MACROECONOMIC DETERMINANTS OF CORPORATE PERFORMANCE AND FAILURE: EVIDENCE FROM AN EMERGING MARKET THE CASE OF JORDAN

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Abstract

This study investigates the impact of aggregate economic risk on a company's performance and failure in a panel estimation using 167 Jordanian companies during 1989-2003. Our finding shows that unanticipated changes in interest rate negatively and significantly affect firms' performance measured by ROA, which suggests that an interest rate rise increases the cost of borrowing and then further negatively affects a firm's profit. We also found that both the production manufacturing index and Islamic credit facilities positively and significantly affect a firm's performance. The positive and significant impact of Islamic credit facilities reflects the importance and the significance of the role of Islamic credit facilities in increasing a firm's performance measured by ROA.

Keywords: corporate performance and failure, capital structure, macroeconomic determinants

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1. Introduction

The firm's performance and health are explained by firm-specific factors such as capital structure, ownership structure, and cash flow. However, corporate performance and failure are not solely determined by the firm's characteristics alone, being in part related to the environmental economy (macroeconomic factors). A firm's performance and distress (failure) can be significantly influenced by the performance of the macroeconomy. For example, the failure risk of a geared firm is augmented by macroeconomic instability and, therefore, the determinants of failure should also be seen in a macroeconomic context. Relevant to our objective of an integrated analysis of the impact of firm-level and aggregate economy factors, several empirical studies on the aggregate liquidation rate are based on the experience of developed countries' firms. These studies have produced several stylised facts regarding the strong impact of macroeconomic factors such as inflation, interest rate movement, exchange rate, money supply, and gross domestic product (GDP) on failure risk.

Monetary policy affects all sectors of the economy through the cost of debt and the availability of money and credit and this could affect a firm's ability to access external sources of funds. Fiscal policies affect a firm's after tax net cash flow, its cost of capital, and potentially the demand for its products, and survival. Also, increases in the nominal interest rate and inflation rate intensify the aggregate rates of failure or default (Wadhwani, 1986; Davis, 1995; Robson, 1996; Tirapat and Nittayagasetwat, 1999; Vlieghe, 2001; Liu and Wilson, 2002; Fabling and Crimes, 2003; Liu, 2004; and Sharabany, 2004), as firms financed with variable rate debt may be unable to increase their borrowing and, therefore, unavoidably face liquidity risk as a result of cash shortage. So, inflation both expected and unexpected, may affect corporate performance and failure. Also, unexpected inflation can result in the misallocation of corporate resources.

Another macro policy factor is the banks' credit and lending policy. According to the credit channel theory, the direct effect of monetary policy on interest rates is augmented by endogenous changes in the external finance premium that affects a firm's ability to access more funds. The change in the external finance premium is affected by the change in the monetary policy that raises or decreases interest rates, and in the same direction (Bernanke and Gertler, 1995; Bernanke, Gertler and Gilchrist, 1996). Therefore, a bank's credit policy could be an additional factor in explaining insolvency risk. So, this factor could be an important determinant of corporate performance.

Linkages between both corporate performance and failure and macroeconomic conditions depend upon which factors in the macro economy are most strongly linked to the industry and how these linkages function. Determining how macroeconomic linkages differentially affect both corporate performance and default risk would help to develop more efficient management strategies that would maximise a firm's performance and reduce default risk. Recent academic research and commercial models of credit risk have attempted to take account of the role of

macroeconomic conditions in explaining the process of corporate failure due to insolvency (see, for example, Bhattacharjee et al., 2002). The macroeconomic conditions should, therefore, be taken into account when analysing a firm's performance and default risk. Ignoring the general macroeconomic framework within which the companies exist could have a negative impact on Jordanian corporate health since it plays an important role in determining the financial health of the firms[1].

Turner, Coutts, and Bowden (1992) showed the importance of bank credit policy in deciding the fate of distressed companies in their time series study of liquidations over the period 1951-1989. Their model gives a prominent role to the level of bank credit and money supply. A more recent study by Liu (2004) also found that interest rates and credit are important factors in determining corporate failure. A study by Cuthbertson and Hudson (1996) carried a theoretical analysis into compulsory liquidation among UK companies over the period 1972-1989. They found that an increase in the nominal interest rate and leverage caused a rise in the corporate liquidation rate.

Tirapat and Nittayasetwat (1999) provide evidence from Thailand and their model includes macroeconomic variables. Their results indicated that higher inflation leads to higher default. Liu and Wilson (2002) provided evidence from the UK, and recognised the importance of including the interest rates as it increases corporate insolvency. Sharabany (2004) provided evidence from Israel; he found that unexpected inflation has a positive impact on liquidation rates.

Although these studies model failures dynamically, the majority of them are restricted to the developed countries rather than developing countries. However, there is increasing awareness that theories originating from developed countries may have limited applicability and need to be tested in emerging markets. For example, in Jordan there are two banking systems.

The banking sector in Jordan plays an important role in corporate finance, as Jordan is considered a bank-based financial system. This is especially the case for small firms, which are more exposed to insolvency than large ones. One of the main characteristics of the Jordanian economy that makes this study unique is its financial system. The banking system in Jordan is different from western countries as it contains conventional banks and Islamic banks[2]. Also, the credit policy in Islamic banks is different from the commercial banks, which could affect corporate performance and default risk[3]. One of the main differences between the former and the latter is that Islamic banks are not allowed to charge a higher interest rate if the market interest rate increases, and are not allowed to charge extra interest if a firm delays paying its obligation, which could serve to protect the distressed firms against the increase in the interest rate. Another important characteristic is that their profit rate is not fixed as a rate on the long term deposit. Debt contracts in Islamic banks prevent the banks from increasing their profit margin (interest rate). A bank's credit policy could be an additional factor for explaining insolvency risk, but information of the relevant motives is hard to come by. It is worth noting that most of Jordanian banks prefer short-term debt rather than long term debt, which could make them vulnerable to an increase in the interest rate on the short-run. According to Creane et al. (2003) financial intermediation through the banking system in Jordan is mostly short-term. Jordanian companies are expected to be affected by unexpected interest rate changes, and if the interest rate increases, this will affect the firm's performance negatively and increase the insolvency rate.

Also, these studies used the rate of bankruptcy (failure) rather than the actual defaulted firms, which could be more valuable to include in the analysis. Another important gap is that most of these studies concentrate on the macroeconomic variables rather than considering both macroeconomic and microeconomic variables, which could provide more valuable results. Even though there are a few studies that have used macro and micro economic variables to determine default risk, their time period is very short.

This article investigates the impact of aggregate economic risk on company performance and failure in a cross-sectional time-series (panel data) sample of 167 Jordanian companies in 1989-2003. The key macroeconomic indicators used in this study were the nominal interest rate, changes in money supply, the production manufacturing index, inflation, exports, and the availability of credit, including Islamic credit. The remainder of the article is organized as follows. Section 2.1 gives details of the data set structure. Section 2.2 describes the explanatory variables, both macro and microeconomic. Section 3 discusses the estimated models used to investigate the effect of macro and microeconomic variables and ownership structure on a firm's performance and default risk. Section 4 presents the results of the empirical models.

[1]For example, in late 1989, the Jordanian economy experienced financial distress and a slow down in economic activities. In particular, the Jordanian exchange rate was under pressure and depreciated, foreign reserves declined, the level of non-performing bank loans increased, which had an impact on corporate performance, and investors' confidence in public policy declined.

[2] It is worth noting that there are other emerging countries that have the same characteristics such as the Middle Eastern countries (Saudi Arabia, Lebanon, Syria, Yemen, Kuwait, UAE, Qatar, Libya, and Bahrain), Muslim counties such as Malaysia, Indonesia, and Pakistan. Furthermore the MENA countries have the same characteristics as been established by the World Bank. Therefore, the result of this paper is important.

[3] For example, the debt contract in Islamic banks prevents them from increasing the profit margin (interest rate) on old contracts and Islamic banks are not allowed to charge an extra profit rate (interest rate) on the delayed payments.

Section 5 concludes the paper and discusses the implications of the results.

2 Methodology and Model Specification

2.1 Data and Specification Issues

The data set is a moderately sized unbalanced panel, consisting of 167 individual quoted firms over the period 1989-2003[4], of which 47 were defaulted firms in the following year. Our sample contains 16 sectors. No financial companies, such as banks, insurance firms, and financial firms, are included in this analysis as their characteristics are different. The firms that failed to deliver their statement for two years or more are considered failed, as they should deliver their statement by law. Our sample includes 47 defaulted firms and 120 non-defaulted firms. This study investigates the information content of macroeconomic variables in relation to business failures and the interactions between policy operations and the real economy. It considers the impact on the firm's performance and default risk of macroeconomic variables, including the real commercial banks' interest rate on lending (INTR), real credit (TCF), Islamic banks' credit as a percentage of total commercial credit (ISCRG), inflation rate (INFL), money supply (MS2), exports (EXPO), and production manufacturing index (PMI). Among these macroeconomic factors, it is the interest rate which is cited as a leading indicator of corporate performance and failure. Figure 1 presents changes in interest rate, changes in total credit facilities, and failure rate. The changes in failure rates are observed in accordance with the changes in interest rate, indicating some relationship over this period. For example, in 1991-1994 and 1995-1996, failure rates increased as the interest rate increased, while from 1996-1997 the failure rates decreased as the interest rate decreased.

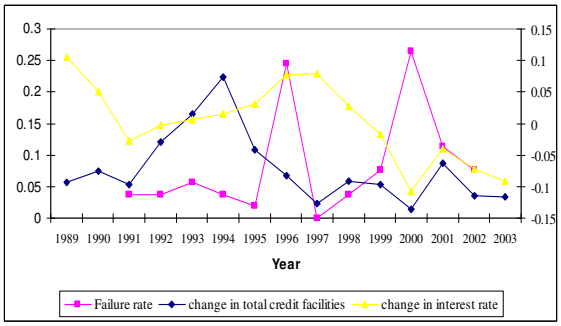


Figure 1. Failure Rate, Changes in Total Credit Facilities and Changes in Interest Rate, 1989-2003

Source: Central Bank of Jordan, Amman Stock Exchange, and author's calculation

[4] It is worth noting that the data is unavailable after 2003 for all firms included in the study. Therefore, our sample extended until 2003 only.

However, even though interest rates decreased over the period 1997-2000, failure rates increased. This could be explained by credit availability, if banks were following a strict credit policy that made obtaining loans difficult, and distressed firms were unable to increase their funds. Figure 1 also provides some evidence about the effect of credit availability on corporate failure rates. For example, over the periods 1995-1997 and 1998-2000, credit availability deceased, while failure rates increased. According to Platt and Platt (1994), corporate performance and failure are also associated with credit conditions, specifically in the case of financially distressed firms that are normally small and reliant on banks for their finance. The next section provides more details about the variables used in the study, both microeconomic and macroeconomic.

2.2 Explanatory Variables and Hypotheses Development

2.2.1 Macroeconomic variables

In modelling the influence of macroeconomic factors, seven macroeconomic variables are used. The inflation rate (INFL) is included because it is expected to have predictive power for business amalgamations and continuance (Wadhwani, 1986). It is proxied by changes in the consumer price index[5]. Unanticipated changes in interest rates (INTR) can damage a firm's cash flow and equity values, which can adversely affect the firm's performance and survival. According to Wadhwani (1986), the nominal interest rate is the main relevant explanatory factor in the failure process. The nominal interest rate is proxied by the 3-month sterling inter-bank rate[6].

In modelling the influence of interest rate, this study follows the approach used by Young (1995) and Hunter and Isachenkova (2003) for representing uncertainty in the macroeconomic factors, by focusing upon only unanticipated changes ('surprises') in interest rates, which directly impact on the burden of debt and the capacity to raise finance. Unexpected changes in inflation (INFL) are hypothesised to be negatively related to a firm's performance (profitability), as unexpected inflation would lead to an erroneous output level, resulting in the misallocation of resources. Also, an unexpected change in interest rate (INTR) is hypothesised to have a negative impact on a firm's performance. Both INFL and INTR lead to increases in interest payments, the firm's expenses, and real wages. Based on this discussion, hypothesis 1 can be stated as:

[5] This measure is employed in the Tirapat and Nittayagasetwat (1999) study to investigate the Thailand listed companies' financial distress using macro and micro variables, among others.

[6] Young (1995) and Hunter and Isachenkova (2003) used the 3-month sterling inter-bank rate as a proxy for the nominal interest rate.

Hypothesis 1*: Unexpected changes in inflation and interest rates influence a firm's performance negatively and decrease corporate performance.*

The lending activities in the economy affect corporate performance and default risk, as firms in Jordan depend on banking credit facilities as external sources of funds. The credit channel theory suggests that credit availability (CRGDP), measured by change in banks credit facilities[7] to changes in GDP, is positively related to a firm's profitability (performance), as the availability of credit encourages firms to invest, while unavailability of credit could cause valuable investment opportunities to be missed (see e.g. Bernanke and Gertler, 1995, Liu and Wilson, 2002, Sharabany, 2004, among others). Based on this argument, hypothesis 2 can be stated as:

Hypothesis 2*: Credit availability positively affects a firm's performance.*

Banking credit policy could have an important impact on a firm's performance and failure (see Stiglitz and Weiss, 1981; Whited, 1992, among others). In this study, a new variable is used to investigate the impact of banking credit policy on a firm's performance. The Islamic banking credit policy could lead to better performance as Islamic banks participate in businesses they finance. As also discussed before, the credit contract in Islamic banks prevents them from increasing the interest rate (profit margin) on the existing contracts. The growth of Islamic banks' credits (ISCRG) is used to investigate the effect of Islamic banking credit on a firm's performance and default. It expected to have a significant impact on a firm's performance and default. Islamic credit to commercial credit, ISCRG, is measured by the total credit facilities issued by Islamic banks to the credit issued by commercial banks. The ISCRG is expected to have a positive impact on a firm's performance. Based on this discussion, hypothesis 3 can be stated as:

Hypothesis 3*: The increase in Islamic banks' credit facilities leads to better firm performance.*

The gross domestic product (GDP) fluctuated substantially during the research period 1989-2003. As a result, there could be perceived inflationary pressures from the product market that might affect monetary policy. Also, the growth of GDP could have an impact on a firm's performance and default risk. Change in the production-manufacturing index (PMI) is used as it could provide a more focused observation than the GDP. The PMI has been used by Tirapat and Nittayagasetwat (1999), among others. The PMI is hypothesised to be positively related to a firm's performance, as a high PMI indicates that there is a booming active market, where firms have larger sales and cash inflow.

The money supply (MS2) is included in this analysis because it is expected to have predictive power for business performance and default. This variable has been used by many previous researchers, such as Demirguc-Kunt and Detragiache (1998), and Eichengreen and Arteta (2000), among others, who found it to be a robust cause of a banking crisis. The money supply, MS2, is the total money supply. The last macroeconomic factor to be included in this study is the Export index (EXPO). The EXPO quantifies total Jordanian exports. Jordan's exports depend on regional conditions. Therefore, exports to neighbouring countries will affect the Jordanian market in a way that may affect a firm's performance and default risk. The EXPO is expected to have a positive impact on a firm's performance as exports are an external source of funds. Money supply (MS2) is also expected to be positively related to a firm's performance.

To investigate the effect of macroeconomic variables on corporate performance, different hypotheses are developed. Unexpected changes in inflation (INFL) and interest rates (INTR) are hypothesised to be positively related to corporate failure (see, Wadhwani (1986), Young (1995), Tirapat and Nittayagasetwat (1999), Vlieghe (2001), Liu (2004), among others). Both INFL and INTR lead to an increase in interest payments, expenses, and nominal wages. As a result, profit is reduced and the probability of default increased. Based on the above discussion hypothesis 4 can be stated as:

Hypothesis 4*: Unexpected changes in inflation and interest rates increase corporate failure.*

The debt to GDP and the deviation of GDP from trend were found to be among the long run determinants of liquidity by Wadhwani (1986) and Vlieghe (2001), Liu (2004), among others. Credit availability measured by CRGDP is hypothesised to be negatively related to corporate failure in the short run as the availability of credit provides funds to distressed firms. Conversely, the unavailability of credit can affect distressed firms badly, as they experience difficulties in raising external finance for working capital. However, in the long run, the availability of credit could also increase the rate of corporate failure, as interest and principal payments rise. Based on this argument, credit availability is expected to affect the probability of default as the availability of credit encourages firms to borrow more. Thus, hypothesis 5 can be stated as:

Hypothesis 5*: Credit availability affects corporate failure.*

The ISCRG, PMI, EXPO, and MS2 are hypothesised to have a negative impact on corporate failure (decrease firms default). The study will focus

[7] The banks credit facilities are defined as the total credit facilities to the private sectors.

on testing whether the aggregate macroeconomic variables[8] play a role in determining firm performance, and whether these macroeconomic variables play a role in determining corporate failure in Jordan, using panel data. Graphs of the macroeconomic variables are provided in Appendix 1 to give clearer picture of these variables during the period studied.

2.2.2 Microeconomic Control Variables

The set of financial ratios represents the "microeconomic" characteristics of the firm that affect firm performance and failure. Shivaswamy, Hoban and Matsumoto (1993) studied thirteen research papers and summarised the most frequently used of these ratios. These were the current ratio, leverage ratio, and the profitability ratio. Altman. (1968, 1983, 1984, 1994, and 2002), Becchetti and Sierra, (2003), among others, adopted numerous models predicting bankruptcy and financial distress[9]. However, as this part of the study investigates the effect of macroeconomic variables on corporate performance and default, rather than predicting the probability of default, the selection of these variables is based on the effect of these variables on both performance and default.

The control variables used in this section are based on the firm's capital structure, profitability and cash flow. They are capital structure variables (total debt to total assets (TDTA), and total debt to total capital (CAPSTR); and firm size (SIZE) (log of total assets and log of net of sales) as a proxy for bankruptcy costs. The level of company profit is an important indicator of overall business activities. A firm is assumed to go bankrupt when the sum of its current year's profit and the expected value of equity is negative[10].

Corporate performance is likely to be closely associated with credit conditions, particularly in the case of financially distressed companies that are usually small and bank-dependent (Platt and Platt, 1994). A firm's performance is measured by the return on assets (ROA) and return on equity (ROE). A firm's age (AGE) is measured by the years since its registration as a corporation. To control for the effect of growth on firm's default, the net income to capitalisation (NICAP) is included. Tax rate (TAX) is measured by tax paid on earnings before interest and tax (EBIT). A firm's cash flow (CASHF) is measured by net profit plus depreciation divided by total assets. The standard deviation of cash flow (STDVCF) is also included in the analysis to investigate the effect of risk factors.

3. Econometrics Models

Because unanticipated changes in macroeconomic variables are not directly observable, they must be represented by proxy variables. In this study, it is assumed that the variables of interest evolve as a random walk. Therefore, it is assumed that the process for a series of observations of the macroeconomic variable u_t is generated by a driftless random walk[11]:

$$u_t = u_{t-1} + \varepsilon_t;\ \varepsilon_t \sim IID(0,\sigma^2);\quad t = 1,\ldots,(n)\ ,\ (1)$$

where u_t is a value of the macroeconomic variable at time *t*; and ε_t is a random disturbance, not predictable from the history of the process. The unanticipated changes can be approximated by the one-year lagged change in the macroeconomic variable[12]. Therefore, one-year lagged logarithmic changes in the nominal interest rate, inflation, money supply, GDP, and total credit facilities are constructed. If financial statement-based independent variables describing an individual firm in the pooled cross-section pertain to year *t*, then the macroeconomic variables are measured as follows:

One - year Lagged Change in Interest Rate *[ln INTR (t-1) - ln INTR(t-2)]*,

where the nominal interest rate, *INTR*, is the interest rate on loans in the 3-month sterling inter-bank market, measured as the annualised percentage rate.

One - year Lagged Change in the Inflation Rate *[ln IRn (t-1) - ln IRn(t-2)],*

where the inflation rate, *INFL*, is a proxy of the changes in the consumer price index

One - year Lagged Change in the money supply *MS2 [ln MS2 (t-1) - ln MS2(t-2)]*,

where the money supply, *MS2,* is the total money supply by the government.

One - year Lagged Change in the total credit facilities

[ln TCRF (t-1) - ln TCRF (t-2)],

where the total credit facilities, *TCRF*, is total credit facilities to the private sector.

One -year Lagged Change in the *GDP [ln GDP (t-1) - ln GDP (t-2)]*,

where GDP is the gross domestic product.

The changes in the percentage of Islamic banks credit facilities to the commercial banks

$$= [\ ISCRG\ (t-1) - ISCRG\ (t-2\ )]$$

where the Islamic credit to commercial credit ratio, ISCRG, is the total credit facilities issued by Islamic banks compared to the credit issued by commercial banks.

[8] The study uses the first differences of macroeconomic variables since these covariates are stationary.

[9] A comprehensive review of the studies to predict default are summarised in Sharma, (2001).

[10] See Wadhwani's, 1986.

[11] The same procedure has been adopted by Hunter and Isachenkova (2003).

[12] The unanticipated change in the macroeconomic variable equals $(u_t - E(u_t))$ where the complete change in macroeconomic variables is unanticipated (see Hunter and Isachenkova, 2003).

Two econometrics models are used. The first is the Random-Effects model via Fixed- Effects, using the panel data methodology to investigate the impact of macro and microeconomic factors on a firm's performance. Equation (2) considers both macro and micro data[13].

$$Y_{it} = F(\beta_0 + \beta_1 Macro_{it} + \beta_2 Micro_{it} + e_{it}) \quad (2)$$

where Y_{it} is the firm's measure of performance (ROA, MBVR, ROE, Tobin's Q); *i*= 1…….n , refers to the Jordanian firms included, t = 1,…T; t ranges from 1989-2003; Macro denotes the macroeconomic factors (INFL, INTR, MS2, CRGDP, ISCRG, EXPO, and PMI) and Micro denotes the microeconomic variables (TDTA, SIZE, AGE, NICAP, STDVECF, and TAX). The failed and non-failed dichotomy dependent variable is a binary response. An outcome is the reflection of the underlying regression, which links the dependent variable *Y* to the explanatory variables in vector *X*. Therefore, a binary choice model should be used to investigate the determinant of default risk. The second econometrics model is the Random-Effect Logit model on panel data, which is used to investigate the determinants of default risk using macroeconomic variables, where the dependent variable equals one if a firm fails, and zero otherwise[14]. Equation (3) considers only macroeconomic variables, whereas Equation (4) considers both macro and microeconomic data.

$$Y_{it}^* = \beta_0 + \beta_1 INFL_{it} + \beta_2 INTR_{it} - \beta_3 MS2_{it} + \beta_4 PMI_{it} - \beta_5 EXPO_{it} - \beta_6 CRGDP_{it} - \beta_7 ISCRG_{it} + e_{it} \quad (3)$$

$$Y_{it}^* = F(\beta_0 + \beta_1 Macro_{it} + \beta_2 Micro_{it} + e_{it}) \quad (4)$$

where *Y** represents the firm's status with Y_{it}^* as the latent factor. Y_{it} = 1 if $Y_{it}^* \geq 0$ (if the firm defaults) and = 0 otherwise (non default), *i* refers to the individual cross-sectional unit (*i=1*,…., *N*), *t* for the time period (*t=1*,…,*T*), *Macro* is the macroeconomic variables (INFL, INTR, MS2, PMI, EXPO, CRGDP, and ISCRG) which are observed (not including a constant). The e_{it} captures the effect of those variables that are peculiar to the *i-th* individual member of the panel and that are constant over time. *Micro* represents the microeconomic variables (CAPSTR, ROE, SIZE, TAX, and CASHF).

4. Empirical Results

4.1 Descriptive Statistics

The descriptive statistics of the macroeconomic variables are reported in Table 1. The Table reports the mean, median, standard deviation, maximum, minimum, coefficient of variation (CV), Skewness, and Kurtosis. The coefficient of variation indicates that there is a significant variation among the macroeconomic variables used in the study. The variable INFL has a standard deviation of 0.057, which is lower than the 0.063 standard deviation of INTR. However, from the CV, the variance of INTR is higher than INFL, with a CV of 1.239 and 31.50 respectively. The variable CRGDP has the largest variation, with a mean of 1.151 and standard deviation of 0.644, while the variable ISCRG has the lowest standard deviation of about 0.01. However, from the coefficient of variation, the variance of ISCRG is higher than CRGDP. The variable MS2 has the lowest CV compared with other macroeconomic variables with a CV of 0.464. Regarding the changes in inflation rate, the highest inflation rate (INFL) was in 1989 as a result of currency crises which affected the exchange rate of the Jordanian Dinar (JD), while the lowest was in 2000. The variations in both inflation and interest rates across the years are small since the standard deviation is only around 6 percent. The Money Supply (MS2) increased in 1991, probably as a result of the Gulf Crisis 1990-1991, as hundreds of thousands of Jordanians (as well as refugees) returned to Jordan from the Gulf States.

With respect to the production manufacturing index (PMI), the highest growth rate was reached in 2001, while the lowest rate was in 2000. The main reason for the low rate in 2000 was the Intifadah outbreak in September 2000, which decreased Jordanian exports to the West Bank by 19 percent. However, the lowest growth rate in export (EXPO) was in 1990 as a result of the Gulf Crisis, while the highest rate was in 1991 as a result of opening the Iraqi markets to Jordanian products. The availability of credit (CRGDP) fell in 2000 and, interestingly, the highest failure rate was also in 2000: about 26 percent of firms defaulted. The fall in credit availability could be explained by the high interest rates that increased the cost of debt. The change rate in the Islamic credit to commercial credit (ISCRG) reached its highest level in 1991, while the lowest rate was in 1993 due to the expansion in the credit facilities issued by commercial banks. A summary of the statistics for all the microeconomic variables used in the study is presented in Table 2. The coefficient of variation (CV) indicates that there is a significant variation among the microeconomic variables. The small mean indicates that most Jordanian firms have a low profitability ratio. The negative mean of ROE indicates that some Jordanian companies have a negative equity which could indicate distress. Also, there is a large difference in the variance of the explanatory variables as measured by the standard deviation. For example, the variable TDTC has a standard deviation of 2.347, which is significantly higher than the 0.268 standard deviation of TDTA. A Shapiro-Wilk test is carried to examine the normality distribution of the variables.

[13] It is worth noting that a model using the macroeconomic variables only is tried in this study to investigate their impact on corporate performance.

[14] For more details about the Random Effects Logit model used in this study, see Greene (2003).

Table 1. Statistical Description of the Macroeconomic Variables

	Obs	Mean	Median	Std. Dev.	Max (Year)	Min (Year)	CV[15]	Skewness	Kurtosis	Shapiro-Wilk	prob[y]
INFL	1586	0.046	0.036	0.057	0.231 (1989)	-0.004 (2000)	1.239	2.633	8.320	308.029	0.00
MS2	1586	0.084	0.089	0.039	0.174 (1991)	0.015 (1996)	0.464	0.528	0.861	37.612	0.00
INTR	1586	0.002	0.007	0.063	0.105 (1989)	-0.107 (2000)	31.500	-0.171	-0.664	23.202	0.00
PMI	1586	0.023	0.005	0.111	0.285 (2001)	-0.160 (2000)	4.826	0.337	0.137	22.941	0.00
EXPO	1586	0.113	0.062	0.378	0.967 (1993)	-0.433 (1994)	3.345	0.795	0.573	50.819	0.00
CRGDP	1586	1.151	0.775	0.644	2.262 (1993)	0.360 (2000)	0.560	0.382	-1.561	106.564	0.00
ISCRG	1586	0.002	0.005	0.010	0.018 (1991)	-0.019 (1993)	5.000	-0.807	0.791	70.038	0.00

Sources: Central Bank of Jordan and International financial statistics and author's calculation.

Table 2. Description Statistics for the Dependent (s) and Microeconomic (independent) Variables

Variable	Obs	Mean	Std. Dev.	Min	Max	CV	Skewness	Kurtosis	Shapiro-Wilk	Probability
ROA	1586	0.012	0.152	-4.071	0.681	12.6667	-13.460	343.435	465.132	0.000
ROE	1586	-0.142	4.195	-159.39	1.998	-29.542	-35.248	1317.897	930.45	0.000
Tobin's Q	1408	1.701	15.443	0.000	538.734	9.0788	31.815	1066.859	840.099	0.000
MBVR	1277	1.947	12.636	-2.556	450.000	6.4900	34.959	1239.922	758.284	0.000
TDTA	1586	0.357	0.268	0.0002	2.600	0.7507	2.184	15.356	128.768	0.000
TDTC	1584	1.232	2.347	-1.278	31.992	1.9050	5.582	47.301	516.079	0.000
Growth1	1270	0.716	8.633	-1.000	292.979	12.0573	30.888	1037.096	736.898	0.000
Size1	1586	6.911	0.599	5.066	9.035	0.0867	0.730	4.221	41.986	0.000
SIZE	1450	14.81	2.0564	0.000	20.4917	0.1389	-0.5394	5.6287	26.154	0.000
STDVCF	1130	0.056	0.243	0.000	6.496	4.3393	20.207	481.994	624.147	0.000
TAX	1556	0.085	0.279	-3.661	7.715	3.2824	13.530	406.426	628.024	0.000
AGE	1575	14.625	12.903	1.00	65	0.8823	1.3301	4.3507	123.389	0.000
NICAP	1549	0.0861	0.56406	-2.491	15.474	6.5486	17.221	433.361	638.867	0.000
CASHF	1583	0.058	0.242	-6.248	0.684	4.1724	-16.394	374.025	637.732	0.000

Notes: see section 2.2 for variable definition

[15] CV is the Coefficient of Variation which is defined as the standard deviation over the mean.

4.2 Diagnostic Tests

A diagnostic test using the correlation matrix for all the macroeconomic variables is used in order to examine multicollinearity. Appendix 2 reports the correlation matrix. The low intercorrelations between the macroeconomic variables and microeconomic variables indicate that there is no reason to suspect a serious multicollinearity problem[16]. Table 3 shows that there is a positive relationship between inflation (INFL) and all macroeconomic variables MS2, INTR, EXPO, CRGDP, PMI, and ISCRG. The strong positive correlation between inflation and interest rates indicates that as inflation increases the interest rate also increases. The interest rate (INTR) was found to have a negative impact on EXPO and ISCRG, but a positive impact on CRGDP. The increase in the unanticipated interest rate, INTR, decreases Islamic credit facilities to the private sector, while the credit availability issued by commercial banks is increased. A possible explanation for this is that, as the interest rate increased, the demand for credit decreased while the availability of credit increased. To ensure the robustness of the estimates, several diagnostic tests on the chosen estimations are performed. The Breusch-Pagan Lagrange Multiplier test (1980) for Random-Effects is reported at the bottom of each table of the results. The Breusch-Pagan Lagrange Multiplier test is used to examine the suitability of the Random-Effect model over the pooled Ordinary Least Square (OLS) estimation. The Hausman specification test is reported at the bottom of each table. The Hausman test (1978) tests the hypothesis that Random-Effects coefficients and Fixed-Effects coefficients are the same. This test is also used to assess problems of misspecification in the models, and answer the question of whether a Fixed-Effect model or Random-Effect model should be used. A further diagnostic test for serial autocorrelation in panel data has been reported at the bottom of each regression using the test developed by Wooldridge (2002)[17]. A modified Wald statistic for groupwise heteroskedasticity in the Fixed-Effect model is also reported[18]. This study also utilises the White (1980) Heteroskedasticity-consistent standard errors test to calculate t-statistics. The Likelihood Ratio test is also reported at the bottom of each table of the results for the default risk section. The coefficient of Rho (ρ), the panel-level variance component, is reported at the bottom of the table for default risk. The overall significance of the models was tested using the Wald test, which has a Chi-square (χ^2) distribution under the null hypothesis that all the exogenous variables are equal to zero.

4.3 Analysis of the Results

4.3.1 Firm's Performance

In order to explore the appropriateness of a Random-Effects model, a Breusch-Pagan Lagrange Multiplier test is conducted for the overall significance of these effects. According to the Breusch-Pagan test, the null hypothesis is that random components are equal to zero. This test also provided support for the rejection of a pooled Ordinary Least Squares (OLS) over a Generalized Least Squares (GLS). The Breusch-Pagan test results for the ROA and MBVR regressions are as follows: χ^2 (1) = 64.15, p=0 and χ^2 (1) = 108.27, p=0 for each model respectively. Additional support for the Random-Effects model was further obtained from the Hausman test of model specification, given that the results failed to reject the null hypothesis of "no difference" between the coefficients of the Random- and the Fixed-effects models. Here χ^2 (13) = 22.03, p=0.06 and χ^2 (13) = 10.78, p=0.63 for ROA and MBVR respectively.

Given these results, the analysis is focused on the outcomes provided by the Random-Effects models since they are more efficient and more robust. However, the decision to focus on the Random-Effects model does not imply that the Fixed-Effects estimators are incorrect. In contrast, the regression coefficients in the Fixed-Effects model are unbiased[19]. Therefore, the results of the fixed effects models are reported to give a clearer idea about the effect of both models on the coefficients of the explanatory variables used in the study. Table 3 presents the results of the analysis for Equation (2). The overall goodness of fit (R^2) for the random-effect model is greater than the goodness of fit of the Fixed-Effect model in the two estimations ROA and MBVR. For example, the goodness of fit for ROA using the Random-Effect model is 56% while it is 49% using the Fixed-Effect model. As far as the overall goodness of fit for the MBVR is concerned, the value of R^2 (0.7 percent) is still acceptable as it picks up more information about the impact of macroeconomic variables on firms' performance using the market measure of performance. The estimated results of Equation (2) using macro and microeconomic variables to determine their impact on firm performance are reported in Table 3. The model augmented with both macro and microeconomic variables explains firm performance better than the

[16] A diagnostic test of multicollinearity is also employed using a Stata 8 package to examine the multicollinearity. The Command used in Stata 8 is _rmcoll.

[17] This test applies regardless of the Fixed-Effects or Random-Effects estimation procedure. The test is available in Stata8 using the XTSERIAL command.

[18] This test is provided in Stata 8 by Christopher Baum. For more details see Stata Journal 2001, page 101-104.

[19] Given the relative size of the standard errors and the vulnerability of this estimation procedure to certain regression assumptions, there is a potential for a type 1 error. Also the F-test confirms that the individual dummies are jointly significant at a high level of significance (F (147, 890)=2.84, p<0.01).

economic variables model[20]. From hypothesis 1, the unexpected changes in inflation and interest rates decrease the firm's performance. Clearly, from Table 3, INTR has a negative and significant impact on firm performance measures ROA and MBVR as predicted[21]. That is because the unanticipated changes in interest rate INTR increased firm interest payments and, therefore, decreased investment opportunities (hypothesis 1). This finding is consistent with previous findings such as Wadhwani (1986) and Gordon (1981), among others. The coefficient of INFL is found to have a positive and significant impact on MBVR only. The growth rate of the PMI is significantly positive, strongly suggesting that the growth in production manufacturing increases firm performance as it increases the firm's ability to gain more income as a result of an economic boom. Money Supply (MS2) is found to have an insignificant impact on ROA, while it has a significant and negative impact on MBVR. An explanation could be that, as MS2 increased, the demand for the local product could decrease relative to demand for foreign products. The growth of EXPO is found to have a positive but insignificant impact on firm performance ROA, while it has a positive and significant impact on MBVR. The positive coefficient indicates that an increase in exports will lead to better performance for the firms, as they increase their external sources of income. The significance of EXPO also reveals the importance of the macroeconomic variables and regional stability as the Jordanian economy is highly dependent on the Arab markets in the region.

Hypothesis 2 predicts that credit availability increases corporate performance. The credit availability CRGDP is insignificantly different from zero. The main reason that credit availability CRGDP is not significant could be that the cost of borrowing is high which affects firms' ability to finance other projects (investments), where the cost of debt is higher than the return on investment. Hypothesis 3 predicts that Islamic banking credit facilities increase corporate performance. The ISCRG is found to have a positive and significant impact on the firm performance measure ROA, but no significant effect on the MBVR. The positive impact of ISCRG indicates that the Islamic banks' credit policy could be more efficient for Jordanian firms. This finding is consistent with the finding of Stiglitz and Weiss (1981) that the banks' credit policy has an important impact on a firm's investment opportunities as a squeeze on credit policy could lead to missed investment opportunities and reduce a firm's profitability. The microeconomic variable TDTA indicates that a firm's capital structure has a negative and significant impact on its performance ROA, so that firms with high leverage ratios have lower performance, a finding that is consistent with previous studies. Firm size is found to have a positive impact on the ROA measure of performance, which indicates that large firms have the ability to gain more income as a result of the economies of scale. Firm growth, NICAP, is found to have a positive and significant impact on ROA. This result indicates that firms with a high NICAP have a higher performance rate ROA. However, NICAP is found to have a negative impact on the MBVE measure of performance.

The firm's age is found to have a negative impact on the two measures of performance ROA, and MBVE. The negative value indicates that older firms have a lower rate of performance. The reason could be that there is a need to renew their assets, so that their productive power is decreased. The STDVCF has a negative impact on the performance measures ROA and MBVE. The positive and significant level of STDVCF indicates that firms with a high risk would expect a high return. TAX is found to have a positive but insignificant effect on performance measured by ROA and MBVE.

4.3.2 Macroeconomic Variables and Default Risk

The results of the maximum likelihood estimation of the Random-Effects logit model are given in Table 4. The table shows two models. The second column of each model reports the estimated marginal effects of the explanatory variables. The overall significance of the models was tested using the Wald test, which has a Chi-square (χ^2) distribution under the null hypothesis that all the exogenous variables are equal to zero. For Model 1, the value of the χ^2 statistic is 16.15 with a P-value of 0.02, indicating that the explanatory power of the model is significant at the 5% level.

[20] We investigated the impact of the macroeconomic variables only on the firm's performance ROA and MBVR. The model estimated was $Y_{it} = \beta_0 - \beta_1 INFL_{it} - \beta_2 INTR_{it} + \beta_3 MS2_{it} + \beta_4 PMI_{it} + \beta_5 EXPO_{it} + \beta_6 CRGDP_{it} + \beta_7 ISCRG_{it} + e_{it}$. However, the adjusted R-square is very small, about 0.76 percent in ROA, indicating that the macroeconomic variables are not adequate determinants of firms' performance. Interestingly, the unanticipated inflation (INFL) and interest rate (INTR) have a positive and significant impact on the firm's performance ROA, at the 10 percent level of significance. The money supply (MS2), PMI, EXPO, and ISCRG have a positive but not significant impact on the firm's performance ROA. Credit availability is found to have an insignificant impact on a firm's performance ROA. The overall performance of the macroeconomic variables model shows acceptable performance of the model with the F statistics being significant at the 1% level of significance. Also, the Hausman test shows that the Random-Effect model is preferred over the Fixed-Effect model. The result of this estimation is presented in Appendix 3.

[21] It is worth noting that the regression model using return on equity (ROE) and Tobin's Q is used in this study and excluded from the analysis as the ROE measure does not have any significant variable in the estimation, and the R-squared value using this measure in most cases was less than 0.1%, while the results from Tobin's Q are very similar to MBVR.

Table 3. Results of Fixed-effects Model, Random-effects Model and FGLS for Firm Performance and Macroeconomic Variables

	ROA			MBVR		
Explanatory Variables	Random	Fixed	FGLS	Random	Fixed	FGLS
Constant	-0.17435 (-6.13)***	-0.19206 (-3.65)***	-0.0881 (-8.06)***	-0.71436 (-1.05)	2.30182 (2.14)**	-0.0551 (-0.27)
Microeconomic variables						
TDTA	-0.09908 (-8.75)***	-0.08967 (-5.31)***	-0.0764 (-14.58)***	-0.04663 (-0.16)	-0.58503 (-1.69)*	-0.0727 (-0.63)
SIZE	0.014 (7.28)***	0.0185 (5.92)***	0.0084 (11.41)***	0.16244 (3.51)***	0.19599 (3.06)***	0.0812 (5.89)***
AGE	-0.00031 (-0.93)	-0.00258 (-2.11)**	-0.0004 (-5.44)***	-0.01052 (-1.22)	-0.14395 (-6.09)***	0.0041 (1.79)*
NICAP	0.20122 (23.14)***	0.19359 (19.31)***	0.2419 (43.88)***	-0.26185 (-1.49)	-0.66478 (-3.48)***	0.8571 (6.86)***
STDEVCF	-0.04327 (-2.56)***	-0.02663 (-1.39)	-0.0314 (-1.75)*	-0.15064 (-0.43)	-0.19373 (-0.53)	0.1572 (0.79)
TAX	0.00286 -0.41	-0.00075 (-0.11)	0.0146 (2.82)***	0.05793 (-0.44)	-0.01828 (-0.14)	0.2357 (2.04)**
Macroeconomic variables						
INFL	0.18129 1.19	0.05258 (0.31)	0.0977 (1.41)	7.84812 (2.57)***	-0.97545 (-0.29)	9.8103 (5.73)***
MS2	-0.04306 (-0.52)	-0.10521 (-1.1)	-0.0633 (-1.66)*	-4.16242 (-2.46)**	-9.41044 (-4.94)***	-3.5092 (-3.82)***
INTR	-0.09286 (-1.65)*	-0.15648 (-2.22)**	-0.0886 (-3.51)***	-6.49669 (-5.69)***	-11.07324 (-7.98)***	-4.5444 (-7.16)***
PMI	0.10142 (3.75)***	0.12695 (4.05)***	0.0649 (5.31)***	1.73637 (3.23)***	3.60857 (5.97)***	0.7657 (2.6)***
EXPO	0.0068 (-1)	0.00647 (-0.94)	0.0125 (3.99)***	0.36193 (2.69)***	0.32514 (2.43)**	0.3142 (4.05)***
CRGDP	0.00061 (-0.17)	-0.00163 (-0.42)	-0.0011 (-0.68)	0.0736 -0.99)	-0.07912 (-1.00)	0.0691 (1.68)*
ISCRG	0.54778 (2.44)**	0.52461 (2.29)**	0.3453 (3.35)***	3.37515 -0.75	-0.04717 (-0.01)	2.8353 (1.1)
No. of observations	1051	1051	1051	964	964	964
R-square	0.56	0.4887		0.0683	0.002	
Wald-test(1) F(13,890)	974.01 (0.00)***	53.05 (0.00)***	3464.04 (0.00)***	99.77 (0.00)***	10.38 (0.00)***	403.30 (0.00)***
F(147, 890) F-test all FE=0		2.84 (0.00)***			4.25 (0.00)***	
Breusch and Pagan Lagrangian (2)	64.15 (0.00)***			108.27 (0.00)***		
Hausman Test (3)	22.43 (0.050)			10.78 (0.6296)		
(4) Panel –Hetero χ^2 (148)=		3.2e+05 (0.00)***			6.7e+34 (0.00)***	
Autocorrelation (5)		3.680 (0.06)*			90.783 (0.00)***	

Notes *, **, *** Significant at 10, 5, and 1 percent levels, respectively. t-statistics are in parentheses. See Section 2.2 for variable definitions. (1) Wald test that all the coefficients (except intercept and FE) are jointly not significant. (2) Breusch and Pagan Lagrangian multiplier for the pooled model (H_0 : pooled regression against H_A : RE). (3) Hausman test for random effects (H_0 : RE against H_A : FE). (4) Modified Wald Statistic for groupwise heteroskedasticity in fixed effect model (Stata routine provided by C.F. Baum). (5) Wooldridge test for first order serial correlation (Stata routine provided by D.M. Drukker).

However, the adjusted R-Square is very small, 0.7 percent, indicating that the macroeconomic variables are not substantial determinants of firms' probability of default. Clearly, the results show that the failure risk is linked to INTR, MS2, PMI, and CRGDP. Results from modelling the impact of macroeconomic variables only (Model 1) on corporate failure in Equation (3) are displayed in Table 4. The results indicate that the impact of macroeconomic instability on the probability of default is substantial. Unexpected increase in inflation rate INFL is found to have a negative but insignificant impact on the failure risk. The negative sign of the INFL coefficient indicates that the increase in the INFL decreases the failure risk. On the other hand, the coefficient for the unanticipated change in interest rate (INTR) is negative and has a significant impact on a firm's probability of default at the 5% level, indicating that INTR appears to decrease corporate failure (hypothesis 4).

This result remains consistent throughout the regression Models 1 and 2, which indicates that the interest rate is an important determinant of corporate failure in Jordan. So, we reject the hypothesis that

unexpected changes in inflation and interest rates increase corporate failure. The negative and significant relationship between unexpected interest rate and corporate failure is consistent with the results from both Hudson (1986) and Simmons (1989) who documented the inverse relation between the real interest rate and the liquidation rate. However, the findings on the relationship between interest rate changes and failure risk are in contrast to other conclusions drawn by Wadhwani (1986), Cuthbertson and Hudson (1996), Vlieghe (2001), and Liu (2004), among others. The reason for this negative relationship between unexpected interest rate and corporate failure could be that the increase in interest rate is, in fact, expected, so that firms borrow on a fixed interest rate. Another explanation is that the inverse relation between default and interest rate can be interpreted as evidence for adverse selection in credit markets. For example, at a high interest rate, credit is more likely to be diverted to a high-risk borrower such as a distressed firm. This condition helps the distressed firm to continue its operations in the short term, so they are less likely to default.

The money supply (MS2) is also found to have a negative and significant impact on the firm's failure risk. The coefficient for the changes in money supply is significant at the 5% level, but being negatively signed in the model indicates that it decreases a firm's probability of default. This result could show that the money supply is endogenous—not under government control. In other words, an unanticipated increase in money supply increases the banks' ability to lend more money, and decreases corporate failure. This finding is consistent with that of Demirguc-Kunt and Detragiache (1998) and Eichengreen and Arteta (2000), among others, who found this factor to be a robust cause of a banking crisis. This result remains consistent throughout the regression Models 1 and 2 which indicates that money supply is an important determinant of corporate failure in Jordan.

The growth in the production manufacturing index, PMI, is an important determinant of the failure risk. The coefficient for the PMI effect is negative and significant at the 5% level, indicating that an increase in the production manufacturing index, PMI, decreases the failure risk. This is because, as firms increase their production, the cash flow generated increases, enabling debt repayment to be financed by operational cash flow. This finding is consistent with prior research such as Tirapat and Nittayagasetwat (1999), among others. This result remains consistent throughout the regression Models 1 and 2, which indicates that the production manufacturing index is an important determinant of corporate failure in Jordan. From hypothesis 5, credit availability is expected to increase the probability of default. The coefficient of credit availability expressed by CRGDP has a positive and significant impact on corporate failure. The explanation for this finding could be that credit availability encourages distressed firms to borrow more in order to cover their short-term debt, which increases their interest payment in the long-run. As a matter of fact, the banking system in Jordan prefers short-term to long-term debt, which could contribute to increasing the default rate. The increased percentage of short-term debt in Jordanian firms' capital structure, as well as the higher interest rate and the availability of credit, increases the default rate.

Indeed, companies that go into bankruptcy are relatively small, and generally they do not have access to the international financial market, so they are highly dependent on the domestic capital market and, therefore, sensitive to fluctuations in banking credit policy. This result remains consistent throughout the regression Models 1 and 2, which indicates that the availability of credit expressed by CRGDP is an important determinant of corporate failure in Jordan. This result is consistent with the credit channel theory that banks shift the supply of credit as a result of the increase in risk (Bernanke and Gerlter, 1995).

Interestingly, ISCRG is found to have a positive but insignificant impact on the firm's risk, while it was found to have a positive impact on the firm's performance. The insignificant coefficient of the ISCRG variable indicates that this variable does not appear to determine corporate failure in Jordan. Also, exports, EXPO, were found not to have any significant impact on corporate failure.

The estimated results of Equation (4), which uses macro and microeconomic variables to determine their impact on default risk, are presented in Table 4. Model 2, which is augmented with both macroeconomic and microeconomic variables, explains failure risk better than the economic variables model only. Clearly, from Table 4, failure risk is linked to the changes in MS2, INTR, PMI, and CRGDP. The coefficients of those variables still have the same sign and significance. However, while the significance of those variables decreased, the overall goodness of fit of this model increased from 3 percent to 15 percent. Also, the overall significance of the model increased as the value of the χ^2 statistic increased to 27.27 with a P-value of 0.01, indicating that the explanatory power of the model is significant at the 1% level. The firm's gearing ratio or capital structure, CAPSTR, firm's size, SIZE, TAX, and cash flow, CASHF, are the main determinants of distress or default. The capital structure variable CAPSTR indicates that companies with a high debt ratio have a high probability of default as the debt payment is high. Firm size, SIZE, is one of the main determinants of failure risk, the negative sign indicating that large firms have a lower probability of default as they have better access to external sources of funds, reinforcing the stylised fact that smaller firms exit first (see e.g. Dunne, Roberts and Samuelson, 1989). Besides, large firms have the ability to diversify their investments as a result of economies of scale. Furthermore, as mentioned in the previous article, large firms have lower bankruptcy costs.

Table 4. Logit Regression: Macroeconomic Variables and Microeconomic Variables

Independent Variables	Model 1		Model 2	
	Coefficient Estimates	Marginal Effects	Coefficient Estimates	Marginal Effects
Constant	-3.1330 (-4.53)***		1.2783 (0.77)	
Macroeconomic Variables				
INFL	-7.9743 (-0.84)	-0.1458	-11.5164 (-0.94)	-0.06991
MS2	-17.3012 (-2.03)**	-0.3164	-20.6900 (-1.94)*	-0.1256
INTR	-11.5622 (-1.93)*	-0.2115	-15.7512 (-1.89)*	-0.09562
PMI	-4.5345 (-2.49)**	-0.0829	-5.0333 (-2.2)**	-0.03055
EXPO	-0.0116 (-0.02)	-0.0002	0.3331 (0.42)	0.002022
CRGDP	0.8195 (2.15)**	0.0150	0.8711 (1.92)*	0.005288
ISCRG	2.2868 (0.08)	0.0418	12.5859 (0.38)	0.076401
Microeconomic Variables				
CAPSTR	0.1663 (2.21)**	0.00101	0.1520 (1.91)*	0.0010
ROE			-0.0305 (-1.38)	-0.00019
SIZE (log Sales)			-0.3502 (-3.03)***	-0.00213
TAX			-2.1428 (-2.38)**	-0.01301
CASHF			-0.7715 (-1.84)*	-0.00468
No. of observations	1586		1442	
Log Likelihood	-198.362		-161.298	
Wald test	χ^2 (7)=16.15		χ^2 (12)=27.27	
P-value	(0.02)**		(0.01)***	
Rho ρ (1)	0.0327		0.4274*	
Pseudo R-Square	0.07		0.15	

Notes *, **, *** Significant at 10, 5, and 1 percent levels, respectively. t-statistics are in parentheses. (1) The proportion of the total variance contributed by panel-level variance component.

Tax payments, TAX, are found to have a negative and significant impact on a firm's probability of default. The negative sign indicates that the proportion of tax payments in pre-tax profit is lower for failing firms. Tax payment is connected to firm performance, which supports the argument that firms with a high performance rate have a lower default rate and higher tax payments. The cash flow variable CASHF is found to have a negative and significant impact on defaulted firms. The negative sign indicates that firms with a high cash flow have a lower probability of default. This finding is consistent with cash flow theory.

5. Conclusions

This article has examined the main determinants of corporate performance and default risk in Jordan using macroeconomic variables. We found most of our control variables for the firm's performance as the function of capital structure including size and growth have their expected sign which is consistent with the previous findings. Our results show that the unanticipated changes in interest rates negatively and significantly affect the firm's performance ROA. That is, the increase in the interest rate increases the cost of debt, at which the required rate of return will be higher, so that firms reject previously profitable projects due to the higher cost of borrowing, and this negatively affects profit. Unanticipated changes in inflation, money supply, and credit availability negatively and insignificantly affect the firm's performance ROA. The production manufacturing index and Islamic credit facilities positively and significantly affect the firm's performance, while exports do not have any significant impact on the firm's performance ROA. The positive and significant impact of Islamic credit facilities reflects the

importance and the significance of Islamic credit facilities in increasing the firm's performance ROA.

Unexpected changes in interest rates, production manufacturing index, credit availability, and money supply are the main macroeconomic factors that determine corporate failure in Jordan. However, unanticipated changes in the interest rate negatively and significantly affect corporate failure in Jordan. This finding is interesting, as unexpected changes in the interest rate were expected to increase corporate failure. The reasons could be: the increase in interest rate is expected so firms borrow on a fixed interest rate; adverse selection in credit markets; and a lack of evidence from this emerging market since the economic structure and development are different from developed counties. Another important reason could be that most of the previous studies covered a shorter period of time, or have just used the failure rate rather than the actual defaulted firms.

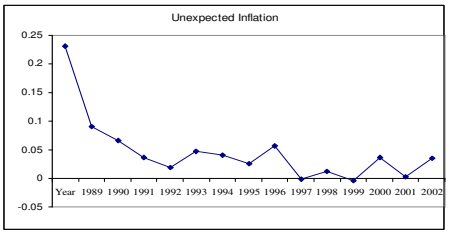
The money supply, export, and production manufacturing index have a negative and significant affect on corporate failure in Jordan. Interestingly, credit availability was found to have a positive and significant effect on the firm's default risk, while Islamic credit facilities are found not to have any significant impact on corporate failure in Jordan. The result does not provide support for the effect of inflation on corporate failure. The pattern of significance of microeconomic variables in determining corporate failure provides evidence on the key role of gearing, the firm's size and cash flow as determinants of corporate failure. The empirical contribution of this research to the literature of corporate failure is in the uniqueness of the data as it is the first study to be done on developing countries. Also, it is the only study that deals with two financial systems, Islamic and non-Islamic, and it considers the difference in the Islamic credit policy as determinants of corporate failure.

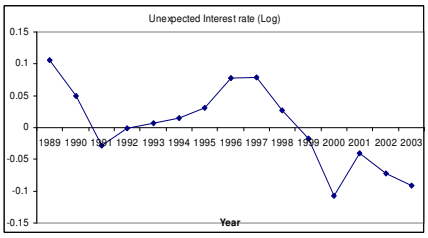
References

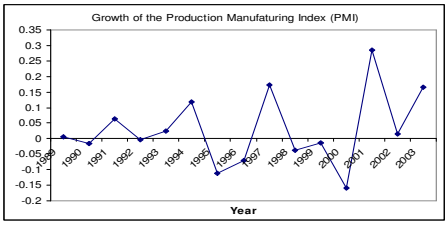
1. Altman, E. I., 1968, Financial Ratios, Discriminate Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance* 23 (September), 589-609.
2. Altman, E. I., 1983, Multi-dimensional Graphics and Bankruptcy Prediction: A Comment, *Journal of Accounting Research* 21 (Spring), 297-299.
3. Altman, E. I., 1984, The Success of Business Failure Prediction Models: An International Survey, *Journal of Banking and Finance* 8, 171-198.
4. Altman, E. I., 1994, Corporate Distress Diagnosis: Comparisons Using Linear Discriminant Analysis and Neural Network (the Italian experience), *Journal of Banking and Finance* 18, 505-529.
5. Altman, E. I., 2002. *Bankruptcy, Credit Risk, and High Yield Junk Bonds* (Blackwell Publishers Ltd, UK).
6. Baltagi, B. H., and X. Wu Ping, 1999, Unequally Spaced Panel Data Regressions with AR (1) Disturbances, *Econometric Theory*, Cambridge University Press 15, 814-23.
7. Baum, Christopher F., 2001, Residual Diagnostics for Cross-Section Time Series Regression Models, *Stata Journal* 1, 101-104.
8. Becchetti, L., and J. Sierra, 2003, Bankruptcy Risk and Productive Efficiency in Manufacturing Firms, *Journal of Banking & Finance* 27, 2099-2120.
9. Bernanke, B. C., and M. Gertler, 1995, Inside the Black Box: The Credit Channel Monetary Transmission Mechanism, *Journal of Economic Perspective* 9, 27-48.
10. Bernanke, B., M. Gertler, and S. Gilchrist, 1996, The Financial Accelerator and the Flight to Quality, *Review of Economics and Statistics* 78, 1–15.
11. Bhattacharjee, A., C. Higson, S. Holly, and P. Kattuman, 2002, Macro Economic Instability and Business Exit: Determinants of Failures and Acquisitions of Large UK Firms, Working Paper 0206, Department of Applied Economic, University of Cambridge Mimeo.
12. Breusch, T., and A. Pagan., 1980, The Lagrange-Multiplier Test and its Applications to Model Specification in Econometrics, *Review of Economic Studies* 47, 239–253.
13. Cuthbertson, K., and J. Hudson, 1996, The Determinants of Compulsory Liquidations in The UK, *The Manchester School of Economic and Social Studies* 3, 298-308.
14. Davis, E. P., 1995. *Debt, Financial Fragility, and Systemic Risk, Revised and Expanded Edition* (New York: Oxford University Press).
15. Demirguc-Kunt, A., and E. Detragiache, 1998, The Determinants of Banking Crises: Evidence from Developing and Developed Countries, International Monetary Fund, Working Paper 45, 81-109.
16. Drukker, D. M., 2003, Testing For Serial Correlation in Linear Panel-Data Models, Stata Journal 3, 168-177.
17. Dunne, T., M. J. Roberts, and L. Samuelson, 1989, The Growth and Failure of U.S. Manufacturing Plants, *The Quarterly Journal of Economics* 104, 671-98.
18. Eichengreen, B., and C. Arteta, 2000, Banking Crises in Emerging Markets: Presumptions and Evidence, Working Paper No. C00-115, August, University of California, Berkeley.
19. Fabling, Richard and Arthur Grimes, 2003, Insolvency and Economic Development: Regional Variation and Adjustment, Motu Working Paper 03-18, Motu Economic and Public Policy Research Trust, Wellington, New Zealand, [online], (www.motu.org)
20. Gordon, R. J., 1981, The Consumer Price Index: Measuring Inflation and Causing It, NBER Reprints 0191, *National Bureau of Economic Research, Inc*.
21. Creane, Susan, Rishi Goyal, A Mushfiq Mobarak, and Randa Sab, 2003, Financial Development in the Middle East and North Africa, Working Paper No.33, (International Monetary Fund).
22. Greene, W. H., 2003. *Econometrics Analysis* (Prentice Hall, New York).
23. Hausman, J. A., 1978, Specification Tests in Econometrics, *Econometrica* 46, 1251-1271.
24. Hudson, J., 1986, An Analysis of Company Liquidations, *Applied Economics* 18, 219-235.
25. Hunter, J., and N. Isachenkova, 2003, Aggregate Economy Risk and Company Failure: An Examination of UK Quoted Firms in the Early 1990s, Working Paper, Mimo.
26. Judge, George, W. E., R. Griffiths, Carter Hill, Helmut Liitkepohl, and Tsoung-Chao Lee, 1985. *The Theory and Practice of Econometrics* (John Wiley and Sons).

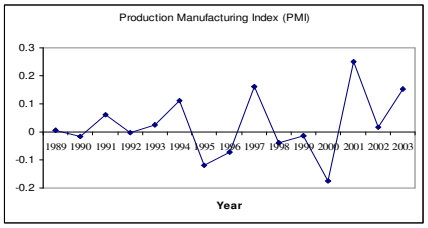
27. Liu, J., 2004, Macroeconomic Determinants of Corporate Failures: Evidence from the UK, *Applied Economics* 36, 939-945.
28. Liu, J., and N. Wilson, 2002, Corporate Failure Rates and the Impact of the 1986 Insolvency Act: An Econometric Analysis. *Managerial Finance* 28, 61-71.
29. Platt, H. D., and M. B. Platt, 1994, Business Cycle Effects On State Corporate Failure Rates. *Journal of Economics and Business* 46, 113-127.
30. Robson, M. T., 1996, Macroeconomic Factors in the Birth and Death of U.K. Firms: Evidence from Quarterly VAT Registration. *Manchester School* 64.
31. Shivaswamy, M., J. P. Hoban, and K. Matsumoto, 1993, A Behavioral Analysis of Financial Ratios, *The Mid-Atlantic Journal of Business* 29, 7-24.
32. Sharabany, R., 2004, Business Failures and Macroeconomic Risk Factors, Working Paper No. 2004.06, Cental Bank of Israel, Israel.
33. Sharma, D. S., 2001, The Role of Cash Flow Information in Predicting Corporate Failure: The State of the Literature, *Managerial Finance* 27, 3–27.
34. Simmons, P., 1989, Bad Luck and Fixed Costs in Personal Bankruptcies, *Economic Journal* 99, 92-107.
35. Stiglitz, J. E., and A. Weiss, 1981, Credit Rationing In Markets With Imperfect Information. *The American Economic Review* 74, 194-199.
36. Tirapat, S., and A. Nittayagasetwat, 1999, An Investigation of Thai Listed Firms' Financial Distress Using Macro and Micro Variables, *Multinational Finance Journal* 3, 103–125.
37. Turner, P., Coutts, A., and Bowden, S. (1992) The Effect of the Thatcher Government on Company Liquidations: An Econometric Study. *Applied Economics*, 24, 935-43
38. Vlieghe, G. W., 2001, Indicators of Fragility in the UK Corporate Sector, Working Paper, ISSN 1368-5562, The Bank of England, UK.
39. Wadhwani, S., 1986, Inflation, Bankruptcy, Default Premia and the Stock Market, *Economic Journal* 96.
40. White, H., 1980, A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity, *Econometrica* 48, 817-838.
41. Whited, T., 1992, Debt, Liquidity Constraints and Corporate Investment Evidence From Panel Data. *Journal of Finance* 47, 1425-60.
42. Wooldridge, J. M., 2002. *Econometric Analysis of Cross Section and Panel Data* (MIT Press, Cambridge).
43. Young, G., 1995, Companies Liquidations, Interest Rates and Debt. The Manchester School Supplement, 36, 57-69.

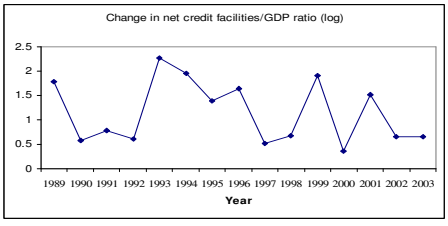
Appendix 1. Description of the Macroeconomic Variables

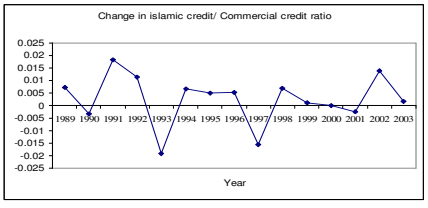


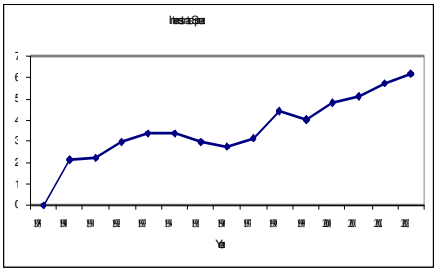












Appendix 2. Correlation Matrix of the Macroeconomic Variables

	INFL	INTR	CRGDP	ISCRG	MS2	EXPO	PMI	TDTA	TDTC	ln(assets)	ln(sales)	AGE	NICAP	CASHF	TAX	STDVCF	C1	INSTIT	FOREIG
INFL	1																		
INTR	0.408	1																	
CRGDP	0.067	0.369	1																
ISCRG	-0.052	-0.266	-0.225	1															
MS2	0.160	-0.440	-0.252	0.195	1														
EXPO	0.133	-0.030	0.259	-0.158	0.286	1													
PMI	0.206	0.159	0.003	-0.186	0.077	0.119	1												
TDTA	0.107	0.033	0.037	0.032	0.110	0.088	0.021	1											
TDTC	0.077	0.077	0.031	-0.026	-0.016	0.018	0.018	0.490	1										
ln(assets)	-0.056	-0.043	-0.035	-0.021	-0.059	-0.028	0.025	0.227	0.424	1									
ln(sales)	0.024	0.016	0.001	-0.013	-0.033	0.028	0.044	0.235	0.398	0.779	1								
AGE	0.027	-0.036	0.014	0.005	-0.007	0.035	0.040	0.165	0.450	0.430	0.469	1							
NICAP	0.145	0.109	0.081	0.004	0.030	0.052	0.025	-0.166	0.107	0.146	0.264	0.177	1						
CASHF	0.078	0.045	0.030	-0.026	0.009	0.011	0.043	-0.082	0.015	0.120	0.166	0.065	0.329	1					
TAX	0.055	-0.024	0.029	0.075	0.042	0.050	0.017	-0.038	0.046	0.094	0.138	0.167	0.156	0.078	1				
STDVCF	0.015	-0.063	-0.025	0.026	0.036	0.038	0.050	0.035	-0.062	-0.151	-0.142	-0.069	-0.085	-0.506	-0.037	1			
C1	-0.041	-0.133	-0.034	0.043	0.080	0.035	0.016	0.079	0.104	0.053	-0.024	0.123	-0.046	0.040	0.025	0.029	1		
INSTIT	-0.083	-0.085	-0.049	0.025	0.015	-0.018	0.004	-0.095	-0.134	-0.126	-0.198	-0.075	-0.063	0.055	0.000	0.025	0.135	1	
FOREIG	-0.053	-0.075	-0.042	0.015	0.007	-0.004	0.007	-0.003	-0.010	0.203	0.134	0.005	-0.055	-0.005	-0.036	-0.016	0.226	-0.236	1

Appendix 3. Macroeconomic Variables and Firm Performance

	ROA		MBVE	
Explanatory Variables	Fixed Effect	Random-Effects	Fixed Effect	Random-effect
Constant	-0.01489 (-1.28)	-0.03409 (-2.17)**	1.74665 (12.77)***	4.32785 (-1.62)
INFL	0.18069 (1.87)*	0.16152 (1.68)*	2.39920 (2.20)**	2.45299 (2.19)**
MS2	0.23337 (1.92)*	0.23124 (1.91)*	-0.46402 (-0.32)	-0.45962 (-0.31)
INTR	0.13667 (1.70)*	0.13598 (1.70)*	-4.16257 (-4.36)***	-4.16453 (-4.26)***
PMI	0.01518 (-0.51)	0.01302 (-0.44)	1.20242 (3.56)***	1.19643 (3.46)***
EXPO	0.00007 (-0.01)	-0.00115 (-0.11)	0.28119 (2.22)**	0.28144 (2.17)**
CRGDP	-0.00012 (-0.02)	0.00041 (-0.07)	0.04964 (-0.72)	0.05027 (-0.71)
ISCRG	0.59627 -1.63	0.55282 (1.52)	4.00132 (-0.95)	4.01512 (-0.93)
No. of observations	1586	1586	1586	1586
R-Square	0.0076	0.0076	0.0006	0.0007
Wald Test (1)	3.80 (0.00)***	24.05 (0.001)***	9.51 (0.00)***	63.49 (0.00)***
F-test all FE=0	F(147, 890)=6.43 (0.00)***		F(147, 890)=26.55 (0.00)***	
Breusch and Pagan Lagrangian (2)		219.54 (0.00)***		0.05 (0.831)
Hausman Test (3)	12.94 (0.0736)*			0.10 (1.00)

Notes *, **, *** Significant at 10, 5, and 1 percent levels, respectively. t-statistics are in parentheses. See Section 8.2.2 for variable definitions. (1) Wald test that all the coefficients (except intercept and FE) are jointly not significant. (2) Breusch and Pagan Lagrangian multiplier for the pooled model (H_0 : pooled regression against H_A : RE). (3) Hausman test for random effects (H_0 : RE against H_A : FE).

Appendix 4. Population-Average Estimation and Corrected Standard Errors with Auto-Correlation

	ROA		MBVR	
Explanatory Variables	PA	Random-Effects with Auto-regressive	PA	Random-Effects with Auto-regressive
Constant	-0.1603 (-6.42)***	-0.1575 (-5.73)***	-0.6621 (-1.15)	0.3451 (0.54)
Microeconomic Variables				
TDTA	-0.0973 (-9.41)***	-0.1038 (-8.95)***	-0.0084 (-0.03)	0.1789 (0.61)
SIZE	0.0131 (7.85)***	0.0132 (7.07)***	0.1439 (3.69)***	0.0916 (2.06)**
AGE	-0.0002 (-0.94)	-0.0002 (-0.59)	-0.0009 (-0.15)	0.0129 (1.46)
NICAP	0.2042 (23.94)***	0.2054 (22.94)***	-0.0497 (-0.29)	-0.3931 (-2.63)***
STDEVCF	-0.0487 (-2.89)***	-0.0555 (-2.93)***	-0.1107 (-0.32)	-0.0077 (-0.02)
TAX	0.0047 (0.66)	0.0048 (0.65)	0.0730 (0.53)	0.0863 (0.76)
Macroeconomic Variables				
INFL	0.1807 (1.15)	0.1337 (0.82)	8.8936 (2.8)***	-2.8386 (-1.06)
MS2	-0.0509 (-0.59)	-0.0472 (-0.53)	-3.8311 (-2.19)**	-2.3812 (-1.65)*
INTR	-0.0991 (-1.71)*	-0.0779 (-1.27)	-6.2969 (-5.4)***	-2.5999 (-2.42)**
PMI	0.1034 (3.71)***	0.0985 (3.5)***	1.5038 (2.71)***	1.3428 (2.95)***
EXPO	0.0066 (0.94)	0.0044 (0.72)	0.3656 (2.6)***	-0.0340 (-0.39)
CRGDP	0.0008 (0.2)	-0.0011 (-0.29)	0.0788 (1.01)	-0.0353 (-0.66)
ISCRG	0.5386 (2.31)**	0.4822 (2.24)**	3.4064 (0.73)	-6.9345 (-2.19)**
No. of observations	1051	1051	964	964
R-square		0.56		0.0205
Wald Test (1) F(15,890)	1084.58 (0.00)***	948.82 (0.00)***	95.10 (0.00)***	45.45 (0.00)***

Notes *, **, *** Significant at 10, 5, and 1 percent levels, respectively. t-statistics are in parentheses. See Section 8.2.2 for variable definitions. (1) Wald test that all the coefficients (except intercept and FE) are jointly not significant.