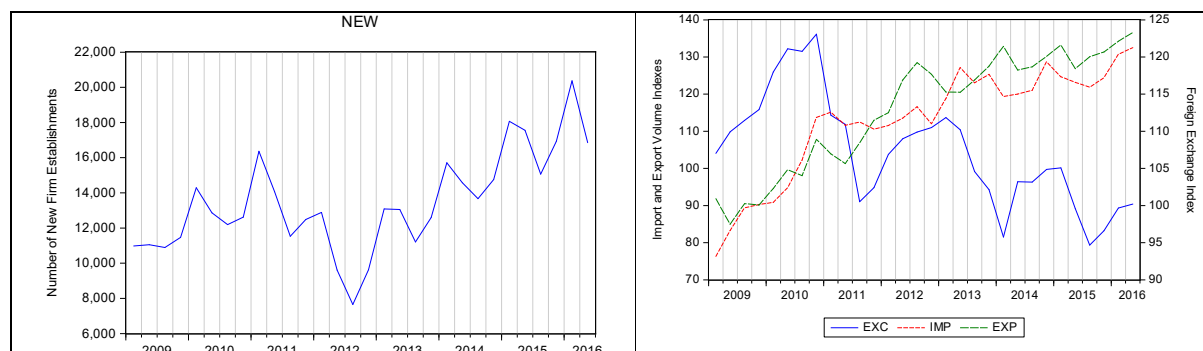


Figure 1: Change in 13 Macroeconomic Variables during 2009/1-2016/2 Period

Note: Figure (A) Postponement of Bankruptcy (FAIL), (B) Gross Domestic Product (GDP) and Industrial Production Index (IPI), (C) Postponement of Bankruptcy and GDP, (D) Inflation Rate (INFL), Nominal Interest Rate (NINT) and Ex ante Real Interest Rate (EXANTE), (E) M1 Money Supply, Volume of Trade Credits (CREDIT) and Bank Free Reserves (RESERVE), (F) Istanbul Stock Exchange 100 Index (BIST100), (G) New Firm Establishment (NEW), (H) Real Exchange Rate Index (EXCHANGE), Import (IMP) and Export (EXP) Volume Indexes. TL stands for Turkish Currency “Turkish Lira”.

2012 is a remarkable year and is the scene of high instability of the 2009-2016 period. Despite the growth of the economy by 8.8% in the previous year, it declines to 2.1% in that year. The sharpest annual increase in the number of filed bankruptcy postponements which is 36%, takes place in this year. Some macroeconomic indicators reflect this negative trend in 2012 clearly. This year, in annual base, nominal commercial credit interest rate increases by an average of 32%, the amount of protested bills increases by 33%, the number of new firm establishment decreased by 27%, and İstanbul Stock Exchange 100 index hits the bottom of its declining trend that started a year earlier. The number and amount of protested bills displaying a parallel track until 2012 begin to diverge and the average amount of debt per protested bill becomes higher from 2012 and onwards. The trending down unemployment begin to rise in 2012.

Econometric Analysis

Regression Analysis

In economics, the influence of macroeconomic factors on firms can be observed after a lapse of time. To this end, in regression analysis involving time series data, regression models include both current and past values of variables which are called distributed lag models. In such models, large number of variables are created to represent a small number of factors which require a large data set to implement the model. In this study, since the number of variables is 19 (one dependent, 18 independent) and observations available for each variable is relatively small (30), the use of distributed lag models is unlikely. For such data set, it would be appropriate to use a multiple linear regression model using only certain lags of variables, as Rose *et al.* (1982), Levy and Bar-Niv (1987) and Robson (1996) do^[iii].

When the impact of a large number of macroeconomic factors on financial distress is to be examined with relatively small observation, the inclusion of all variables in the model is not possible. In such models, the variables must be eliminated by a certain method and then, the remaining variables can be estimated. Because of the data limitation, forward stepwise regression method is employed in this study by following Rose *et al.* (1982)’s approach.

Also, considering Gujarati (2004, p. 341)'s ad hoc notice that such general methods, which are allegedly not based on an economic basis and may lead to the design of inappropriate models, a classical linear regression model of 7 independent variables is estimated based on the most frequently used variables in macroeconomic empirical literature. The model developed is accepted as the final model and after regression, the variables which appear to be statistically insignificant are not dropped from the model.

All the variables are in natural logarithm except the ones expressed in percentage, i.e. interest rate, inflation rate and unemployment rate. Variables in natural logarithm are marked with the prefix letter (L) added before those variable names.

All the data series are tested for stationarity by using the Augmented Dickey-Fuller test, including the test parameters intercept, intercept and trend, and none. The null hypothesis that the series is nonstationary (i.e. bears unit root), is tested at 5% significance level based on the MacKinnon critical values. Appropriate lag lengths are selected according to the Schwarz Information Criteria. In the tests, if the absolute value of the calculated (t) is greater than the critical value, then the null hypothesis is rejected that the series is stationary. In this context, the tests performed indicate that all the variables bear unit root at the level. Then, tests are repeated in the first differences. For variables still bearing unit root, further tests carried out in the second differences. Consequently, nonstationary data series are specified and excluded from the study.

Of the total 19 variables, 12 are stationary at the first difference and 6 are stationary at the second difference. The protested bill amounts is nonstationary and excluded from the study.

Due to the lagged effect of macroeconomic factors, optimal lag length for each variable is determined. Altman (1983) states that there is no precise theory on the choice of lag length. Therefore, following Rose *et al.* (1982), Altman (1983) and Vlieghe (2001), the maximum lag length is determined as 4 quarter. Selection of the appropriate lag length within the maximum length is made according to Rose *et al.* (1982)'s approach. Based on this approach, the appropriate lag is the lag at which the correlation between the dependent variable and the independent variable is the highest.

Implementation of the Forward Stepwise Regression

To avoid possible multicollinearity problems to some extent, a correlation matrix is constructed. Independent variable pairs having 80% correlation in between are specified and, ones having a lower correlation with the dependent variable is eliminated. According to this procedure, D_EXANTE_{t-2} and DDL_GDP_{t-4} are eliminated and, thus, the number of independent variables to be included in the regression reduces to 15, i.e. DL_EXCHANGE_{t-2}, D_INFL_{t-2}, DL_EXP_{t-3}, D_UNEMP_{t-2}, DL_IMP_{t-1}, D_NINT_{t-2}, DL_NBILL_t, DL_IPI_{t-1}, DL_NEW_{t-1}, DDL_BIST100_{t-1}, DDL_LABOR_{t-4}, DDL_CREDIT_{t-2}, DDL_M1_t, DDL_RESERVE_{t-4}, D_EXPOST_t.

Lagged postponement of bankruptcy DL_FAIL_{t-4} is included in the implementation as the 16th independent variable to see the effect of the lagged dependent variable on itself.

Summary results of the forward stepwise regression implementation are presented in Table 1.

Computed F statistics of the final model are less than 5%. Summary results are presented in Table 2. The model with estimated coefficients is given below.

Model 2:

$$DL_FAIL_t = -0.01921 - 0.22024 DL_FAIL_{t-4} + 0.055007 D_INFL_{t-2} + 0.153945 D_EXANTE_{t-2} + 0.488034 DL_NEW_{t-1} + 0.165566 DDL_BIST100_{t-1} - 2.55618 DDL_GDP_{t-4} + 4.038077 DDL_M1_t$$

(-0.32)
(-1.34)
(1.29)

(2.64)**
(1.02)
(0.24)

(-2.24)**
(2.35)**

R-square: 0.62, Adjusted R-square: 0.45, *p<10%; **p<5%; ***p<1%, t statistics are in parenthesis.

Regression results show that the ex ante real interest rate, the GDP and the money supply are statistically significant at 5%. According to R-square value, the model’s power to explain the change in the dependent variable is 62%. A visual understanding of the prediction success provided in Figure 2/B on the actual-fitted-residual graph.



Figure 2: Actual, Fitted, Residual Graph

Evaluation of the Data and the Results of the Stepwise and the Classical Regressions

Aggregate results for two regression analysis, which are detailed in section 3.2.2 and 3.2.3 are reported in Table 2.

In the forward stepwise regression implementation, the unemployment rate and the industrial production index are the significant variables entering the model. The explanatory power of the model is not high but 34%. The unemployment rate is expected to increase the financial distress, yet its sign is negative as opposed to the expectations. In the period of the study, which coincides with the United States’ 2008 mortgage crisis post-period, the unexpected negative sign might be a particular conjuncture. Because, despite the steady increase of real labor cost during 2009-2016, the unemployment rate does not seem affected much by these costs.

The industrial production index, which is an indicator of economic health, has a negative sign in accordance with the expectations. Its large coefficient indicates that a change in this variable may have a high impact on the short run on bankruptcy postponement.

In the classical regression implementation, the ex ante real interest rate, the GDP and the money supply display statistically significant relations with the postponement of bankruptcy. The explanatory power of the model is 62%. The sign of the ex ante real interest rate is positive and that of the GDP is negative. Their signs are as expected. But, the sign of the money supply is positive as opposed to expectations. Despite the fact that liquidity is not low, the emergence of the money supply as an adverse factor affecting the postponement of bankruptcy shows how complicated the interactions between financial distress and the macroeconomic factors are.

Liu (2009, p. 51), quoting from Gordon (1988), reports that tight monetary policy and an increase in effective interest rates can sharply affect both borrowing and production costs, and these cost pressures can be detrimental to the continued existence of the corporate sector. Benito *et al.* (2004, p. 18) implies that instability at the nominal and real interest rate levels can negatively affect the willingness of banks to grant credit. Considerations of Liu (2009), and Benito *et al.* (2004) on tight monetary policy or tightening credit availability do not seem effective here. Because, during 2009-2016, the real interest rates are instable and the market liquidity shows only reactionary declines in periods of high interest rates keeping its upward trend parallel to the GDP.

Table 2: Aggregate Results for Both Regressions

Variables	Coefficients Estimated	
	Stepwise Regression Model 1	Classical Regression Model 2
Constant	0.182805 (2.216164)**	-0.019206 (-0.32439)
DL_FAIL _{t-4}	-	-0.220242 (-1.338992)
D_INFL _{t-2}	-	0.055007 (1.293595)
D_EXANTE _{t-2}	-	0.153945 (2.643156)**
D_UNEMP _{t-2}	-0.29452 (-2.069589)**	-
DL_IPI _{t-1}	-13.65605 (-3.177247)***	-
DL_NEW _{t-1}	-	0.488034 (1.018811)
DDL_BIST100 _{t-1}	-	0.165566 (0.244574)
DDL_GDP _{t-4}	-	-2.556184 (-2.240243)**
DDL_M1 _t	-	4.038077 (2.346093)**
R-square	0.339744	0.61644
Adjusted R-square	0.284723	0.448632
Regression Standard Error	0.298923	0.27447
Diagnostic and Stability Tests		
Breusch-Pagan-Godfrey ₁	3.76 p(Chi-square(2))=0.15	2.89 p(Chi-square(7)) = 0.89
Breusch-Godfrey ₂	0.96 p(Chi-square (2))=0.62	6.22 p(Chi-square (4))= 0.18
Ramsey RESET(1) ₃	F(1, 23)=2.88 p=0.10	F(1, 15)=0.08 p=0.78
VIF ₄	All VIF<10	All VIF<10
Jarque-Bera ₅	0.77 p=0.68	0.87 p=0.65

Note: * $p < 10\%$; ** $p < 5\%$; *** $p < 1\%$. 1) Heteroscedasticity test, test statistics Scaled Explained Sum of Squares, 2) Serial correlation LM test, test statistics Observations * R-square, 3) Model specification test, F statistics, 4) Variance inflation factor (multicollinearity), 5) Normality test. FAIL stands for Postponement of Bankruptcy, INFL for Inflation Rate, EXANTE for Ex ante Real Interest Rate, UNEMP for unemployment rate, IPI for Industrial Production Index, NEW for New Firm Establishment, BIST100 for Istanbul Stock Exchange 100 Index, GDP for Gross Domestic Product, M1 for M1 Money Supply. Stationarity at first difference represented by prefix D, at second difference by prefix DD. Prefix L and subscript t denote natural logarithm and observation time respectively.

Hol (2007, p. 83) states that more money supply will affect the interest rate through IS-LM model by increasing the spending rate and influencing the well-being of the economy positively. Reduced interest rates, then, will lead the companies to invest in new projects rather than repaying their debts which will increase the probability of firm failure. Hol (2007)'s reasoning does not appear to be the rationale for firm postponements of bankruptcy during 2009-2016 period. Because, in this period interest rates keeps high despite the increasing liquidity.

Young (1995, pp. 66-67) finds that, in the late 1980s, small unexpected increases in real interest rates led to higher insolvency rates in the United Kingdom. The main reason for the rise in insolvency rates appear to be that large amount of capital is financed by debt rather than equity. In the period of 2009-2016, because, no tight monetary policy and no contraction in the volume of credits take place, the fact that may be accounted for the firm bankruptcy postponements in Turkey can be higher interest rates and excessive debt burden firms have to carry.

Cointegration Analysis and Vector Error Correction Model Implementation

Nation's economic health and credit market conditions are the common variables both in the forward stepwise regression and the classical regression models. In the forward stepwise regression model, the industrial production index, in the classic regression model the gross domestic product is the statistically significant proxy variables for the health of the economy. Regarding the credit market conditions, the nominal interest rate is in the forward stepwise regression model, but not statistically significant, and the ex ante real interest rate is in the classical regression model and is statistically significant. This implies that there is a short run impact of the health of the economy and the cost of borrowing on financial distress.

The postponement of bankruptcy, the industrial production index and the nominal interest rate variables are nonstationary at level but become stationary when first differenced. This suggests that these variables are likely to be cointegrated. When variables are cointegrated, then there is a long run relationship between them. Vector error correction model (VECM) is used to investigate the existence of the long run relationship^[iv].

The VECM formed by the industrial production index, the nominal interest rate and the postponement of bankruptcy is estimated. The maximum lag order is set to 4 and the optimum lag length is selected based on the information criteria. Two information criteria, including Akaike, select four lag lengths, and three information criteria, including Schwarz, select one lag length. First, the VECM model involving the longest lag length is run, but the model does not meet the stability requirements. Then, the tests are repeated using the model of one lag length. This model meets the stability requirements.

The Johansen cointegration test is applied to the model of one lag length to determine the number of cointegration equations and the model's cointegration test specification. Based on the Akaike and the Schwarz criteria, model's cointegration test specification is selected among the alternatives as an intercept and trend in the cointegration equation, and no intercept in the vector autoregressive equation. Trace test and maximum eigenvalue test statistic points to the existence of 2 cointegrating equations.

After determining the number of cointegrating vectors, weak exogeneity test is performed. Among the three variables, at a 5% significance level, weak exogeneity is rejected for the postponement of bankruptcy and the industrial production index. However, weak exogeneity is not rejected for the nominal interest rate. That is, the nominal interest rate does not appear to be an endogenous variable determined by the other two variables and therefore, it is specified in the VECM model as exogenous.

Impulse Responses

Figure 3 illustrates the estimated impulse responses. It displays the responses of two variables up to 30 quarters after one standard deviation shock in other variables.

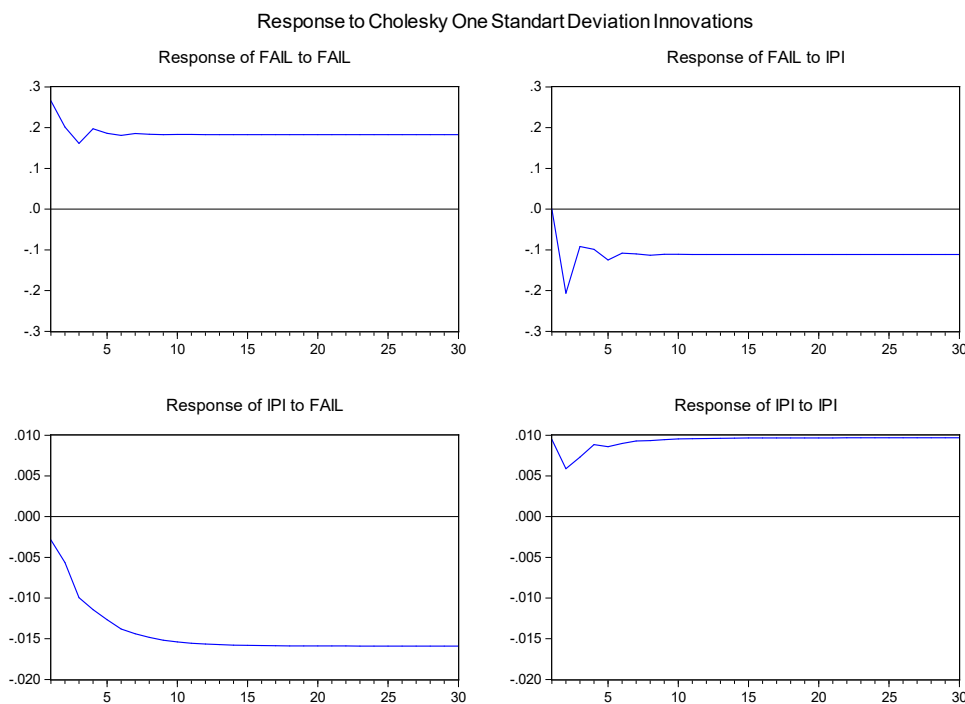


Figure 3 Impulse Response Graphs

Note: FAIL stands for Postponement of Bankruptcy, IPI for Industrial Production Index.

The first row shows the response of postponement of bankruptcy to the shocks in itself and in industrial production index.

A shock in postponement of bankruptcy creates a 27% increase in itself immediately. After a volatile period, this impact stabilizes around 18% of the 8th period and stays persistent in the long

run. In their studies Fabling and Grimes (2005) for New Zealand, Harada and Kageyama (2011) for Japan, Zhang *et al.* (2013) for the United States, obtained similar response trends provided that in the mentioned studies, the time span for the impact to stabilize is 2 to 3 times longer than this study.

The postponement of bankruptcy does not respond immediately to a shock in the industrial production index. The postponement of bankruptcy decreases by -%21 in the first period and finally stabilizes around -11% at 9th period. This indicates that the postponement of bankruptcy responds to a shock in the industrial production index negatively, as expected, and this negative response, after stabilizing at some negative point, continues even after 30 periods. This finding supports the findings of Fabling and Grimes (2005), Liu (2009), Harada and Kageyama (2011) and, Zhang *et al.* (2013), however Zhang *et al.* (2013)'s result is negligible in magnitude.

The second row of Figure 3 shows the response of the industrial production index to the shocks in itself and in the postponement of bankruptcy. These responses are fairly weak in magnitude.

The industrial production index responses negatively to a shock in the postponement of bankruptcy and it stabilizes at a negative point after 15 periods of decline. On the other hand, the industrial production index responds to a shock in itself positively which stabilizes after 10 periods at a positive level.

The finding that a shock in the postponement of bankruptcy has impact, although weak, on the industrial production index suggests that high increases in postponement of bankruptcy may have consequences on macroeconomic factors. This finding gives support to the findings of Fabling and Grimes (2005), Liu (2009), Harada and Kageyama (2011) and Zhang *et al.* (2013).

Summary and Conclusion

In the study, relations between macroeconomic factors and financial distress in Turkey are investigated by using the 2009-2016 data. This is a distinctive period because it coincides with the United States' mortgage post-crisis period that broke out in 2008 and rapidly spread to the world.

The number of observations is relatively limited. Therefore, a forward stepwise regression method is employed in the study to include a large number of macroeconomic factors in the analysis. Considering the view that such general methods may lead to the design of inappropriate models, a classical linear regression model is also estimated based on the most commonly used macroeconomic variables in empirical studies. Nation's economic health and credit market conditions are the common variables that entered the models in both the stepwise regression and the classical regression approaches. These two variables, displaying a short run relationship with the financial distress, are further investigated through the cointegration analysis, whether they exhibit a long run relationship with financial distress. Due to limited observational data, no other variable is included in the analysis.

In the forward stepwise regression implementation, performed with 16 independent variables, statistically significant variables entered to the model are the industrial production index with negative sign as expected and the unemployment rate with negative sign against the expectations. The unexpected negative sign of the unemployment rate is considered to be a particular conjuncture. The idea behind that is that the real labor cost steadily increases in 2009-2016 period,

however, the unemployment rate does not seem affected much by these costs yet displays a trend like the postponement of bankruptcy. As a result, in this method, the industrial production index, emerges as the only variable affecting the postponement of bankruptcy in accordance with the literature.

In the classical regression implementation, performed with 7 independent variables, statistically significant variables are ex ante real interest rate with positive sign and GDP with negative sign as expected and money supply with negative sign against the expectations. Contrary to the fact that liquidity is not low in this period, emergence of money supply as an adverse factor affecting the postponement of bankruptcy shows how complicated interactions between financial distress and macroeconomic factors are.

The impulse response graphics indicate that there is a bi-directional long run relationship between the postponement of bankruptcy and the industrial production index. A positive shock in the industrial production index has a strong and immediate upward impact on the postponement of bankruptcy while a positive shock in the postponement of bankruptcy has a weak but reducing impact on the industrial production index. This limited evidence may suggest that, in Turkey, changes in macroeconomic factors may have a long run impact on the postponement of bankruptcy and/or other way around.

Consequently, the findings show that financial distress is sensible to changes in the macroeconomic factors and, the interest rate is an important factor influencing the bankruptcy postponement adversely in the short run. However, to come to a solid conclusion, future research is required.

References

- Altman, E. I. (1968), "Financial Ratios, Discriminate Analysis and the Prediction of Corporate Bankruptcy", *Journal of Finance*, Vol. 23 No. 4, pp.589-609.
<https://doi.org/10.1111/j.1540-6261.1968.tb00843.x>
- Altman, E. I. (1971), "Railroad Bankruptcy Propensity", *The Journal of Finance*, Vol. 26 No. 2, pp.333-345. <https://doi.org/10.1111/j.1540-6261.1971.tb00901.x>
- Altman, E. I. (1983), "Why Businesses Fail", *Journal of Business Strategy*, Vol. 3 No. 4, pp.15-21. <https://doi.org/10.1108/eb038985>
- Asteriou, D., Hall, S. G. (2007), "Applied Econometrics - A Modern Approach Using E-views and Microfit", Updated Edition, London, Palgrave Macmillan.
- Benito, A., Delgado, F. J., Pages, J. M. (2004), "A Synthetic Indicator of Financial Pressure for Spanish Firms", *Banco de Espana* No. 0411.
- Bernanke, B. S., (1981), "Bankruptcy, Liquidity, and Recession", *The American Economic Review*, Vol. 71 No. 2, pp.155-159.
- Bhattacharjee, A., Higson, C., Holly, S., Kattuman, P. (2009), "Macroeconomic Instability and Business Exit: Determinants of Failures and Acquisitions of UK Firms", *Economica*, Vol. 76 No. 301, pp.108-131. <https://doi.org/10.1111/j.1468-0335.2007.00662.x>
- Chava, S., Jarrow, R. A. (2004), "Bankruptcy Prediction with Industry Effects", *Review of Finance*, Vol. 8 No. 4, pp.537-569. <https://doi.org/10.1093/rof/8.4.537>
- Cuthbertson, K., Hudson, J. (1996), "The Determinants of Compulsory Liquidations in the U.K.", *The Manchester School of Economic and Social Studies*, Vol. 64 No. 3, pp.298-308.
<https://doi.org/10.1111/j.1467-9957.1996.tb00487.x>
- Davis, E. P. (1987), "Rising Sectoral Debt/Income Ratios: A Cause for Concern?", *BIS Economic Papers*, No. 20.
- Demirgüç-Kunt, D. (1997), "The Determinants of Banking Crisis: Evidence from Developing and Developed Countries", *IMF Working Paper* WP/97/106.
<https://doi.org/10.5089/9781451947175.001>
- Dewaelheyns, N., Hulle, C. V. (2007), "Aggregate Bankruptcy Rates and the Macroeconomic Environment: Forecasting Systematic Probabilities of Default", *Tijdschrift Voor Economie En Management*, Vol. 52 No. 4, pp.541-565. <https://doi.org/10.2139/ssrn.1025805>
- Fabling, R., Grimes, A. (2005), "Insolvency and Economic Development: Regional Variation and Adjustment", *Journal of Economics and Business*, Vol. 57 No. 4, pp.339-359.
<https://doi.org/10.1016/j.jeconbus.2005.02.005>
- Goudie, A. W., Meeks, G. (1991), "The Exchange Rate and Company Failure in a Macro-Micro Model of the UK Company Sector", *The Economic Journal*, Vol. 101 No. 406, pp.444-457.
<https://doi.org/10.2307/2233551>
- Gujarati, D. (2004), *Basic Econometrics*, 4th Edition, McGraw Hill Inc., New York.
- Harada, N., Kageyama, N. (2011), "Bankruptcy Dynamics in Japan", *Japan and the World Economy*, Vol. 23 No. 2, pp.119-128. <https://doi.org/10.1016/j.japwor.2011.01.002>

- Hol, S. (2007), "The Influence of the Business Cycle on Bankruptcy Probability", *International Transactions in Operational Research*, Vol. 14 No. 1, pp.75-90.
<https://doi.org/10.1111/j.1475-3995.2006.00576.x>
- Hudson, J. (1986), "An Analysis of Company Liquidations", *Applied Economics*, Vol. 18 pp.219-235. <https://doi.org/10.1080/00036848600000025>
- Hudson, J. (1987), "The Age, Regional, and Industrial Structure of Company Liquidations", *Journal of Business Finance and Accounting*, Vol. 14 No. 2, pp.199-213.
<https://doi.org/10.1111/j.1468-5957.1987.tb00539.x>
- Hudson, J. (1997), "Company Bankruptcies and Births Matter", *Applied Economics*, Vol. 29 No. 5, pp.647-654. <https://doi.org/10.1080/000368497326840>
- Hunter, J., Isachenkova, N. (2006), "Aggregate Economy Risk and Company Failure: An Examination of UK Quoted Firms in the Early 1990s", *Journal of Policy Modeling*, Vol. 28 No. 8, pp.911-919. <https://doi.org/10.1016/j.jpolmod.2006.04.014>
- Johnson, C. G. (1970), "Ratio Analysis and the Prediction of Firm Failure", *Journal of Finance*, Vol. 25 No. 5, pp.1166-1168. <https://doi.org/10.1111/j.1540-6261.1970.tb00879.x>
- Jones, P. L. (2013), "The Determinants of Aggregate Creditors' Voluntary Liquidations", *Applied Economics*, Vol. 45 No. 10, pp.1321-1330.
<https://doi.org/10.1080/00036846.2011.617695>
- Levy, A., Bar-Niv, R. (1987), "Macroeconomic Aspects of Firm Bankruptcy Analysis", *Journal of Macroeconomics*, Vol. 9 No. 3, pp.407-415.
[https://doi.org/10.1016/0164-0704\(87\)90005-X](https://doi.org/10.1016/0164-0704(87)90005-X)
- Liu, J. (2009), "Business Failures and Macroeconomic Factors in the UK", *Bulletin of Economic Research*, Vol. 61 No. 1, pp.47-72. <https://doi.org/10.1111/j.1467-8586.2008.00294.x>
- Liu, J., Wilson, N. (2002), "Corporate Failure Rates and the Impact of the 1986 Insolvency Act: An Econometric Analysis", *Managerial Finance*, Vol. 28 No. 6, pp.61-71.
<https://doi.org/10.1108/03074350210767924>
- Maksimovic, V., Phillips, G. (1998), "Asset Efficiency and Reallocation Decisions of Bankrupt Firms", *The Journal of Finance*, Vol. 53 No. 5, pp.1495-1532.
<https://doi.org/10.1111/0022-1082.00063>
- Melicher, R. W., Hearth, D. (1988), "A Time Series Analysis of Aggregate Business Failure Activity and Credit Conditions", *Journal of Economics and Business*, Vol. 40 No. 4, pp.319-333. [https://doi.org/10.1016/0148-6195\(88\)90030-6](https://doi.org/10.1016/0148-6195(88)90030-6)
- Mensah, Y. M. (1984), "An Examination of the Stationarity of Multivariate Bankruptcy Prediction Models: A Methodological Study", *Journal of Accounting Research*, Vol. 22 No. 1, pp.380-395. <https://doi.org/10.2307/2490719>
- Platt, H. D., Platt, M. B. (1994), "Business Cycle Effects on State Corporate Failure Rates", *Journal of Economics and Business*, Vol. 46 No. 2, pp.113-127.
[https://doi.org/10.1016/0148-6195\(94\)90005-1](https://doi.org/10.1016/0148-6195(94)90005-1)

- Robson, M. T. (1996), "Macroeconomic Factors in the Birth and Death of UK. Firms: Evidence From Quarterly VAT Registrations", *The Manchester School*, Vol. 64 No. 2, pp.170-188. <https://doi.org/10.1111/j.1467-9957.1996.tb00479.x>
- Rose, P. S., Andrews, W. T., Giroux, G. A. (1982), "Predicting Business Failure: A Macroeconomic Perspective", *Journal of Accounting, Auditing and Finance*, Vol. 3, pp.20-31.
- Salman, A. K., Friedrichs, Y., Shukur, G. (2011), "The Determinants of Failure of Small Manufacturing Firms: Assessing the Macroeconomic Factors", *International Business Research*, Vol. 4 No. 3, s22-32. <https://doi.org/10.5539/ibr.v4n3p22>
- Santoro, E., Gaffeo, E. (2009), "Business Failures, Macroeconomic Risk and the Effect of Recessions on Long-Run Growth: A Panel Cointegration Approach", *Journal of Economics and Business*, Vol. 61 No. 6, pp.435-452. <https://doi.org/10.1016/j.jeconbus.2009.05.001>
- Sayılğan, G., Ece, A. (2016), "İflasın Erteleenmesi ve Türkiye'de 2009-2013 Arasındaki İflasın Erteleenmesi Davalarının Analizi", *Maliye Finans Yazıları*, No. 105, pp.47-74. <https://doi.org/10.33203/mfy.312132>
- Sharabany, R. (2004), "Business Failures and Macroeconomic Risk Factors", Bank of Israel Research Department, Discussion Paper No:2004.06.
- Turner, P., Coutts, A., Bowden, S. (1992), "The Effect of the Thatcher Government on Company Liquidations: An Econometric Study", *Applied Economics*, Vol. 24 No. 8, pp.935-943. <https://doi.org/10.1080/00036849200000060>
- Vlieghe, G. W. (2001), "Indicators of Fragility in the UK Corporate Sector", Bank of England Working Paper No. 146. <https://doi.org/10.2139/ssrn.293186>
- Wadhvani, S. B. (1986), "Inflation, Bankruptcy, Default Premia and the Stock Market", *Economic Journal*, Vol. 96 No. 381, pp. 120-138. <https://doi.org/10.2307/2233429>
- Young, G. (1995), "Company Liquidations, Interest Rates and Debt", *The Manchester School Supplement*, pp.57-69. <https://doi.org/10.1111/j.1467-9957.1995.tb01448.x>
- Zhang, J., Bessler, D. A., Leatham, D. J. (2013), "Aggregate Business Failures and Macroeconomic Conditions: A VAR Look at the U.S. Between 1980 and 2004", *Journal of Applied Economics*, Vol. 16 No. 1, pp.179-202. [https://doi.org/10.1016/S1514-0326\(13\)60008-2](https://doi.org/10.1016/S1514-0326(13)60008-2)

Appendix

The Definitions of the Variables

Variables	Definitions	Data Source	Expected Sign
Dependent Variable			
FAIL	Number of postponements of bankruptcy filed	Ministry of Justice	
Independent Variables			
<i>Nation's Economic Health</i>			
GDP	Real gross domestic product, 000 TL	TSI	-
IPI	Industrial production index (2010=100)	TSI	-
<i>Credit Availability (Liquidity)</i>			
M1	M1 money supply deflated by the GDP deflator, 000 TL	CBRT	-
RESERVE:	Bank free reserves deflated by the GDP deflator, 000 TL	CBRT	-
CREDIT	Domestic credits granted by the banking sector deflated by the GDP deflator, 000 TL	CBRT	-
<i>Inflation</i>			
INFL	Annual inflation rate based on the GDP deflator, %	Own calculation	+
<i>Credit Market Conditions</i>			
NINT	Commercial credit nominal interest rate, annual %.	CBRT	+
EXANTE	Commercial credit ex ante real interest rate, annual %.	Own calculation	+
EXPOST	Commercial credit ex post real interest rate, annual %.	Own calculation	+
<i>Capital Market Activities (Investor Expectations)</i>			
BIST100	İstanbul Stock Exchange 100 Index (1986=1)	İstanbul Stock Exchange	-
<i>New Firm Establishment</i>			
NEW	Number of new firms established	The Union of Chambers and Commodity Exchanges of Turkey	+
<i>Exchange Rate and Openness of the Economy</i>			
EXCHANGE	Real effective exchange rate index (2003=100)	CBRT	-
EXP	Export volume index (2010=100)	TSI	Uncertain
IMP	Import volume index (2010=100)	TSI	Uncertain
<i>Miscellaneous</i>			
UNEMP	Unemployment rate, %.	TSI	+
LABOR	Hourly labor cost index (2010=100)	TSI	+
NBILL	Number of protested bills	CBRT, Risk Center of the Banks Association of Turkey	+
VBILL	Amount of protested bills, 000 TL		+

^[i] As stated in the beginning of the third section of this study, number of filed bankruptcy postponements is used to proxy financial distress in Turkey. According to Turkish Execution and Bankruptcy Code No.6102, only capital stock companies and cooperatives may resort to court for postponement of bankruptcy. Therefore, in this study, the number of newly established firms contains only capital stock companies and cooperatives. In Article 124 of the Turkish Commercial Code No.2004, capital stock companies are stated as limited and joint stock companies as well as limited partnership companies.

^[ii] see Sayılğan and Ece (2016) for an analysis on the bankruptcy postponements filed in Turkey during 2009-2013, in regard to number of filings, distribution to provinces, court decision types and duration of litigations.

^[iii] Rose *et al.* (1982) have a data set consisting of 28 independent variables and 40 observations (and predict the model by forward stepwise regression method), Levy and Bar-Niv (1987) have a data set consisting of 3 independent variables and 36 observations, Robson (1996) have a data set 14 (4 dummy) independent variables and 43 observations (and estimate the model with the least squares method). For a mathematical representation of the multiple linear regression model, see Gujarati (2004, pp.202-203).

^[iv] For a general expression of VECM, see Asteriou and Hall (2007, p.319, 323).