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# Macroeconomic determinants of corporate performance and failure: evidence from an emerging market the case of Jordan

Rami Zeitun

*University of Western Sydney*

Gary Tian

*University of Western Sydney, gtian@uow.edu.au*

Steve Keen

*University of Western Sydney*

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# Macroeconomic determinants of corporate performance and failure: evidence from an emerging market the case of Jordan

## **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**

Macroeconomic, Determinants, Corporate, Performance, Failure, Evidence, From, Emerging, Market, Case, Jordan

## **Disciplines**

Business | Social and Behavioral Sciences

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# Macroeconomic Determinants of Corporate Performance and Failure: Evidence from Emerging Market a case of Jordan

Rami Zeitun<sup>1</sup>, Gary Tian<sup>2</sup> and Steve Keen<sup>3</sup>

School of Economics and Finance  
University of Western Sydney

2006

The central objective of this study is to investigate the impact of aggregate economy risk on company performance and failure in a cross-sectional time-series (panel data) sample representative 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 unanticipated changes in interest rate negatively and significantly affect firms performance ROA. That is, the increase in interest rate rise the cost of debt at which the required rate of return will be lower than the cost of debt, therefore firms reject profitable projects due to the high cost of borrowing, which affected negatively firm's profit. Unanticipated changes in inflation, money supply, and credit availability negatively and insignificantly affect firm's performance ROA. The production manufacturing index and Islamic credit facilities positively and significantly affect firm's performance, while export was found not to have any significant impact on firm's performance ROA. The positive and significant impact of Islamic credit facilities reflect the importance and the significant role of Islamic credit facilities in increasing firm's performance ROA. The macroeconomic variables found to have a strong impact on MBVR performance measure compared with ROA measure.

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<sup>1</sup> School of Economics and Finance, University of Western Sydney, Phone: +612 96859164, Mobile: +612 404955320, E-mail: [r.zeitun@uws.edu.au](mailto:r.zeitun@uws.edu.au) or [r\\_zaiton2005@yahoo.com](mailto:r_zaiton2005@yahoo.com). Mailing address is School of Economics and Finance, Parramatta Campus, University of Western Sydney, Locked Bag 1797, Penrith South DC, NSW 1797 Australia.

<sup>2</sup> Gary Tian is the corresponding author, his email address is [g.tian@uws.edu.au](mailto:g.tian@uws.edu.au) and his mailing address is School of Economics and Finance, Parramatta Campus, University of Western Sydney, Locked Bag 1797, Penrith South DC, NSW 1797 Australia.

<sup>3</sup> Steve Keen is Associate Professor, School of Economics and Finance, University of Western Sydney, and the author of *Debunking Economics: the Naked Emperor of the Social Sciences* his email address is [s.keen@uws.edu.au](mailto:s.keen@uws.edu.au).

## 1 Introduction

The firm level, 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 completely 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 fund. 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 (Wadhvani, 1986; Davis, 1995; Robson, 1996), 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. 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. 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. The banking system in Jordan is different from western countries as it contains Islamic banks and commercial banks. Also, the credit policy in Islamic banks is different from the commercial banks, which could affect corporate performance and default risk<sup>4</sup>. Therefore, a bank's credit policy could be an additional factor in explaining insolvency risk, but information of the relevant motives is hard to come by. So, this factor could be an important in 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

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<sup>4</sup> For example, the debt contract in Islamic banks prevents them from increasing profit margin (interest rate) on old contract and Islamic banks are not allowed to charge an extra profit rate (interest rate) on the delayed payments.

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<sup>5</sup>.

Turner, Coutts, and Bowden (1992) showed the importance of bank credit policy in deciding 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. More recent study by Liu (2004) also found that interest rates and credit are important factors in determining the corporate failure. A study by Cuthbertson and Hudson (1996) carried a theoretical analysis into compulsory liquidation among UK companies by over the period 1972-1989. They found that an increase in the nominal interest rate and leverage caused a rise in corporate liquidation rate.

Tirapat and Nittayasetwat (1999) provide evidence from Thailand their model include macroeconomic variable. Their results indicated that higher inflation leads to higher default. Liu and Wilson (2002) provided evidence from 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 originated from developed countries may have limited applicability and need to be tested in emerging markets. For example in Jordan there are two banking systems. Also, these studies are used the rate of bankruptcy (failure) rather than the actual defaulted firms, which could be more valuable to be included 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 there is a few studies that used macro and micro economic variables to determine default risk their time period is very short.

One of the main characteristics for Jordanian economy that makes this study unique is its financial system beside others that have been discussed in chapter three in more details. The banking sector (system) in Jordan plays an important role in corporate finance as Jordan is considered as a bank-based financial system. This is especially the case for small firms, which are more exposed to insolvency than large ones. 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

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<sup>5</sup>For example, in late 1989, the Jordanian economy experienced financial distress and a slow down in the 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.

affects firm's ability to get more funds. The change in the external finance premium is affected by the change in the monetary policy that raises or decreases interest rate and in the same direction. Therefore, monetary policies have impact on firm's ability to increase funds as a result of increasing costs.

Furthermore, the banking system in Jordan is different as it contains Islamic banks and commercial banks. One of the main differences is that Islamic banks are not allowed to charge a higher interest rate if market interest rate increase, and not allowed to charge extra interest if firm's delays paying its obligation, which could serve to protect the distressed firms against the increase in interest rate. Another important characteristic is that their profit rate is not fixed as the rate on the long term deposit. We expected that the growth in the Islamic banks credit facilities in comparison to commercial banks facilities to decrease the firm's probability of default. As the debt contract in Islamic banks prevent them from increasing 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 the 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. Jordanian companies are expected to be affected by the unexpected interest rate, and if interest rate increases this will affect the firm's performance negatively and increase the insolvency rates.

The central objective of this chapter is to investigate the impact of aggregate economy 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 chapter is organized as follows. Section 8.2.1 gives details of the data set structure. Section 2.2 describes the explanatory variables, both macro and micro economic. Section 3 discusses the estimated models used to investigate the effect of macro and micro economic variables and ownership structure on a firm's performance and default risk. Section 4 presents the results of the empirical models. Section 4.3.1 discusses the results of macroeconomic variables and firm's performance, while the macroeconomic variables and default risk results are discussed in section 4.3.2. Section 5 concludes the paper and discusses the implications of the results.

## **2 Methodology and Model Specification**

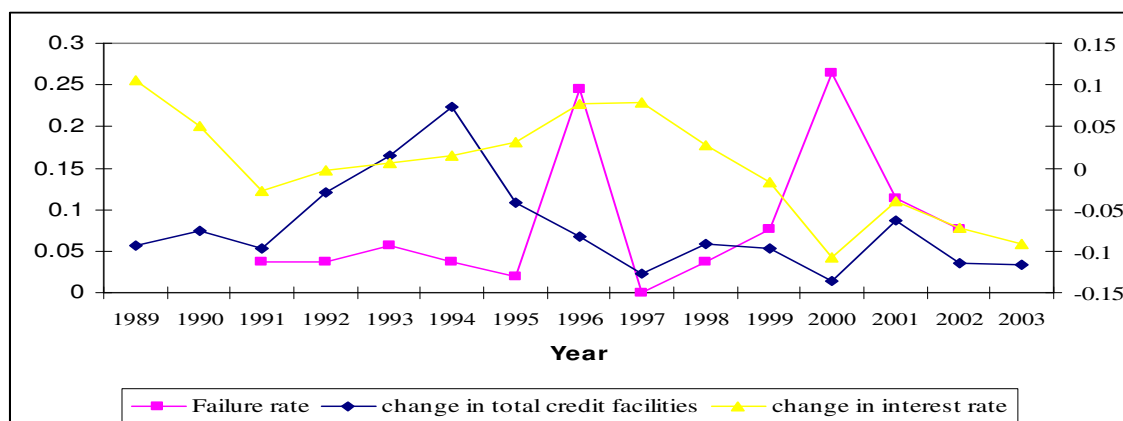
### **2.1 Data and Specification Issues**

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 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) over the sample period, 1989-2003<sup>6</sup>. 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 interest rate increased, while from 1996-1997 the failure rates decreased as the interest rate decreased.

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 decreased, 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.

**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

## 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 (Wadhvani, 1986). It is proxied by changes in the consumer price index<sup>7</sup>. 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 Wadhvani (1986), the

<sup>6</sup> These variables will be discussed shortly in more detail.

<sup>7</sup> This measure is employed in the Tirapat and Nittayagasetwat (1999) study to investigate the Thailand listed financial distress using macro and micro variables, among others.

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<sup>8</sup>.

In modelling the influence of interest rate, this study follows the approach used by Young (1995) 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:

**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<sup>9</sup> 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, 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 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 old 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 is 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 a better 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

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<sup>8</sup> Young (1995) and Hunter and Isachenkova (2003) used the 3-month sterling inter-bank rate as a proxy for the nominal interest rate.

<sup>9</sup> The banks credit facilities are defined as the total credit facilities to the private sectors.



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, Wadhvani (1986), Young (1995), Tirapat and Nittayagasetwat (1999), Vlieghe (2001), among others). Both INFL and INTR lead to increased the 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 Wadhvani (1986) and Vlieghe (2001), 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 then focus on testing whether the aggregate macroeconomic variables<sup>10</sup> play a role in determining firm

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<sup>10</sup> The study uses the first differences of macroeconomic variables since these covariates are stationary.

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 more idea about these variables during the period studied.

### **2.2.2 Microeconomic 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, and 1994), among others, adopted numerous models predicting bankruptcy and financial distress. 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 variables used in this section are based on the firm’s capital structure, profitability, cash flow, and ownership structure. 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 to bankrupt when the sum of its current year’s profit and the expected value of equity is negative<sup>11</sup>.

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. This analysis also includes variables to control for the effect of ownership structure and concentration. Ownership concentration is measured by the largest shareholder share (C1). Ownership structure is measured by institutional ownership (INSTIT) and foreign ownership (FOREIG) proportions.

## **3 Econometrics Models**

Because unanticipated changes in macroeconomic variables are not directly observable, they must be proxied. 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<sup>12</sup>:

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<sup>11</sup> See Chapter 2 section 2.3.4 and Wadhvani’s, 1986.

<sup>12</sup> The same Procedure has been adopted by Hunter and Isachenkova (2003).

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

where  $u_t$  is a value of the macroeconomic variable at time  $t$ ; and  $\varepsilon_t$  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<sup>13</sup>. Therefore, a one-year lagged logarithmic change in the nominal interest rate, inflation, money supply, GDP, and total credit facilities is 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.

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 micro economic factors on a firm's performance. Equation (2) considers both macro and micro data<sup>14</sup>. Equation (3) estimates not only micro and macro variables, but also includes ownership structure (mix and concentration). Thus, the empirical model to be estimated as follows:

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

<sup>13</sup> 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).

<sup>14</sup> It is worth noting that a model using the macroeconomic variables only is tried in this study to investigate their impact on corporate performance.

$$Y_{it} = F(\beta_0 + \beta_1 Macro_{it} + \beta_2 Micro_{it} + \beta_3 OWNER_{it} + e_{it}) \quad (3)$$

where  $Y_{it}$  is the firm's measure of performance (ROA, MBVR, ROE, Tobin's Q);  $i=1, \dots, n$ , refers to the Jordanian firms included,  $t = 1, \dots, T$ ;  $t$  ranges from 1989-2003; Macro denotes the macroeconomic factors (INFL, INTR, MS2, CRGDP, ISCRG, EXPO, and PMI), Micro denotes the microeconomic variables (TDTA, SIZE, AGE, NICAP, STDVECF, and TAX), and OWNER denotes the ownership structure variables (C1 and INSTIT).

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 Effects 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<sup>15</sup>. Equation (4) considers only macroeconomic variables, whereas Equation (5) considers both macro and microeconomic data. Equation (6) estimates not only the macro and microeconomic variables, but also includes the ownership structure variables. Thus, the empirical model to be estimated is as follows:

$$Y_{it}^* = \beta_0 + \beta_1 INFL_{it} + \beta_2 INTR_{it} - \beta_3 MS2_{it} + \beta_4 PMI_{it} - \beta_5 EXPO_{it} - \beta_6 CRGDP_{it} - \beta_7 ISCRG_{it} + e_{it} \quad (4)$$

$$Y_{it}^* = F(\beta_0 + \beta_1 Macro_{it} + \beta_2 Micro_{it} + e_{it}) \quad (5)$$

$$Y_{it}^* = F(\beta_0 + \beta_1 Macro_{it} + \beta_2 Micro_{it} + \beta_3 OWNER_{it} + e_{it}) \quad (6)$$

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 ( $i=1, \dots, N$ ),  $t$  for the time period ( $t=1, \dots, T$ ), *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), and *OWNER* is the ownership structure variables (C1 and FOREIGN).

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<sup>15</sup> For more details about the Random Effects Logit model used in this study, see Greene (2003).

## 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.

**Table 1: Statistical Description of the Macroeconomic Variables**

	Obs	Mean	Median	Std. Dev.	Max (Year)	Min (Year)	CV <sup>16</sup>	Skewness	Kurtosis	Shapiro-Wilk	prob <sup>y</sup>
<b>INFL</b>	1586	0.046	0.036	0.057	0.231 (1989)	-0.004 (2000)	1.239	2.633	8.320	308.029	0.00
<b>MS2</b>	1586	0.084	0.089	0.039	0.174 (1991)	0.015 (1996)	0.464	0.528	0.861	37.612	0.00
<b>INTR</b>	1586	0.002	0.007	0.063	0.105 (1989)	-0.107 (2000)	31.500	-0.171	-0.664	23.202	0.00
<b>PMI</b>	1586	0.023	0.005	0.111	0.285 (2001)	-0.160 (2000)	4.826	0.337	0.137	22.941	0.00
<b>EXPO</b>	1586	0.113	0.062	0.378	0.967 (1993)	-0.433 (1994)	3.345	0.795	0.573	50.819	0.00
<b>CRGDP</b>	1586	1.151	0.775	0.644	2.262 (1993)	0.360 (2000)	0.560	0.382	-1.561	106.564	0.00
<b>ISCRG</b>	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.

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 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) falls 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 in the Islamic credit to commercial credit (ISCRG) had the highest rates in 1991, while the

<sup>16</sup> CV is the Coefficient of Variation which is defined as the standard deviation over the mean.

lowest rate was in 1993 as a result of expansion in the credit facilities issued by commercial banks.

A summary of the statistics for the 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.

**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 8.2.2 for variable definition

#### 8.4.2 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<sup>17</sup>. 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 the Islamic credit facilities to the private sectors, while the credit availability issued by

<sup>17</sup> 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`.

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)<sup>18</sup>. A modified Wald statistic for groupwise heteroskedasticity in the fixed effect model is also reported<sup>19</sup>. 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 ( $\rho$ ), 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 ( $\chi^2$ ) 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:  $\chi^2 (1) = 64.15$ ,  $p=0$  and  $\chi^2 (1) = 108.27$ ,  $p=0$  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. The  $\chi^2 (13) = 22.03$ ,  $p=0.06$  and  $\chi^2 (13) = 10.78$ ,  $p=0.63$  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

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<sup>18</sup> This test applies regardless of the fixed-effects or random-effects estimation procedure. The test is available in Stata8 using the XTSERIAL command.

<sup>19</sup> This test is provided in Stata 8 by Christopher Baum. For more details see Stata Journal 2001, page 101-104

incorrect. In contrast, regression coefficients in fixed-effects model are unbiased<sup>20</sup>. 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 economic variables model<sup>21</sup>. 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<sup>22</sup>. 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 Wadhvani (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 for that 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

<sup>20</sup> Given the relative size of the standard errors and the vulnerability of this estimation procedure to certain regression assumptions, there is a potential for 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).

<sup>21</sup> We investigated the impact of the macroeconomic variables only on 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 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 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.

<sup>22</sup> It is worth noting that the regression model using return on equity (ROE) and Tobin's Q are 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.



significance of EXPO also reveals the importance of the macroeconomic variables and the 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 Islamic banks' credit policy could be more efficient for Jordanian firms. This finding is consistent with the finding of Stiglitz and Weiss (1981) that 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.

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

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

(4) Panel –Hetero $\chi^2$ (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).

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.

The estimation of Equation (3) using macro and microeconomic variables, ownership structure INTIT, and ownership concentration C1 is presented in Table 4. Using the ownership structure (mix and concentration), the ownership concentration measure C1<sup>23</sup> is found to have a positive and significant impact on a firm’s performance ROA. The positive sign indicates that ownership concentration increases the firm’s ROA. Company ownership (INSTIT) is found to have a negative but insignificant impact on the firm’s performance (ROA). The negative sign of INSTIT indicates that institutional ownership has a negative impact on the firm’s performance.

When the estimation includes ownership structure variables and ownership concentration, the significance and the sign of the microeconomic variables does not change. The TDTA and STDVCF still have a negative and significant impact on firm performance ROA, while both variables SIZE and NICAP have a significant and positive impact on ROA. Firm’s AGE and TAX still have a negative but insignificant effect on ROA. However, the INTR becomes insignificant in the ROA model, while PMI and ISCRG still have a positive and significant impact on the firm’s performance measure ROA.

<sup>23</sup> Using the largest shareholder C1 instead of the largest five share holders provides a more significant impact on a firm’s performance.

**Table 4: Results of Fixed-effects model, Random-effects model and FGLS for Firm Performance and Macroeconomic Variables**

	ROA			MBVR		
	Random	Fixed	FGLS	Random	Fixed	FGLS
<b>Constant</b>	-0.18525 (-6.18)***	-0.18622 (-3.52)***	-0.1004 (-8.16)***	-0.90087 (-1.28)	2.26663 (2.09)**	-0.3834 (-1.7)*
<b>Microeconomic Variables</b>						
<b>TDTA</b>	-0.10233 (-8.93)***	-0.09392 (-5.43)***	-0.0785 (-14.48)***	0.01406 (0.05)	-0.50208 (-1.42)	-0.0610 (-0.5)
<b>SIZE</b>	0.01438 (7.40)***	0.01815 (5.80)***	0.0091 (11.53)***	0.16356 (3.53)***	0.19417 (3.02)***	0.0915 (6.16)***
<b>AGE</b>	-0.00038 (-1.14)	-0.0027 (-2.16)**	-0.0004 (-5.19)***	-0.0099 (-1.16)	-0.14886 (-6.15)***	0.0023 (0.99)
<b>NICAP</b>	0.20045 (22.98)***	0.19194 (19.02)***	0.2421 (42.87)***	-0.25037 (-1.42)	-0.67277 (-3.50)***	0.9087 (7.19)***
<b>STDEVCF</b>	-0.0429 (-2.49)**	-0.02851 (-1.48)	-0.0280 (-1.54)	-0.12865 (-0.37)	-0.17395 (-0.48)	0.0484 (0.24)
<b>TAX</b>	0.00201 (-0.29)	-0.00126 (-0.18)	0.0119 (2.34)**	0.0563 (0.42)	-0.01963 (-0.15)	0.2065 (1.78)*
<b>Macroeconomic Variables</b>						
<b>INFL</b>	0.17949 (1.16)	0.03396 (0.2)	0.0882 (1.23)	8.38049 (2.70)***	-0.78864 (-0.23)	11.1995 (6.49)***
<b>MS2</b>	-0.03183 (-0.3)	-0.08771 (-0.92)	-0.0569 (-1.43)	-4.07866 (-2.38)**	-9.48489 (-4.95)***	-3.8510 (-4.3)***
<b>INTR</b>	-0.08056 (-1.41)	-0.14262 (-2.01)**	-0.0853 (-3.29)***	-6.45472 (-5.58)***	-11.17225 (-7.99)***	-4.6788 (-7.4)***
<b>PMI</b>	0.09989 (3.64)***	0.12702 (4.01)***	0.0670 (5.51)***	1.65067 (3.02)***	3.59922 (5.88)***	0.5245 (1.83)*
<b>EXPO</b>	0.00622 (0.91)	0.00562 (0.81)	0.0119 (3.62)***	0.35903 (2.64)***	0.31451 (2.33)**	0.3276 (4.11)***
<b>CRGDP</b>	0.00045 (0.12)	-0.00193 (-0.49)	-0.0010 (-0.6)	0.0828 (1.1)	-0.07668 (-0.96)	0.0657 (1.61)
<b>ISCRG</b>	0.54412 (2.40)**	0.52155 (2.25)**	0.3762 (3.58)***	3.47908 (0.77)	-0.04847 (-0.01)	2.9271 (1.15)
<b>Ownership Variables</b>						
<b>Largest Owners (C1)</b>	0.03148 (1.87)*	0.04594 (1.89)*	0.0045 (1.03)	-0.01853 (-0.05)	0.10296 (0.22)	0.4467 (3.53)***
<b>(INSTIT)</b>	-0.00275 (-0.17)	-0.03512 (-1.57)	0.0068 (1.53)	0.42762 (1.19)	0.26841 (0.61)	0.4258 (3.84)***
<b>No. of observations</b>	1049	1042	1042	957	957	957
<b>R-square</b>	0.5634	0.49		0.076	0.002	
<b>Wald-test F(13,890) (1)</b>	976.11 (0.00)***	46.25 (0.00)***	6267.85 (0.00)***	99.58 (0.00)***	8.98 (0.00)***	470.91 (0.00)***
<b>F(147, 890) F-test all FE=0</b>		2.76 (0.00)***			4.11 (0.00)***	
<b>Breusch and Pagan Lagrangian (2)</b>	52.09 (0.00)***			90.38 (0.00)***		
<b>Hausman Test (3)</b>		27.24 (0.03)**		59.79 (0.00)***	59.79 (0.00)***	

<b>Panel –Hetero <math>\chi^2</math> (148)=</b>	1.1e+32 (0.00)***	5.3e+34 (0.00)***
<b>Autocorrelation</b>	3.610 (0.06)*	89.494 (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).

The goodness of fit  $R^2$  is slightly better in the MBVR but still very small at 8 percent. The Hausman test still supports, to some extent, the use of a random effect model over the fixed effect model in ROA estimation, while it shows that there is no difference in the MBVR estimation case. The overall goodness of fit of the models using the accounting performance measure ROA is greater than the goodness of fit of the models using the market performance measure MBVR which could indicate that the Jordanian market is not efficient, and that is why investors rely on the accounting measure of performance in their decision. The Breusch and Pagan Lagrangian test still supports the use of GLS over the OLS in both models ROA and MBVR.

In this research the models are re-estimated to account for different ways to model the likely presence of heteroskedasticity and serial autocorrelation. Initially, the Population Average Approach (PA) is used, as this procedure yields robust estimates of variance that translate into smaller standard errors. The results of the Population Average Approach (PA) for Equation (2) and Equation (3) are presented in Appendix 4 and Appendix 5 respectively. Compared to the results for the random-effects model presented in Table 3 and Table 4 the coefficients are nearly the same. For example, in Equation (2) the Wald  $\chi^2=1084.58$ ,  $p<0.001$  for the ROA.

The issue of serial autocorrelation in panel data is important as it can bias the computation of standard errors; therefore, an autocorrelation test is conducted. The null hypothesis of no autocorrelation in the MBVR model is rejected, while the ROA model shows that the autocorrelation is not a serious problem as  $P>0.05$ . The results for both ROA and MBVR using the random-effects model to estimate Equation (2), taking into account an auto-regressive process of order 1 (Baltagi and Wu, 1999), are reported in Appendix 4. The results are somewhat similar to those presented in Table 3. However, the results for ROA do not change too much: only the INTR variable becomes insignificant, while in MBVR the significance of several variables fell, and some of them became insignificant (INFL and EXPO). The results in Appendix 4 also show a significant and negative impact of NICAP and ISCRG on the market performance measure MBVR. The results for Equation (3) are reported in Appendix 5; the results are somewhat similar to those presented in Table 4.

The Feasible Generalized Least Squares (FGLS) approach is used to fit the cross sectional times-series models in the presence of Heteroskedasticity and correlation (see Judge, Hill et al., 1988). The results are presented in Table 3 for Equation (2), while Table 4 presents the results for Equation (3). The size of both the regression coefficients and standard errors tend to be smaller compared with the results from the random-effects model in both estimations of ROA and MBVR. Overall, the results presented with this estimation procedure tend to confirm that macroeconomic

variables have an important impact on a firm's performance. However, there are some noticeable differences: AGE, TAX, MS2, and EXPO have a significant impact on the ROA performance measure.

To sum up, the above estimations have shown that the macroeconomic variables have an important impact on both the ROA and MBVR measures of a firm's performance. The microeconomic variables are also very important determinants of corporate performance, as the goodness of fit of the model without the microeconomic variables is very small. Therefore, the macroeconomic variables alone cannot determine a firm's performance. Another important finding is that ISCRG has an important and significant impact in increasing the firm's performance measure ROA. The macroeconomic variables are found to have a more significant impact on the market performance measure MBVR, compared with the accounting performance measure ROA. Also, controlling for ownership structure shows that ownership concentration has a positive and significant impact on a firm's performance. The next section provides evidence of the effects of macroeconomic variables on corporate failure. Three models were used in the next section to investigate whether macroeconomic variables are determinants of corporate failure.

#### **8.4.3.2 Macroeconomic Variables and Default Risk**

The results of the maximum likelihood estimation of the random effects logit model are given in Table 5. The table shows three 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 ( $\chi^2$ ) distribution under the null hypothesis that all the exogenous variables are equal to zero. For Model 1, the value of the  $\chi^2$  statistics is 16.15 with a P-value of 0.02, indicating that the explanatory power of the model is significant at the 5% level. 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 modeling the impact of macroeconomic variables only (Model 1) on corporate failure in Equation (4) are displayed in Table 5. 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 to 3, which indicate 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 increased 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 Wadhvani (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 to 3 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 to 3, 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 to 3, 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 Gertler, 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.

**Table 5: Logit Regression: Macroeconomic Variables and Microeconomic Variables**

Independent Variables	Model 1		Model 2		Model 3	
	Coefficient Estimates	Marginal Effects	Coefficient Estimates	Marginal Effects	Coefficient Estimates	Marginal Effects
Constant	-3.1330 (-4.53)***		1.2783 (0.77)		0.8611 0.5	
<b>Macroeconomic Variables</b>						
INFL	-7.9743 (-0.84)	-0.1458	-11.5164 (-0.94)	-0.06991	-10.9534 (-0.9)	-0.0690
MS2	-17.3012 (-2.03)**	-0.3164	-20.6900 (-1.94)*	-0.1256	-20.0412 (-1.88)*	-0.1262
INTR	-11.5622 (-1.93)*	-0.2115	-15.7512 (-1.89)*	-0.09562	-14.4702 (-1.72)*	-0.0912
PMI	-4.5345 (-2.49)**	-0.0829	-5.0333 (-2.2)**	-0.03055	-5.2163 (-2.29)**	-0.0329
EXPO	-0.0116 (-0.02)	-0.0002	0.3331 (0.42)	0.002022	0.2667 (0.34)	0.0017
CRGDP	0.8195 (2.15)**	0.0150	0.8711 (1.92)*	0.005288	0.8607 (1.92)*	0.0054
ISCRG	2.2868 (0.08)	0.0418	12.5859 (0.38)	0.076401	9.3725 (0.28)	0.0590
<b>Microeconomic Variables</b>						
CAPSTR	0.1663 (2.21)**	0.00101	0.1520 (1.91)*	0.0010		
ROE			-0.0305 (-1.38)	-0.00019	-0.0307 (-1.39)	-0.0002
SIZE (log Sales)			-0.3502 (-3.03)***	-0.00213	-0.3393 (-2.82)***	-0.0021
TAX			-2.1428 (-2.38)**	-0.01301	-2.0862 (-2.3)**	-0.0131
CASHF			-0.7715 (-1.84)*	-0.00468	-0.8010 (-1.9)*	-0.0050
<b>Ownership Variables</b>						
Largest Shareholders Share (C1)					-1.0234 (-1.19)	-0.0064
Foreign ownership					-1.3280 (-0.81)	-0.0084
No. of observations	1586		1442		1434	
Log Likelihood	-198.362		-161.298		-160.229	
Wald test	$\chi^2(7)=16.15$		$\chi^2(12)=27.27$		$\chi^2(14)=27.22$	
P-value	(0.02)**		(0.01)***		(0.02)**	
Rho $\rho$ (1)	0.0327		0.4274*		0.41158*	
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.

The estimated results of Equation (5), which uses macro and microeconomic variables to determine their impact on default risk, are presented in Table 5. Model 2, which is augmented with both macroeconomic and microeconomic variables, explains failure risk better than the economic variables model only. Clearly, from Table 5, 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  $\chi^2$  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 the 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 chapter, large firms have lower bankruptcy costs.

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.

The results from Model 3 in Table 5 show the estimated results of Equation (6) using macro and microeconomic variables, ownership structure FOREIG, and ownership concentration C1. Clearly, from Table 5, failure risk is linked to the changes in macroeconomic variables (MS2, INTR, PMI, and CRGDP) and microeconomic variables (CAPSTR, SIZE, TAX, and CASHF). The coefficients of those variables still have the same sign and significance. The overall significance of the model is acceptable as the value of the  $\chi^2$  statistic is increased to 27.27 with a P-value of 0.02, indicating that the explanatory power of the model is significant at the 5% level. The ownership concentration C1 is found to have a negative but insignificant impact on corporate failure. Foreign ownership (FOREIG) is found to have a negative but insignificant impact on the probability of default. The negative sign indicate that firms with a high percentage of foreign FOREIG ownership are less likely to default.

To sum up, the above estimations have shown that macroeconomic variables have a significant impact on corporate failure in Jordan. Money supply, unexpected interest rate changes, the production manufacturing index and credit availability are the main macroeconomic variables that determine corporate failure in Jordan. The



microeconomic variables are very important determinants of corporate failure, as the overall significance of the model is increased by their inclusion. Therefore, both macroeconomic and microeconomic variables are important determinants of corporate failure in Jordan.

## 5 Conclusions

This chapter has examined the main determinants of corporate performance and default risk in Jordan using macroeconomic variables. In the first estimation, fixed effect and random effect models were used to examine the determinants of the firm's performance using macro and microeconomic variables in the first model, and micro, macro and ownership structure variables in the second model. Then the models were re-estimated to check for heteroskedasticity and serial correlation. The Population Average (PA) estimation and Random-Effects Auto-regressive were used, and finally the models were fitted using the Feasible Generalized Least Square (FGLS) in all estimations to control for the heteroskedasticity. Then, Logit estimations were used to examine the determinants of the default risk. In investigating the determinants of default risk, three models were also employed. The first model used the macroeconomic variables only, the second used both micro and macroeconomic variables, and the last model used both micro and macroeconomic variables and ownership structure variables. The results were obtained using the maximum likelihood estimations of the random-effects Logit regression. Also, the chapter provided some important descriptive statistics of the micro and macroeconomic variables used in the study.

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. The macroeconomic variables were found to have a strong impact on the MBVR performance measure compared with the ROA measure.

The firm's capital structure and age have a negative and significant impact on the firm's performance. The result regarding the capital structure is consistent with the capital structure theory, while the age result is not consistent with the previous findings. The firm's size and growth positively and significantly affect the firm's performance. These results are consistent with the previous findings of a positive relationship between the firm's performance and both the firm's size and growth.

The results show that for ownership concentration, the largest one share holders C1, has a positive impact on the firm's performance. The significance of ownership concentration is consistent with agency theory. The fraction held by institutions is found to have a negative but insignificant impact on the firm's performance ROA,

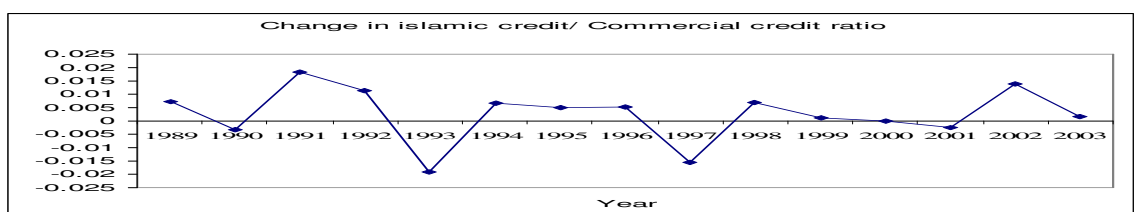
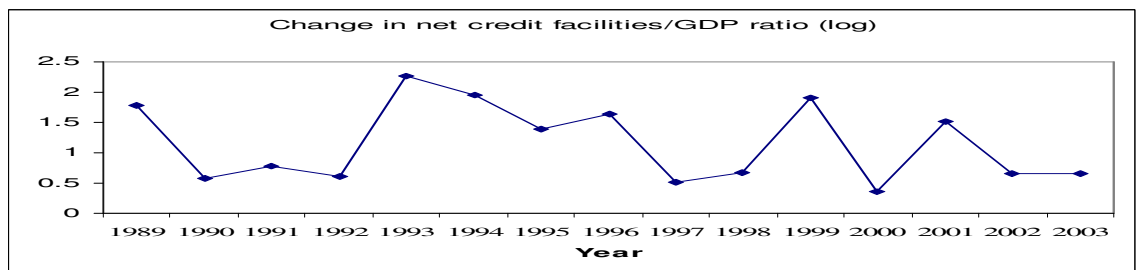
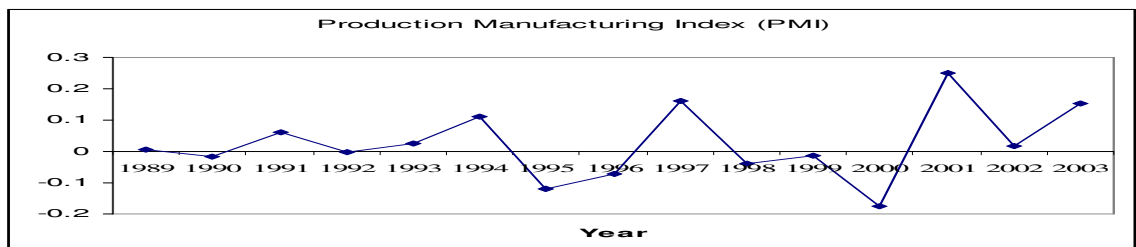
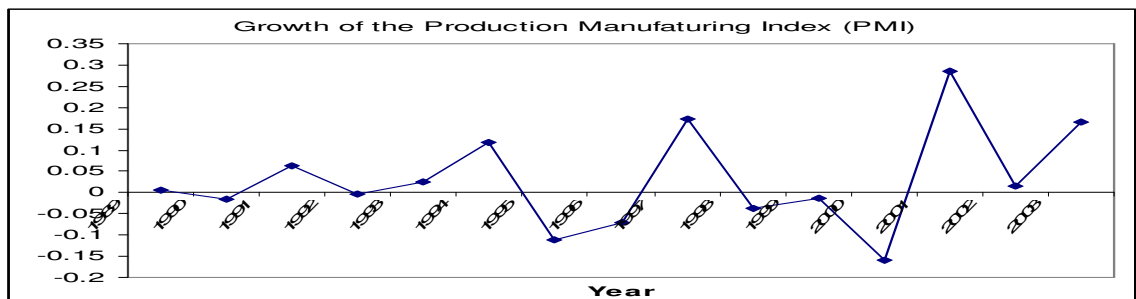
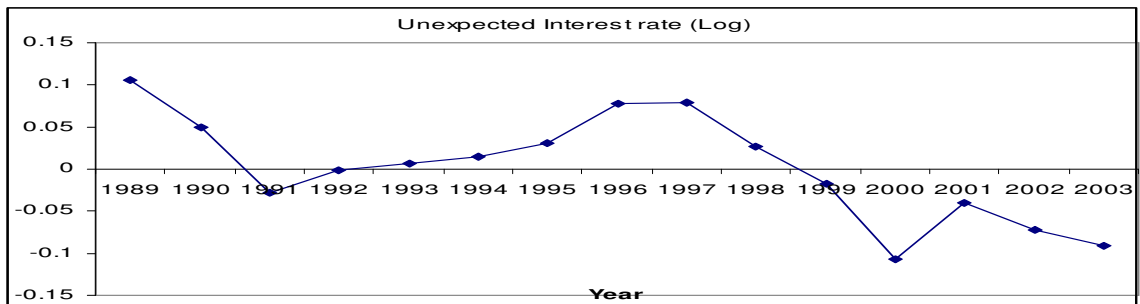
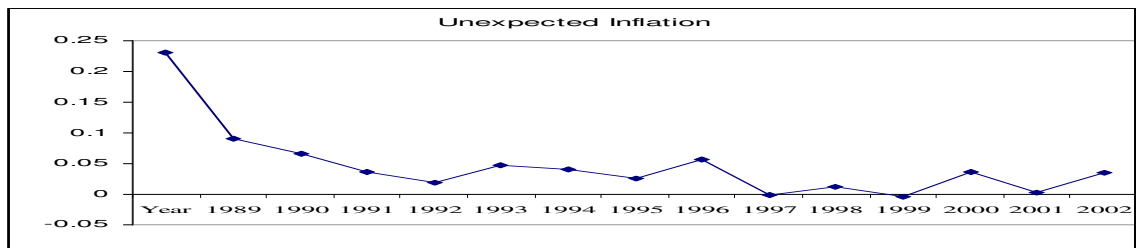
while it has a positive but insignificant impact on MBVR. However, institutional ownership was found to have a positive and significant impact in FGLS estimation.

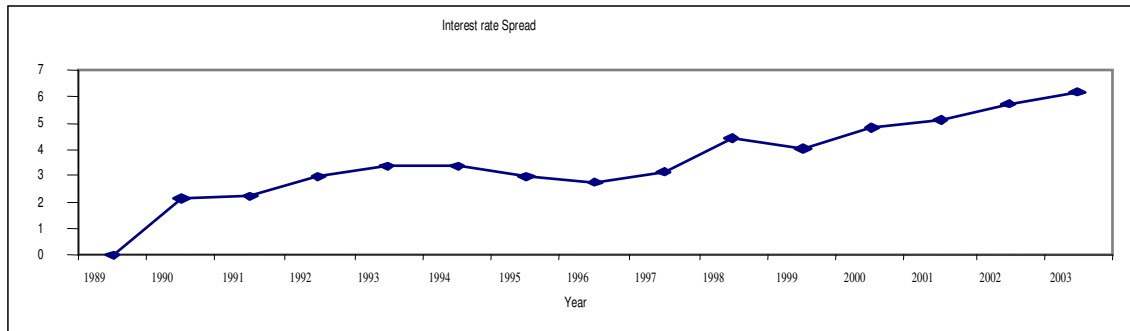
Unexpected changes in interest rates, production manufacturing index, credit availability, and money supply are the main macroeconomic factors that determine corporate failure in Jordan. However, unanticipated changes in the interest rate negatively and significantly affect corporate failure in Jordan. This finding is interesting, as unexpected changes in 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 countries. 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. Following the discussion above, our principal conclusion is that macroeconomic variables play an important role in determining the firm's performance and default risk. Furthermore, both agency costs theory and capital structure theory, and tax theory can partly explain the firm's performance and default risk for Jordanian companies.

## 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	
<b>INFL</b>	1																			
<b>INTR</b>	0.408	1																		
<b>CRGDP</b>	0.067	0.369	1																	
<b>ISCRG</b>	-0.052	-0.266	-0.225	1																
<b>MS2</b>	0.160	-0.440	-0.252	0.195	1															
<b>EXPO</b>	0.133	-0.030	0.259	-0.158	0.286	1														
<b>PMI</b>	0.206	0.159	0.003	-0.186	0.077	0.119	1													
<b>TDTA</b>	0.107	0.033	0.037	0.032	0.110	0.088	0.021	1												
<b>TDTC</b>	0.077	0.077	0.031	-0.026	-0.016	0.018	0.018	0.490	1											
<b>ln(assets)</b>	-0.056	-0.043	-0.035	-0.021	-0.059	-0.028	0.025	0.227	0.424	1										
<b>ln(sales)</b>	0.024	0.016	0.001	-0.013	-0.033	0.028	0.044	0.235	0.398	0.779	1									
<b>AGE</b>	0.027	-0.036	0.014	0.005	-0.007	0.035	0.040	0.165	0.450	0.430	0.469	1								
<b>NICAP</b>	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							
<b>CASHF</b>	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						
<b>TAX</b>	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					
<b>STDVCF</b>	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				
<b>C1</b>	-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			
<b>INSTIT</b>	-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		
<b>FOREIG</b>	-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

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

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

**Appendix 5: Population-Average Estimation and Corrected Standard Errors with Auto-Correlation**

Explanatory Variables	PA		Random Autogressive		PA		Random-Autogressive	
	ROA	ROA	ROA	ROA	MBVR	MBVR	MBVR	MBVR
<b>Constant</b>	-0.1715 (-6.62)***	-0.1786 (-6.77)***	-0.1674 (-5.88)***	-0.1723 (-5.92)***	-0.6758 (-1.13)	-1.0041 (-1.66)*	0.3583 (0.55)	0.2056 (0.31)
<b>Microeconomic Variables</b>								
<b>TDTA</b>	-0.0978 (-9.4)***	-0.0994 (-9.58)***	-0.1040 (-8.91)***	-0.1054 (-9.06)***	-0.0269 (-0.1)	0.0340 (0.12)	0.1842 (0.62)	0.1999 (0.67)
<b>SIZE</b>	0.0134 (7.97)***	0.0138 (8.23)***	0.0135 (7.15)***	0.0138 (7.32)***	0.1424 (3.61)***	0.1510 (3.84)***	0.0913 (2.04)**	0.0948 (2.11)**
<b>AGE</b>	-0.0003 (-0.97)	-0.0003 (-1.29)	-0.0002 (-0.62)	-0.0003 (-0.88)	-0.0016 (-0.25)	-0.0011 (-0.17)	0.0131 (1.45)	0.0133 (1.49)
<b>NICAP</b>	0.2040 (23.93)***	0.2040 (23.94)***	0.2053 (22.93)***	0.2051 (22.88)***	-0.0488 (-0.28)	-0.0376 (-0.22)	-0.3919 (-2.62)***	-0.3856 (-2.57)***
<b>STDEVCF</b>	-0.0487 (-2.9)***	-0.0481 (-2.87)***	-0.0553 (-2.92)***	-0.0548 (-2.89)***	-0.1098 (-0.32)	-0.0865 (-0.25)	-0.0071 (-0.02)	0.0056 (0.01)
<b>TAX</b>	0.0048 (0.67)	0.0038 (0.53)	0.0048 (0.65)	0.0041 (0.56)	0.0687 (0.5)	0.0660 (0.48)	0.0855 (0.76)	0.0769 (0.68)
<b>Macroeconomic Variables</b>								
<b>INFL</b>	0.2004 (1.27)	0.1854 (1.17)	0.1522 (0.93)	0.1381 (0.84)	8.9123 (2.78)***	9.5458 (2.98)***	-2.8648 (-1.06)	-2.7190 (-1.00)
<b>MS2</b>	-0.0428 (-0.49)	-0.0431 (-0.5)	-0.0428 (-0.48)	-0.0429 (-0.48)	-3.7787 (-2.14)**	-3.6794 (-2.08)**	-2.3553 (-1.62)	-2.3597 (-1.61)
<b>INTR</b>	-0.0856 (-1.46)	-0.0893 (-1.52)	-0.0665 (-1.08)	-0.0704 (-1.14)	-6.2604 (-5.29)***	-6.1956 (-5.25)***	-2.6100 (-2.4)**	-2.6249 (-2.41)**
<b>PMI</b>	0.0985 (3.51)***	0.1012 (3.6)***	0.0941 (3.31)***	0.0971 (3.41)***	1.4971 (2.67)***	1.3839 (2.46)**	1.3507 (2.93)***	1.3173 (2.84)***
<b>EXPO</b>	0.0063 (0.89)	0.0060 (0.85)	0.0041 (0.66)	0.0039 (0.63)	0.3672 (2.6)***	0.3606 (2.54)**	-0.0329 (-0.38)	-0.0328 (-0.37)
<b>Credit_GDP</b>	0.0009 (0.24)	0.0007 (0.17)	-0.0010 (-0.26)	-0.0012 (-0.32)	0.0769 (0.98)	0.0907 (1.16)	-0.0362 (-0.67)	-0.0338 (-0.63)
<b>ISCRG</b>	0.5305 (2.27)**	0.5312 (2.26)**	0.4753 (2.2)**	0.4753 (2.18)**	3.5257 (0.75)	3.4688 (0.74)	-6.8228 (-2.14)**	-6.8000 (-2.12)**
<b>Ownership Variables</b>								
<b>Largest Owners (C1)</b>	0.0295 (1.82)*	0.0256 (1.73)*	0.0277 (1.5)	0.0244 (1.43)	0.1271 (0.35)	0.1359 (0.4)	-0.0702 (-0.17)	-0.0866 (-0.22)
<b>INSTIT</b>		-0.0098 (-0.69)		-0.0059 (-0.37)		0.5734 (1.79)*		0.3516 (0.96)
<b>No. of observations</b>	1049	1042	1049	1042	962	957	957	962
<b>R-square</b>	0.56	0.56	0.56	0.56	0.0205	0.0205	0.0205	0.0205
<b>Wald Test F(13,890)</b>	1091.72 (0.00)***	1101.32 (0.00)***	952.15 (0.00)***	956.39 (0.00)***	95.83 (0.00)***	98.15 (0.00)***	45.21 (0.00)***	45.13 (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.

## References

- Altman, E. I., 1968, Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance* 23 (September), 589-609.
- Altman, E. I., 1983, Multi-dimensional Graphics and Bankruptcy Prediction: A Comment, *Journal of Accounting Research* 21 (Spring), 297-299.
- Altman, E. I., 1984, The Success of Business Failure Prediction Models: An International Survey, *Journal of Banking and Finance* 8, 171-198.
- 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.
- Baum, Christopher F., 2001, Residual Diagnostics for Cross-Section Time Series Regression Models, *Stata Journal* 1, 101-104.
- 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.
- 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.
- Hudson, J., 1986, An Analysis of Company Liquidations, *Applied Economics* 18, 219-235.
- Bernanke, B. C., and M. Gertler, 1995, Inside the Black Box: The Credit Channel Monetary Transmission Mechanism, *Journal of Economic Perspective* 9, 27-48.
- 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.
- 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.
- Davis, E. P., 1995. *Debt, Financial Fragility, and Systemic Risk, Revised and Expanded Edition* (New York: Oxford University Press).
- 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.
- Drukker, D. M., 2003, Testing For Serial Correlation in Linear Panel-Data Models, *Stata Journal* 3, 168-177.
- 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.
- Eichengreen, B., and C. Arteta, 2000, Banking Crises in Emerging Markets: Presumptions and Evidence, Working Paper No. C00-115, August, University of California, Berkeley.
- Gordon, R. J., 1981, The Consumer Price Index: Measuring Inflation and Causing It, NBER Reprints 0191, *National Bureau of Economic Research, Inc.*
- Greene, W. H., 2003. *Econometrics Analysis* (Prentice Hall, New York).
- Hausman, J. A., 1978, Specification Tests in Econometrics, *Econometrica* 46, 1251-1271.
- Hunter, J., and N. Isachenkova, 2003, Aggregate Economy Risk and Company Failure: An Examination of UK Quoted Firms in the Early 1990s, Working Paper, Mimeo.



- 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, New York).
- Liu, J., 2004, Macroeconomic Determinants of Corporate Failures: Evidence from the UK, *Applied Economics* 36, 939-945.
- 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.
- Platt, H. D., and M. B. Platt, 1994, Business Cycle Effects On State Corporate Failure Rates. *Journal of Economics and Business* 46, 113-127.
- Robson, M. T., 1996, Macroeconomic Factors in the Birth and Death of U.K. Firms: Evidence from Quarterly VAT Registration. *Manchester School* 64, 57-69.
- Shivaswamy, M., J. P. Hoban, and K. Matsumoto, 1993, A Behavioral Analysis of Financial Ratios, *The Mid-Atlantic Journal of Business* 29, 7-24.
- Sharabany, R., 2004, Business Failures and Macroeconomic Risk Factors, Working Paper No. 2004.06, Cental Bank of Israel, Israel.
- Simmons, P., 1989, Bad Luck and Fixed Costs in Personal Bankruptcies, *Economic Journal* 99, 92-107.
- Stiglitz, J. E., and A. Weiss, 1981, Credit Rationing In Markets With Imperfect Information. *The American Economic Review* 74, 194-199.
- 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.
- 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
- Vlieghe, G. W., 2001, Indicators of Fragility in the UK Corporate Sector, Working Paper, ISSN 1368-5562, The Bank of England, UK.
- Wadhvani, S., 1986, Inflation, Bankruptcy, Default Premia and the Stock Market, *Economic Journal* 96, 120-38.
- White, H., 1980, A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity, *Econometrica* 48, 817-838.
- Whited, T., 1992, Debt, Liquidity Constraints and Corporate Investment Evidence From Panel Data. *Journal of Finance* 47, 1425-60.
- Wooldridge, J. M., 2002. *Econometric Analysis of Cross Section and Panel Data* (MIT Press, Cambridge).
- Young, G., 1995, Companies Liquidations, Interest Rates and Debt. The Manchester School Supplement, 36, 57-69.