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Business Failures and Macroeconomic Risk Factors[1]

by

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Abstract

This paper analyzes the characteristics of businesses in Israel that went into liquidation. It finds that those businesses had fewer employees than the average, local-market oriented, and were mainly in manufacturing, and in particular in traditional industries. Quarterly data (from 1990:I to 2002:I) on the compulsory company liquidation rate and potential macroeconomic determinants are used to build a time-series econometric model which tests explicitly for the impact of macroeconomic variables on the number of company liquidations in Israel. The results show that the liquidation rate rises with unexpected inflation and with positive changes in the nominal and real interest rates. The output gap negatively affects the liquidation rate. In line with the findings of Bernanke, Gertler and Gilchrist (1996), it was found that the factors relevant to the businesses that went into liquidation do not necessarily affect the financial distress of traded companies. This is because the latter are generally larger and can therefore more readily raise debt or capital, and are usually less affected by credit rationing.

1. Introduction

This paper investigates the determinants of company failures in Israel. Company failure may be defined in various ways, (a) discontinuation of the business, (b) the business does not earn an adequate return, (c) insolvency via the court. The first definition is a proxy of a business failure, as discontinuation suggests that resources have been shifted to more profitable opportunities. This is a very broad definition of failure, because discontinuation may be caused by non-economic motives such as merger, acquisition, and even renaming. The advantage of the second definition is that it provides an economic criterion for failure. However, it is subjective because an adequate return is hard to define. In this paper, because of the availability of the data, we focus on compulsory liquidation, where the firm is declared insolvent by a court. Compulsory liquidation is based on an economic criterion because insolvency arises from a debt that is not in dispute. Approximately 5% of businesses close for this reason. The paper shows that there is a relation between the first and second definitions and the third one, enabling conclusions to be drawn about the closure of firms in accordance with the second definition.

First we categorize failed companies by industry, and compare each industry with the overall business sector, so that the chances of liquidation of different industries can be compared. It was found that manufacturing companies are more likely to fail than service or trading companies. Among manufacturing companies, those with traditional technology are the most likely to go into liquidation. Also, the companies that went into liquidation had fewer employees on average than did all business-sector companies, and they were less likely to be exporters.

The failure rate of corporations is determined by three factors: 1. firm risk, i.e., the effectiveness of the management and adequacy of its capital. Young companies are more likely to fail than experienced companies (see Altman, 1993). Small companies are more prone to go bankrupt because their accessibility to the credit markets is more limited than that of large companies (Bernanke and Gertler, 1995). 2. industry risk, i.e., a shock to a specific industry, such as its exposure to import reform, tariff reform, etc., and 3. macroeconomic risk, i.e., risk deriving from macroeconomic or monetary factors. The goal of this paper is to explain the rate of liquidation due to macroeconomic variables such as the clearing bank base rate, unexpected inflation,

lending to the company sector, the output gap, the difference between changes in the real wage and change in labor productivity, and the birth rate of new companies.

A firm usually fails because of a combination of factors. If, for example, a firm has liabilities in foreign currency and the local currency depreciates, it is unable to cover its liabilities and therefore goes bankrupt. Two factors determine this company failure, a firm factor - the manager's decision to take a loan in foreign currency - and a macroeconomic factor – local-currency depreciation.

The particular interest of this paper is to understand the role of the macroeconomic factors determined by policy-makers, such as interest rates, inflation, etc, in company failure. The paper uses macroeconomic data on the compulsory liquidation rate. This series is available in Israel for 1990:1-2002:1.

There are numerous cross-sectional studies of the causes and dynamics of business failures (Taffler, 1983; Altman & Spicack, 1983; Keasey & Waston, 1986; Wilson, Hope and Summers, 2000). Using micro-data on firms, these papers analyzed the financial characteristics of failing firms and found that liquidity constraints and cash-flow problems often precipitate financial distress and failure. The aim of most of these studies was, however, to build models predicting the failure of an individual firm.

The value of investigating company failures derives from their effect on the economy as a whole. The most important effect is that company failure could indicate the fragility of the business sector and have far-reaching macroeconomic consequences. Liquidation is an extreme form of credit impairment. Company failures may affect bank capital: if realized losses on the company loan book are unanticipated, bank capital is eroded, thereby weakening the banking system. Understanding the factors that determine company failures in Israel is, therefore, important for banks, regulators, and the authorities.

In this context we also examined the effect of macroeconomic factors on financial distress on traded manufacturing companies, and found that such an effect does exist, but as this population is essentially different from the population of companies that failed, the same macroeconomic factors do not always affect the two populations in the same way.

To analyze company liquidations I use the company liquidation rate, which is the number of liquidations divided by the stock of companies. A measure that takes into account the size of companies would be desirable from the aspect of measuring its

importance to banks, but no aggregate data are available in Israel on the size of liquidated companies.

Note, however, that failure due to firm, industry, or macroeconomic factors might have a positive effect on the business sector as a whole (Caballero and Hammour, 1994) because resources from less efficient firms or industries are reallocated to more efficient ones.

The econometric result shows that the key relationships between compulsory company liquidation and the potential determinants are in accordance with the theory. Specifically, an increase in the level of the nominal and real interest rates and unexpected inflation positively affect the compulsory company liquidation rate. While the output gap (which is high in recession) negatively affects it, increases in the level of lending to the company sector and the birth rate of companies increase the compulsory company liquidation rate in the short term and decrease it in the long term.

The paper also examines the effect of macroeconomic parameters on the financial stability of traded manufacturing companies. The liquidation of firms as a result of macroeconomic causes is a measure of financial distress in its widest meaning, as it may be assumed that a company that is liquidated due to insolvency encountered financial difficulties prior to its liquidation. This therefore leads to the broader question of how macroeconomic variables affect the robustness of the business sector.

The analysis of financial relations in traded manufacturing companies, which reflect the degree of financial distress, shows that they are less affected by macroeconomic factors, and are not affected by changes in the short-term interest rate or by the output gap. On the other hand, they are affected by changes in the exchange rate, as would be expected for large companies which export a high proportion of their production.

The paper is organized as follows: section 2 describes the process of liquidation via the courts in Israel and describes the features of companies which go into compulsory liquidation via court; section 3 presents the theoretical model of a firm which goes into liquidation via the court, presents some key empirical papers; section 4 presents the empirical model and empirical results and the relation to financial distress. Section 5 concludes.

2. Companies which liquidate via court

2.1. The process of liquidation via the courts in Israel

There are three kinds of liquidation orders regarding firms: voluntary, under supervision, and by court order. In this paper, I refer solely to liquidation through a court order, which is granted only if specific legal conditions are met. The main reason for a court order to be requested (over 95 percent of cases) is insolvency, i.e., the inability to pay a debt that is not disputed.

The courts have some leeway in deciding on liquidation (sections 257 and 263 of the Companies Ordinance), as the process is irreversible. If the judge thinks that there is social or other justification that overrides the need for liquidation, he or she can decide not to close a firm.

The law does not mention economic efficiency as a reason for accepting or rejecting liquidation. There are economic considerations, however, since capital is an economic resource and liquidation means that the capital that is returned to the creditors can be utilized with a higher marginal return through alternative transactions. Considerations of economic efficiency also enable the court to appoint an active receiver, in order to set the firm on the road to recovery. This was the case with El-Al, Israel Shipyards, and Alliance.

The liquidation process is as follows: when the entity requesting liquidation, generally a creditor, submits a request to the court,[1] a copy is sent to the firm's registered office.[2] The liquidation request is submitted to the Official Receiver if there is justification for liquidation., e.g., failure to respond to a demand for payment. At this stage a file is opened on the firm by the Official Receiver. If the company submits the liquidation request, a statement of its assets and liabilities, updated to the date of the request submitted by the company, is attached to it. The law does not define the maximum time between the submission of a request and its discussion by the court. After submission of the liquidation request, and before the substantive discussion, the court may appoint a provisional receiver whose task it is to preserve the firm's assets.

[1] The series CAR, see definition in Appendix A

[2]The fact that a firm is notified that a request for its liquidation has been submitted gives it a chance to pay its debt.

In most cases, however, he is not entitled to sell them unless authorized to do so by the court.

The data provided by the Official Receiver indicate that the median time between a request and the court's discussion of it is 160 days, i.e., two quarters. There are variations in the time that elapses till liquidation, and this may proceed rapidly or slowly. It is known that the period is short for start-ups because the employees know their rights, while in other industries it may take longer**.**

Note that some of the companies that went into liquidation had been inactive for a long time, i.e., in some cases there is a considerable interval between the cessation of a company's activity and the submission of the request for its liquidation. No data are available on the proportion of firms which had been inactive for a long time before the liquidation request was submitted.

Additional parties to the request for a liquidation order, as well as opponents of it, may participate in the court discussion regarding a liquidation order. The figures show that a liquidation order was granted for 62 percent of the firms against which proceedings were begun. This figure remained more or less stable during the period of the study. If a request for the liquidation of a firm is denied by the courts, this is usually on the grounds that the creditors have reached a settlement with the firm as regards the debt. The policy of the courts on granting liquidation orders has not changed over the years, though fewer provisional receivers are currently appointed.

Israel's judicial system is oriented towards the English one, which provides strong protection for creditors. In the rating undertaken by La Porta et al. (1998), Israel's judicial system was rated 4/4 as regards creditors' rights. In an international comparison made in the same paper Israel received very high grades for such variables as the efficiency of the judicial system and relative lack of corruption.

After a liquidation order has been granted (the dependent variable CLR in the empirical model, see appendix A for definition), the court must decide which direction it should take: questioning of directors, identification of assets, liquidation, etc. The purpose of the report submitted by the Official Receiver once the liquidation order had been granted is to assist the court in reaching a decision. It is up to the court to decide to what extent the firm will function after the liquidation order is issued, considering its chances of recovery if it is sold as a going concern.

A negligible fraction of firms survive liquidation and continue to function. Currently, it is possible to suspend the process in order to reach an arrangement, and when this is the case firms have no incentive to embark on the liquidation process and subsequently rehabilitate. There are regulations that deal with the legal requirements for this, but these have had no effect on the number of bankruptcies since they were introduced at the end of the research period. The feature characterizing firms which survive liquidation is that they are solvent and their shareholders disagree with one another.

As is generally known, large firms have a better chance of being rehabilitated, but there are no data for this. Even before the new law was introduced, changes were made in the regulations concerning the arrangements for suspending procedures. During the sample period, no substantial changes were made in the Companies Ordinance that affected the proportion of firms going into liquidation.

2.2. The features of companies which liquidate via court

The average number of employees in companies that went into liquidation in 2001 was 11.2,[3] whereas the average number of employees in companies in the business sector was far higher, 17.[4] For the companies that went into liquidation exports constituted 11.4 percent, while the figure for the economy as a whole is 23.7 percent.[5] Companies that went into liquidation in the research period had been established for 8.7 years on average, while the median (of the same companies) was 5.3 years. Hence, in line with the theory, newer companies have a higher liquidation tendency. No data is available on the average age of all companies in the economy, but the average age of manufacturing companies traded on the stock exchange was about 28 years.

We now turn to the question of whether companies in particular industries are more likely to go into liquidation than those in other industries, and analyze the difference between the characteristics of companies that went bankrupt and those of all business-

[3] Calculated from the number of employees who submitted claims for compensation to the National Insurance Institute as a result of the liquidation of the company in which they had been employed, *divided by* 0.8, as according to data from the Official Receiver about 80 percent of such employees actually submit claims.

[4] Based on the 2002 Companies Register.

[5] Based on the 2002 Companies Register. The definition of export is Export>5000$. In another definition of export: Export>10% of revenue, 18.5 percent of total companies are included.

sector firms. The category of companies that had gone into liquidation was created by merging two data bases of the Ministry of Justice. One gave particulars (name and registered private-company number) of companies that had gone into liquidation (i.e., for the Company Liquidation Rate, CLR), and of a larger group that included companies for which requests for liquidation orders had been submitted (Company Application Rate, CAR). This data base was merged with the second one that contained information on the purpose of establishment of all the companies. The company name and purpose of establishment enabled about 91 percent of the companies for which liquidation orders had been issued to be classified by industry, and the data were extrapolated to include the total population of such companies. Every company was classified into one of the two-digit industries according to the 1993 (Central Bureau of Statistics (CBS) classification. To enable inter-industry comparison of the probability of going into liquidation (henceforth the liquidation tendency), data were obtained from the CBS on the number of companies in the economy by industry (the data were derived only for 2002,[6] from the new CBS register of active companies, including subsidiaries) (see Table 1).

The industry with the highest liquidation tendency is manufacturing, followed by construction, while health and welfare services and banking and insurance have the lowest tendency. From the overall economy aspect, manufacturing inflicted the greatest damage. Manufacturing companies, which constituted only 13 percent of all companies in the economy, accounted for 28 percent of all company liquidations in the research period. After manufacturing came wholesale and retail trade and repairs, which accounted for 23 percent of all company liquidations, followed by business services, due to the large number of companies in the latter industries.

[6] The breakdown of all companies by industry is available from the CBS only for 2002; no year-by-year breakdown is available.

Table 1

Companies that went into liquidation, by industry

Industry[1]	Total no. of companies in the economy[2] 2002	Number of liquidated companies 1990:1-2002:1	Industry share in economy (percent)[3]	Industry share of liquidated companies in total liquidations[4]	Liquidation tendency by industry (average = 1.00)[5]
Community, social, personal and others services	2,521	61	3.2	1.8	0.55
Health and welfare services	2,717	32	3.4	0.9	0.27
Education	682	23	0.9	0.7	0.77
Business services	21,890	631	27.5	18.1	0.66
Banking and insurance	2,918	66	3.7	1.9	0.51
Transport, storage and communications	4,030	152	5.1	4.3	0.86
Hotels and catering	3,444	137	4.3	3.9	0.91
Wholesale and retail trade and repairs	20,407	810	25.7	**23.2**	0.90
Construction, electricity and water[6]	9,312	550	11.7	15.7	**1.34**
Manufacturing	10,436	988	13.1	**28.3**	**2.15**
Agriculture	1,186	45	1.5	1.3	0.86
Total	79,543	3,496	100.0	[7]100.0	

1.Public services are omitted as companies in the industry are not part of the business sector and thus do not go into liquidation due insolvency.
2. The total number of companies in the economy and the total number of company liquidations are not normalized by the number of employees.
3. The number of companies in the industry *divided by* the total number of companies in the economy.
4. The number of companies in the industry that went into liquidation *divided by* the total number of companies in the economy that went into liquidation.
5. The number of companies in the industry that went into liquidation *divided by* the total number of companies in that industry. The average is 1.00, based on 100 percent of the companies in the economy that went into liquidation *divided by* 100 percent of the companies in the economy
6. Construction also includes the corporations engaged in the production of electricity and water, that were not affected as they are highly centralized.
7. The percent of companies that liquidate in the total economy.

Note that there is no industry bias regarding companies for which requests for liquidation orders have been submitted; in other words, the issue of a liquidation order is independent of industry (see Appendix C). Additional data (from the CBS industry

survey) show that there is no major difference in the probability to export for an industrial company and a liquidate industrial company about 17 percent for each.

Division into sub-periods - The research period was divided into two sub-periods: 1990:I to 1997:I, and 1997:II to 2002:I (see table in Appendix C). It can be seen that the trends in the two sub-periods are the same as the general trend: although the number of companies going into liquidation rose in the second sub-period, after weighting with the number of active companies in each period, the rise in the number of liquidations between the two sub-periods does not represent a rise in the liquidation tendency. The inter-industry comparison shows that the two industries with the highest liquidation tendency in both sub-periods were manufacturing (see below) and construction. The construction industry was worse affected in the second sub-period than in the first, due to the severe crisis the industry is undergoing as a result of the fall in demand mainly because the drop in the number of new immigrants. A marked rise in liquidations in the two-digit industry computer services and R&D as well as in communications services[7] is probably related to the marked increase in activity in the industry in the last few years. Agriculture suffered more in the first sub-period than in the second.

Table 2

Manufacturing companies that went into liquidation, by technological intensity of company

Technological intensity	Percent of total	Liquidated manufacturing companies as percent of total liquidations in manufacturing	Average number of employees per manufacturing company[1]	Average number of employees per liquidated manufacturing company	Liquidation tendency by technological intensity (average =1.00)
High tech	10	10	55	15	1.06
Mixed high tech	13	10	41	7	0.80
Mixed traditional	34	28	25	12	0.78
Traditional	43	52	32	9	1.22
	100	100	33	10	1.00

1. Based on the weighted average in industry surveys in the years 1990–94. The actual number is almost certainly lower since only companies employing five or more workers have been included.

Table 2 shows that within the manufacturing industry companies with a low technological intensity had a high liquidation tendency, traditional technology,

including textile and clothing plants, whereas companies with a medium level of technology had a low liquidation tendency. High-tech industries had a medium liquidation tendency due to the fact that activity in this area expanded rapidly in the years relevant to this study, so that on the one hand a large share of the businesses are relatively new and therefore have a high liquidation tendency, while on the other hand the growth in activity derived from the increase in world demand for the products in which Israel had a comparative advantage.

In the second sub-period the liquidation tendency in manufacturing was more moderate than in the first. This occurred mainly in traditional industries, where fewer companies went into liquidation, while in the mixed high-tech and mixed traditional industries more did so in the second sub-period than in the first.

3. Theoretical Background

3.1. Theoretical considerations

This section considers theoretical links between the macroeconomic variables and insolvencies. The theoretical underpinning of the analysis is provided by a stylized version of Wadhwani's (1986) model. A firm is assumed to go bankrupt when the sum of its current year's profit, Π, and the expected value of equity (excluding Π), S, is negative, so that $\Pi + S < 0$. This condition assumes that a firm has access to external capital and can borrow up to its net worth. If a firm is constrained at its current level of borrowing, the bankruptcy condition substitutes the liquidation value of the firm's assets for the expected value of equity.

The probability of bankruptcy (for firms able to borrow) is: $\Pr ob[\Pi + S < 0]$ for a random variable Π with mean μ_{Π} and standard deviation σ_{Π}. The probability of bankruptcy is then a negative function of profitability, but a positive function of the availability of debt, and a measure of the variability of the profitability.

To decompose the change in profitability, it can be rewritten as $\Pi = pY - wL - qM - rD$, where p is the output price, Y is the output, w is the wage rate, L is the level of employment, q is the input price, M is the raw material, r is the interest rate, and D is the level of debt. In the empirical model variants of the profit's components are used and not the profit itself, firstly because as there is no perfect

[7] The two-digit computer and R&D industries are part of the business services industry.

measure of aggregate profit, the determinants of profit may have greater explanatory power than profit itself (see Vlieghe, 2001). Second, it is important to understand how the macroeconomic variables (which define the aggregate profit and may be determined by economic policy) affect the rate of liquidation.

Now, let us analyze the effect (of variants) of the firm's profit components. Inflation, both unexpected and expected, may affect the firm's profit. In general, unexpected inflation would lead to an erroneous output level, resulting in the misallocation of resources. Specifically, unexpected inflation affects the firm's profit. If actual inflation is lower than expected inflation, i.e., $(\pi_t^e - \pi_t)>0$ (see appendix A for definition of the variables used in the empirical model), at the time of entry into a nominal and fixed rate of debt or nominal wage contract, then it increases both the firm's real interest payments and the real wage. As a result, the firm's profit is reduced and the probability that it will go bankrupt increases.

Expected inflation may also have a real effect on some companies' profit. Wadhwani (1986) notes that when expected inflation rises, a firm with a floating-interest nominal debt and no access to external capital, i.e., it cannot increase its nominal value of debt, experiences a negative cash-flow effect as its interest payments increase by more than the output price. This is because the nominal interest payments that the firm must pay include payment of principal. The nominal value of the firm's debt (without the current required payment of nominal interest) remains as it was before the price rise, while the real value of the debt is lower after it. The difference between the real value of the debt before and after the price rise is expressed by the negative cash flow. As a result, it is expected that for such a firm an increase in the nominal interest rate, i.e., $\Delta R>0$, will increase the rate of liquidation. This theory suggests that it is not the level of nominal interest but the difference between nominal interest in period t and t-1 that affects the liquidation rate.

If a firm has access to external capital, then, in the same case, the increase in the nominal value of its assets allows it to borrow more in order to offset the negative cash-flow effect. As long as firms can borrow against the market value of their assets, expected inflation will be neutral, i.e., have no real effect. This applies only if a firm has access to external capital on the same terms as internal funds, and depreciation is perfectly indexed.

In fact, there is a large theoretical and empirical literature as summarized in Freixas and Rochet (1997), e.g., Schiantarelli (1996) that considers whether firms are credit-constrained and, if they are, whether they face an external finance premium in accessing external funds rather than internal finance. If firms are credit-constrained, higher expected inflation will increase the probability of default through the negative cash-flow effect due to higher nominal interest rates - often referred to as the `front-end loading effect' of inflation on debt. A change to a higher level of expected inflation - and therefore a higher level of nominal interest rates - will then have real effects.

The credit-channel literature also suggests that higher nominal interest rates will have a greater effect on company real activity. For the credit-channel to be operative, banks have to play a special role in the private sector. Bank finance plays an important role in firms' finance in Israel. This is especially the case for small firms, which are more prone to insolvency than large ones.

According to the credit-channel theory, the direct effect of monetary policy on interest rates is amplified by endogenous changes in the external finance premium; this has been called the "financial accelerator effect". The change in monetary policy that raises or lowers open-market interest rates tends to change the external finance premium in the same direction. The credit-channel theory also suggests that the availability of credit is not comprehensible at a time of tightening monetary policy, especially for small firms (Bernanke and Gertler, 1995) and (Bernanke, Gertler and Gilchrist, 1996). Commercial banks shift the supply of intermediated credit (loans by banks); this has been called the bank lending channel. This increases the external finance premium and reduces real activity.

As a result, the availability of credit, which can be measured as the ratio of the change in business-sector debt to the change in GDP, i.e., $\Delta DEBT\_R$, is expected to be negatively correlated with the rate of liquidation in the short run. In the long run, however, an increase in a firm's leverage should increase the probability of liquidation.

It might be expected that a rise in the real interest rate, which increases real interest payments, tends to reduce investment, spending and real economic activity, thereby increasing the probability of liquidation.

GAP, the business cycle, expresses the difference between actual and potential GDP (which falls at a time of prosperity and rises in a slump[8]), or between actual GDP and its trend, GAP_{PF} and GAP_{HP} respectively. It is expected that the rate of companies being liquidated will decline in a period of prosperity.

Assuming that at long-term equilibrium there is a cointegrative relation between real wages and labor productivity (see Lavi and Sussman, 2001). In the short run, however, there are real wage rigidities, so that when the rise in wages in the short run outstrips that in labor productivity, i.e., $(\Delta w - \Delta Y_{LP}) > 0$ the rate of companies being liquidated can be expected to rise.

It is well established that the variable *NEW*, the number of new firms, is relevant as a firm risk variable because new managers who are associated with new firms are less experienced and therefore tend to make more mistakes. Altman, 1983, noted that firms are most likely to fail within three years of formation. Those failures result from a variety of causes, including poor planning during the business development phase, a limited capital base, and inadequate managerial abilities.

3.2. Previous studies on aggregate company liquidations

Liu and Wilson (2002), Vlieghe (2001) and Cuthbertson and Hudson (1996) show the impact of macroeconomic factors on the probability of compulsory liquidation using UK data, which, unlike Israeli data, are not stationary. Vlieghe (2001) found that the debt/GDP ratio, the real interest rate, deviation of GDP from trend, and the real wage are long-run determinants of the liquidation rate. The birth of new companies, an index of property prices, and the nominal interest rate have significant short-run effects.

The paper most similar to the current one is that of Young (1995). Using 2sls regression he focused on the effect of interest rates on company liquidations. He argued that what matters is not real interest rates and inflation per se, but the extent to which ex-post inflation and real interest rates differ from their expected levels. He concluded that inflation hurts companies on the way up, due to cash-flow problems associated with high nominal interest rates, and on the way down, when a stronger than anticipated fall in inflation causes high real wages and real interest rates. Zinger (1992) uses a logit regression, defining company failure as discontinuation of the

[8] The relevant slumps in Israel occurred in April 1988- August 1989, March 1996- November

business. Using Israeli social security microeconomic data on firms for 1987-1990, he shows that industry, geographic area, age, and the wage paid to employees are the main factors that determine the probability of company failure. He also shows that minimum-wage legislation increases the probability of company failure. Since the data period is very short, it is not possible to investigate the impact of macroeconomic factors on the probability of company failure.

4. Methodology and Specification

We now examine the theoretical model. As noted in the model, the variables used are the components of the firm's profit.

4.1 Data

Quarterly data are used, as conventional in this literature, because many of the macroeconomic series used here are from the National Accounts, which are measured quarterly. In addition, it is reasonable to assume that the speed with which macroeconomic variables cause a company to go bankrupt is longer than a month.

Data on company liquidation in Israel: This data was received from the Ministry of Justice. Between the beginning of 1990 and the first quarter of 2002 about 5,094 requests for liquidation by the courts, about 3,200 of them were issued by the court. Most of the liquidation orders were issued in the Tel Aviv area. In 2001, 369 liquidation orders were issued by the courts.

The seasonal nature of liquidation orders (CLR):[9] The number of requests peaks in March and declines until September. This trend recurs each year, and can be ascribed to the recess that begins in July and ends in September, as well as to the Jewish high Holydays in September-October. During this period not only do the courts which grant the liquidation orders work on a rota basis, but the other elements in the system also operate slowly. No new decisions are made by the courts, so that fewer files are opened by the Execution Office; creditors who are public entities function at a lower level of intensity, so that there is less pressure on debtors, and the latter are in less of a hurry to request a liquidation order. Activity begins to pick up towards December, and reaches a peak in the spring (around Passover). This is followed by another slack period, which is at its nadir during the courts' recess. This applies with regard to all

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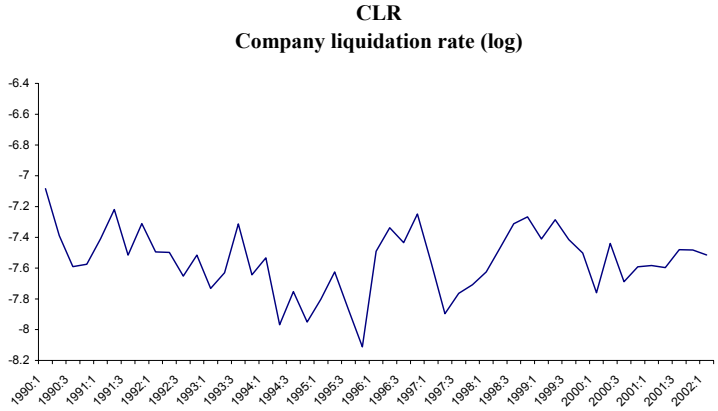
1996, May 1998- January 1999 and November 2000- …

[9] Gittit Sar-Shalom, of the office of the Official Receiver, explained the seasonal nature of orders issued for the liquidation of companies.

the series presented. To find the rate of company failure the total number of liquidations was divided by the total number of active companies.

All the real data are seasonally adjusted, taking the Jewish holidays into account. Figure 1 refers to the company liquidation rate, i.e., CLR.



Description of other variables

Two definitions of (Δw-ΔYLP) are used: one (Δw-ΔYL), in which labor productivity is measured by product input, and the other, (Δw-ΔYEM), in which labor productivity is measured by the number of employees.

The variable ΔDEBT_R is a very rough indicator for business-sector debt because it reflects gross and not the net debt. We could not find a net debt variable (see definition of variables in Appendix A and graphs of the variables in Appendix B).

Interest rates during the period of the research: Monetary policy in Israel during the 1990s was expansionary in some periods and tight in others. From the end of 1993 until mid-1995, nominal interest rates were raised to fight inflation. During that period, real short-term rates also rose. Tight monetary policy was implemented at the end of 1996 and during 1997 as well.

Potential GDP in the research period: During most of the 1990s, GDP was smaller than estimated "potential" GDP. As a result, there were no perceived inflationary pressures from the product market that might have affected monetary policy.

The real NIS/dollar exchange rate was high at the beginning of the 1990s, and fell thereafter to low levels in 1996–98, except for high rates in the third quarter of 1991 and the second quarter of 1993. In the next few years it showed some recovery. Israel's economy is a very open one, so that exchange-rate fluctuations have a marked

effect on raw-material prices, and via the profitability of exports also on company profits.

4.2 Method of estimation

In line with economic theory and previous studies, it is hypothesized that failure rates (CLR) will rise with unexpected inflation and positive change in nominal and real interest rate and the difference between the real wage and labor productivity. It is hypothesized that the failure rate will vary inversely with the rate of lending to the corporate sector and the birth rate of companies in the short run and positively in the long run. The gap, which is positive in a recession and negative in booms, should vary positively with (CLR). The following equation captures those possibilities as presented in the section - theoretical considerations.

$CLR_t=C+a_1(L)\Delta R_t+a_2(L)(\pi^e-\pi)MA_t+a_3(L)\ \Delta r5+a_4(L)\Delta DEBT\_RMA_t+a_5(L)GAP_t+$

$a_6(L)(\Delta w-\Delta Y_{LP})MA_t+a_7(L)NEWR_t$ where L is the lag operator.

Although an industry breakdown is available, even by two-digit industry, it was not possible to analyze the effect of the macroeconomic variables on the different industries, as the industry data was derived from the total period (49 quarterly observations). The number of companies that went into liquidation was too small to enable a by-industry breakdown of each observation.

There are some points that need to be clarified regarding this general equation:

1. Selection bias

In effect, the model examined is:

(Rate of compulsory liquidation via court | application to court) = F(macroeconomic variables). However, as noted in the introduction, there are other ways of closing firms for economic reasons (see definition 2 in the introduction, which is far more comprehensive than CLR, and indicates the difficulties of the business sector more precisely). Hence, it is advisable to show that there is a relationship between the definition used here and the wider one.[10] There may be a problem of selection bias that prevents making inferences from the restricted definition of CLR to the wider one.

Note, however, that studies undertaken abroad have examined the effect of macroeconomic variables on the liquidation of firms, as variously defined. Empirical

[10]The relationship between liquidation rate and financial distress is also investigated.

research in the UK by Turner, Coutts and Bowden (1992) showed that the effect of macroeconomic variables on the closure of firms by the courts was similar to that of macroeconomic variables on the closure of firms by means of an agreement between the creditors and the owners of the firm undertaken independently of the courts. Israel's judicial system is similar to England's, so that inferences about Israel can be made on the basis of studies undertaken in England. The study by Everett and Watson (1998) of the closure of small businesses in Australia showed that there are similarities between the various definitions of closure, i.e., there is a high correlation between the time series for company closures as variously defined.

2. The identification problem

The assumption underlying the estimation is that exogenous macroeconomic variables explain CLR. However, there may be macroeconomic variables that are not exogenous to CLR, e.g., suppose that the central bank reduces its key interest rate if it sees that CLR or a variant of it has risen. The GAP and the number of business-sector employees are also determined simultaneously with CLR, since the liquidation of a company reduces GDP and its employees are unemployed, at least temporarily.

Simultaneity is expressed here with a technical lag of 2–3 quarters, since this is the time period between the economic event of a company's inability to fulfill its obligations, the submission of a request to the court, and the issuing of a liquidation order, CLR, by the court.

We first examine the direction of the bias. With regard to the central bank's key interest rate, the estimate of ΔR will be biased in the opposite direction to the sign of the coefficient obtained in the (CLR) regression, since it is assumed that the central bank will reduce its key interest rate when it perceives the difficulties in the business sector. Hence, the estimation of the coefficient of the effect of ΔR on the liquidation of firms, if there is an identification problem, is an underestimation.

Second, the model predicts that the macroeconomic variables will affect the closure of firms with a lag. It seems unlikely that the effect on CLR of the macroeconomic variables is "simultaneous" as defined here. Consequently, the examination of the variables' significance is limited to a lag threshold of at least three periods.

3. Heteroscedasticity

The Newey-West HAC method is used to adjust for variance, as during the period of the study there were many changes in the factors causing companies to be liquidated,

and hence the variance of the residuals is not uniform throughout the period. An examination of the residuals shows that while the variance differs, a White test for heteroscedasticity does not contradict the assumption that the variance is the same throughout the period of the study. It was decided to use this method as it improved the statistical significance of the variables vis-à-vis LS without a Newey-West HAC correction.

4. A word of caution about the dependent variable

As stated, the date on which a firm became inactive is not known, and sometimes firms are liquidated long after they have ceased to be active. It is assumed that over time a large and fixed proportion of requests for liquidation is submitted as soon as (or soon after) there is a reason for liquidation, while the proportion of firms regarding which some time has passed since they have become inactive introduces noise into the series.

All the variables in the equation are defined so that they are stationary in the long run. The dependent variable, the liquidation rate, is stationary in the long run by nature, and the same applies to the birth rate of new companies. Other variables, which are naturally non-stationary, are defined in difference term. For unit root tests see Appendix D.

4.3. Estimation Results

We obtained three different specifications with minor differences. Specifications 1 and 2 use different definitions of the output gap and specification 3 shows the 'honeymoon effect' of new companies. In specification 3 the output gap becomes non-significant because the 'honeymoon effect' is strongly related to the GAP.

It appears that similar coefficients were obtained of each specification. The Chow breakpoint tests (see Table 1) show that there is no breakpoint in the model structure. This is in line with the fact that there has been no serious change in insolvency law or court policy during the research period. Most of the usual diagnostic tests are satisfactory. For example, in every specification the DW statistics indicate that there is no first-order serial correlation.

Regarding the Jargue-Bera statistical test of whether the residuals have a normal distribution, note that the dependent variable is a proportion and therefore its value

must be between 0 and 1, but as it is in Log form it does not have a lower limit. The CLR-Fitted does not have an upper limit either as the share of companies that went into liquidation due to insolvency in the total number of active companies is very low, and the explanatory power of the regression is high. Thus the Jargue-Bera test is valid and shows that the residuals have a normal distribution.

Interestingly, the coefficients of the independent variables become statistically significant in this model and the sign is as expected. The most powerful independent variables are ΔR and $(\pi^e - \pi)MA$ (see table 3).

Table 3: Regression coefficients and Diagnostic tests of the linear model 1992:1 2002:1

Method LS Newey-West HAC

	Specification 1	Specification 2	Specification 3
Dependent variable	CLR	CLR	CLR
Constant	-6.2721 (-11.2155)	-6.7278 (-17.6984)	-7.8777 (-19.0940)
$\Delta R(-8)$	0.0450 (5.2857)	0.0455 (4.9967)	0.0462 (5.1017)
$\Delta r10(-5)$	0.0764 (2.0690)	0.0621 (1.6955)	
$\Delta r5(-5)$			0.0718 (2.5910)
$(\pi^e - \pi)MA(-6)$	0.0507 (6.1919)	0.0558 (4.9300)	0.0391 (4.2882)
$\Delta DEBT\_RMA(-8)$	-7.1769 (-3.1917)	-8.7772 (-3.4527)	-7.8343 (-3.4455)
$\Delta DEBT\_RMA(-12)$	4.3520 (2.9630)	5.3552 (3.9334)	3.6796 (2.4130)
$GAP_{PF}(-4)$	2.7484 (2.7677)		
$GAP_{HP}(-4)$		3.1036 (2.1689)	
$(\Delta w - \Delta Y_L)MA(-9)$	7.3793 (3.6407)	7.0742 (3.2614)	7.7166 (4.1368)
NEWR(-7)			-0.3429 (-4.0724)
NEWR(-11)	0.4306 (2.5271)	0.2687 (2.3706)	0.2712 (1.8752)
Adj R^2	0.7070	0.6911	0.6955
S.E.	0.1092	0.1121	0.1114
F-sta	13.0670	12.1886	12.4211
DW	1.9019	2.0224	1.9810
Q – stat	No serial correlation	No serial correlation	No serial correlation
Chow breakpoint test 1997:2	F-st 1.3616 0.2614	F-st 0.6209 0.76724	F-st 1.3863 0.2507
Jargue-Bera	1.1628 prob 0.5591	1.04287 prob 0.5937	0.4944 prob 0.781

1. The T statistics are in parentheses.
2. The "MA" suffix indicates a 4-lag moving average.
3. Another version of the difference between the real wage and labor productivity was tested where labor productivity was defined per employee, $\Delta w - \Delta Y_{EM}$. However, it was less significant.
4. Each specification was tested additionally with a lag-dependent variable. However, it was not significant.
5. Long – 5 and 10 year – real interest rate: Neither rate is stationary in the sample period. The first differences of the long-run real rates, $\Delta r5$, $\Delta r10$ respectively, which are very similar series, were stationary. The t-values of $\Delta r5$, $\Delta r10$ were similar in each specification. Finally, using the t-value criterion, $\Delta r10$ is presented in specification 1 and 2, while $\Delta r5$ is presented in specification 3.
6. Several other definitions of Δ(nominal interest rate) were tested instead of **ΔR**; **Δ**BOIEF_Q and **Δ**R3 (see definition in Appendix A) were significant, though with less explanatory power than **ΔR**.
7. The variable "labor share" **SHR_LABOR** (see definition in Appendix A) which is a potential determinant of company failure was tested. It was not significant, however.
8. The variable "rate of check returns" **CHECK** (see definition in Appendix A) which is a potential determinant of company failure was tested. It was not significant, however.
9. We find that there is no significant muliticollinearity between the variables $(\pi^e - \pi)$MA(-6), $\Delta r5(-5)$, $(\Delta w - \Delta Y_L)$MA(-9).

Note that the equation is specified in logs so that the coefficients are elasticities, except for the coefficients of ΔR, $\Delta r5$, $\Delta r10$ and $(\pi^e - \pi)$MA which are semi-elasticities. In analyzing the effect on the dependent variable of a change in the explanatory variables, in specification 1, which has the largest F-statistic, an increase of 1 percent point in ΔR will result in a 4.50 percent increase in the liquidation rate. If the fourth quarter moving average of actual inflation is one percent lower than the expected inflation, i.e., $(\pi^e - \pi)$MA=1% then there will be 5.08 percent increase in the liquidation rate. When actual inflation exceeds expected inflation the effect acts in the opposite direction, i.e., the number of companies that go into liquidation falls.

An increase of 1 percent point in $\Delta r10$ will result in a 7.65 percent increase in the liquidation rate. As predicted, ΔDEBT_RMA has two effects. In the relatively short run, an increase of 1 percent point in the fourth-quarter moving average of it will result in a 7.18 percent decrease in the liquidation rate, while in the relatively long run it will result in a 4.35 increase in the liquidation rate.

Indeed, companies that go into liquidation are relatively small, do not export, and generally do not have access to international financial markets, so that they are highly dependent on loans from domestic sources and are therefore sensitive to fluctuations

in the domestic nominal and real interest rates and to changes in their debt to the domestic banks.

The coefficient of GAP also reveals an important effect. A 1 percent point decline in GDP from its estimated trend will increase the liquidation rate by 2.75 percent. If the real wage is one percent point above labor productivity than the liquidation rate will rise by 7.38 percent.

The birth rate of new companies has two effects: one, the 'honeymoon effect,' is similar qualitatively to the effect of GAP on the liquidation rate. The other effect is the tendency of new companies to go bankrupt more frequently than old ones.

In none of the specifications did the real NIS/$ or NIS/currency-basket exchange rate have a significant effect on the rate of companies going into liquidation. The exchange rate has opposite effects on the rate of profitability of companies indifferent industries: (1) A rise in the exchange rate is likely to increase the profitability of exporting companies. For companies that import raw material and compete with imported final goods, a rise in the exchange rate will increase their profitability. (2) A rise in the exchange rate may lower the profitability of companies engaged in the wholesale trade if they do not make a prudent adjustment to their product mix in response to the change in the exchange rate, e.g., by replacing imported goods with domestically produced merchandise. The above two effects work in opposite directions. Perhaps, this is the reason why the exchange rate was not statistically significant in the estimation. The following section examines the effect of macroeconomic variables, including the exchange rate, on the financial stability of manufacturing companies many of which are exporters whose exports account for a large part of their revenue so that effect (1) above is the dominant one.

4.4. The relation to financial distress

The liquidation of companies as a result of macroeconomic causes represents in a broad sense financial distress, because a company that goes into liquidation due to insolvency had previously encountered financial difficulties. The wider question addressed, therefore, is how macroeconomic variables affect the financial robustness of the business sector. Since financial distress is analyzed via its effect on financial ratios, only companies with published financial statements are examined.

The sample and the data sources

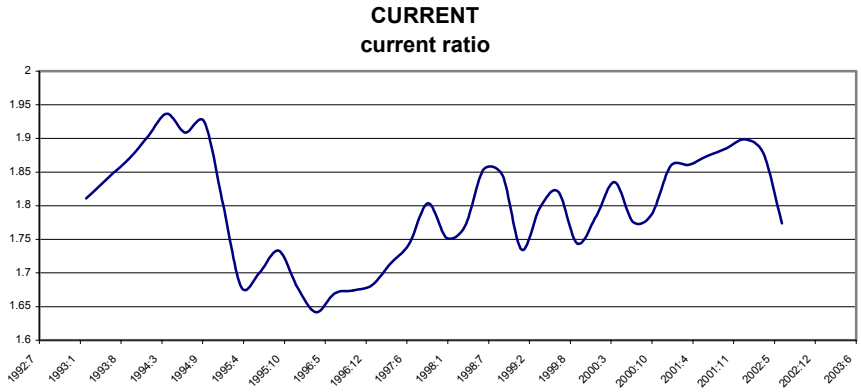
The companies studied were manufacturing companies traded on the TASE,[11] and the data are quarterly data from 1993:I to 2002:I. Manufacturing companies[12] were chosen because the focus of the current study is the effect of policy variables on the financial stability of the real business sector, not the financial sector. The probability of a traded company going into liquidation due to insolvency is very low, as such companies are generally long established ones, with access to nonbank credit and even credit from abroad, and are in general efficiently managed. The average age of manufacturing companies is 28 years, far above the average age of manufacturing companies that went into liquidation, the average age of which was 8.4 years.

We collected data from several key sources: (1) financial statements, obtained from a Compustat-type database ("Dukas") compiled by the TASE from quarterly reports; (2) stock-price data (required for the calculation of some of the financial ratios). The financial ratios of all traded manufacturing companies were calculated by means of a weighted average of all the quarterly financial statements of those companies.

The current ratio CURRENT is the balance-sheet ratio of current assets to current liabilities. This ratio provides information on the business's liquidity. The higher the ratio the greater the company's financial stability, because it enables the company to continue operating for a given time even without an income, by selling current assets. Clearly, too high a ratio indicates inefficiency, as a company should invest in real long-term assets with a high yield rather than in current assets with low yields. In periods of economic slump, current assets and current liabilities are both low. The current ratio rose in the course of 1993 and at the beginning of 1994 reached its highest point in the period of the sample. In 1994–95 it declined rapidly to its lowest point due to a marked rise in liabilities and a modest increase in assets, apparently because of the considerable increase in business-sector product, with the rise in activity accompanied by leverage by traded companies. Their need of leverage derived from the fact that actual product was close to its potential, i.e., there was a low output gap in those years, so that an increase in activity had to be financed by loans.

[11] In the official TASE classification by industry, the category "manufacturing" includes venture capital firms and holding companies. To preserve the (relative) homogeneity of the sample, these firms are omitted.

The ratio rose again in 1996–97 apparently due to a slower increase in business-sector product, with companies no longer needing leverage to finance an increase in activity. It remained at a relatively high level and improved even further in 2000, when business-sector product surged. In 2000 companies may not have required leverage to finance the increase in activity as the starting point was a situation with a large output gap. The ratio fell again in 2001 as companies' situation deteriorated due to the recession.



Tobin's Q - According to the q theory associated with James Tobin (1969), firms invest according to the ratio of the stock market value of their assets and the cost of replacing them. Tobin's Q is the ratio of the sum of the book value of debt and the market value of equity to total assets.

Tobin's Q is a measure of the market's assessment of a firm's investment opportunities, to determine the market's perception of future growth. It is also found that firms that filed for bankruptcy had lower (pseudo-) Tobin's Q, which may have affected their inability to access credit during financial distress and increased the likelihood of their bankruptcy.

Calculating Tobin's Q

We measure the average Tobin's Q as the market value of assets divided by their replacement value. Replacement value is calculated under the assumption that fixed assets and inventories appreciate at a rate equal to that of the Consumer Price Index (CPI). The market value of assets equals the market value of common equity (obtained directly using stock-price data) plus the value of debt and other liabilities.

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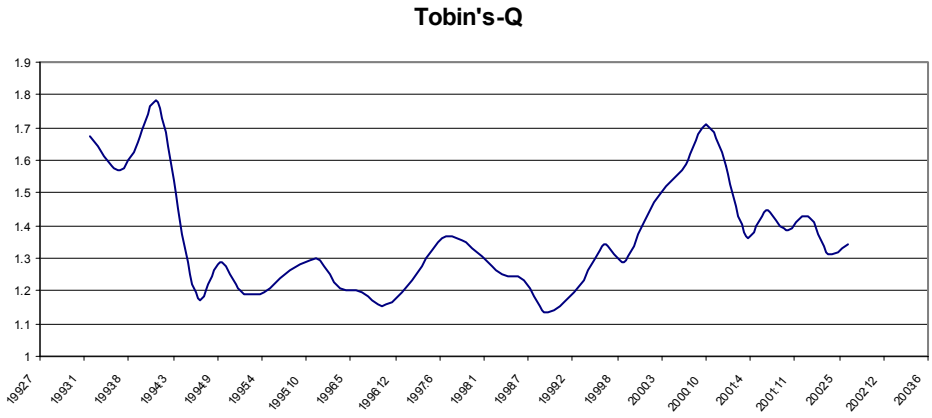
[12] In 1998, the firms in our sample constituted 36 percent in terms of sales income of the entire manufacturing sector (publicly traded and privately held firms).

Since debt is mostly not traded, its value is estimated by subtracting from the replacement value of the fixed assets the sum of (CPI adjusted balance sheet) deferred taxes and employee benefits, and the book value of common equity.[13] Tobin's Q calculated so rose dramatically in 1992 and 1993, reflecting the stock price run-up in those years, and then declined precipitously in 1996. In 1997, market conditions improved and market value became as large as replacement value.

Tobin's Q plunged again in 1998, and then rose, reaching a peak in 2000 due to the considerable increases in the stock market, and then dropped steeply again because of the falls in the stock exchange in 2001 and 2002:I.



It is not possible to run a regression on those same independent variables and the rate of liquidation, or on the independent variables and the financial ratios representing financial stability. The macroeconomic variables have different effects, as the populations affected are different and the independent variable is also different. Clearly we would not expect the financial stability of manufacturing companies to be affected by the birth rate of new companies in each quarter (see table 4).

A significant difference was found between the effect of the macroeconomic variables on the rate of company liquidations and their effect on financial stability:

As was found in other research on the subject, the rate of change of the nominal interest rate has much less effect on the well establish manufacturing companies than it does on companies that went into liquidation. The latter are more exposed to changes in the domestic interest rate than are manufacturing companies because most

[13] For details see Hedva Ber, Asher Blass, Oved Yosha 2003.

of them do not have the ability to raise capital or debt abroad or in foreign currency, whereas the traded companies have access to sources abroad.

Table 4: Regression coefficients and Diagnostic tests of the linear model 1993:2 2002:1

Method LS Newey-West HAC

	Specification 1	Specification 2	Specification 3	Specification 4
Dependent variable[1, 2]	CURRENT	CURRENT	Tobin's-Q	Tobin's-Q
Constant	1.8076 (36.090)	1.8073 (44.741)	1.335944 (22.302)	1.323534 (20.44445)
ΔR				
Δr10	-0.08871 (-3.681)			
Δr5		-0.0438 (-2.142)		
$(\pi^e - \pi)(-1)$			-0.01325 (-1.694)	-0.012493 (-1.660939)
ΔDEBT_R(-2)				1.124235 (1.668137)
GAP_{HP}				
$(\Delta w - \Delta Y_L)MA(-2)$	-1.5337 (-2.839)	-1.2491 (-2.155)		
$(\Delta w - \Delta Y_L)MA(-3)$			2.773533 (2.683)	3.333865 (2.962023)
ΔEXCH_$REAL (-1)	14.1293 (3.016)	10.0543 (2.340)		
ΔEXCH_$REAL (-3)			22.21558 (1.660)	24.75466 (1.817980)
AR(1)	0.8169 (8.360)	0.7853 (7.061)	1.031064 (7.172625)	1.024350 (6.100403)
AR(2)			-0.265262 (-1.929186)	-0.242865 (-1.433906)
Adj R^2	0.64483	0.6404	0.714700	0.726940
S.E.	0.0489	0.0500	0.088895	0.086967
F-sta	16.9338	18.2356	17.53354	15.64213
DW	1.866	1.878	1.628	1.595301

1. In order to understand the meaning of each coefficient, i.e., the effect of the macroeconomic variables on each ratio, it would be advisable first to understand the effect of the macroeconomic on the numerator and on the denominator of the ratio (see Appendix E).
2. The following financial ratios were also examined: market value/equity, the quick ratio (trading securities *plus* cash and collateral/current liabilities), but as they were found to be non-stationary, they were ignored. Cash flow ratios — cash from current activity as a percentage of fixed assets, and as a percentage of income — and the interest coverage ratio (the number of times a company could make its interest payments with its earnings before interest and taxes) were also examined, but the explanatory power of the macroeconomic variable regarding them was low.

The rate of exchange-rate changes affects the financial stability of manufacturing companies but not of companies that go into liquidation. When the rate of change of the real exchange rate is positive, the ratio improves (in the current ratio the rate of

current assets to current liabilities increases); this occurs because a large share of traded manufacturing companies are exporters, and the rate of change in the exchange rate greatly affects their performance, whereas most of the companies that went into liquidation were in service industries, and thus less exposed to exchange-rate changes. Publicly traded firms are required to disclose their export income if it exceeds 10 percent of their total sales income. Otherwise, publishing this information is optional. It was found that average over the research period, that more than 43 percent of traded manufacturing companies are exporters, in comparison to 11 percent of the companies that liquidate. This figure explains the effect of the exchange rate on the financial stability of the traded manufacturing companies and the fact that it is not a parameter that determines the probability of insolvency among all companies in the company.

Traded manufacturing companies are less exposed to the output gap because when domestic demand is in a trough they can switch to exports. Also, in a recession the local currency generally depreciates, making exports more worthwhile. Most of the small companies that went into liquidation, on the other hand, are not exporters, and hence are less able of defending themselves against fluctuations in domestic demand. Moreover, small companies are almost certainly dependent on demand in the geographical region in which they operate, whereas traded companies can market their products throughout the country, and the fluctuations in demand for their products are therefore lower.

A significant part of credit taken by traded manufacturing companies, about 44 percent on average, is in foreign currency; among exporters the percentage is even higher. These companies are less affected by credit rationing than were the companies that went into liquidation, as they have the ability to raise credit or capital abroad, while the companies that went into liquidation due to insolvency are small companies that were far more dependent on Israel's banking system (see also Bernanke, Gertler and Gilchrist 1996).

5. Conclusion

This paper compares the characteristics of companies that went into liquidation with those of business-sector companies in general and examines the relationship between macroeconomic factors and company rate of liquidation. The findings are similar to findings abroad, i.e., companies that went into liquidation were smaller, relatively few

of them were exporters, and their ability to raise capital or debt other than through the domestic banking system was limited. This finding is supported by the study of the relationship between macroeconomic factors and company rate of liquidation. Additional inferences may be drawn regarding the effect of macroeconomic variables on the financial stability of traded manufacturing companies. Furthermore, in line with Bernanke, Gertler and Gilchrist (1996) findings it was found that the same macroeconomic variables do not necessarily affect the financial distress of the population of traded manufacturing companies in the same way.

The analysis reveals that liquidation rate rises with positive change in nominal interest rate. On the other hand, the rate of change of the nominal interest rate does not affect the financial stability of large companies as they are not limited to raising capital on the domestic market.

In addition, when actual inflation is higher than expected inflation, the rate at which companies are liquidated will fall. In order to prevent sharp increases (or decreases) in the rate of companies going into liquidation, the variance between actual and forecast inflation should be small. Central bank policy plays an important role in regulating the rate of companies being liquidated.

The availability of credit is expressed by the debt/GDP ratio. When this ratio raises, the availability of bank credit to the business sector rises, and in the short run the rate of companies going into liquidation declines. In the long run, a high debt/GDP ratio increases the rate of liquidation.

The business cycle is expressed in the difference between actual and potential GDP. The present study shows that the rate of liquidation declines when actual GDP is near to (or higher than) its potential level. In contrast, traded manufacturing companies are affected less by the business cycle because when domestic demand is down they can switch to exports.

Appendix A: Definition of the variables

Significant variables and the dependent variable

CLR – the number of compulsory liquidation orders by courts divided, by the number of active companies on the register (LOG). The number of compulsory liquidation orders by courts is seasonally adjusted. It may take two to three quarters between CAR and CLR (source: Ministry of Justice.).

The series, the number of active companies on the register, was obtained by linking the series of the number of new firms in each quarter to the (smoothed) number of companies closed in each quarter and to the number of active companies in 2002:I.

ΔR – Quarterly average of the rate of change in the yield on 12-month T-bills.

(nominal rate) (source: Bank of Israel, Monetary Department.)

$\pi_t^e - \pi_t$ - inflation for 12 months ahead *less* inflation expectations for 12 months ahead. The 12-month forecast inflation rate is calculated on the basis of the difference between yields to maturity on Israeli government debt and indexed bonds.

Δr10- the yield to maturity on CPI-indexed 10-year (government) bonds.

Δr5- the yield to maturity on CPI-indexed 5-year (government) bonds.

DEB_R – the gross debt of the private non-financial business sector divided by GDP at current market price (LOG). (source of the nominator: Bank of Israel, Banking Supervision Department.) Because this variable is not stationary, I use in the empirical model ΔDEBT_R, which is a quarterly average of changes between DEB_R_t and DEB_R_{t-1}. Finally, in the regression I use a moving average of four quarters.

The structure of the Banking Supervision Department was altered in January 1992, but the figures for total credit, credit to individuals and the credit to the public sector are not extraordinary.

In January 1997 further changes were made in banking supervision, causing a huge increase in both credit to individuals and aggregate credit, so that the growth rate of credit to the business sector is not extraordinary. Moreover, similar growth was recorded in credit to manufacturing at the same period.

GAP– GDP gap in the business sector. The method of estimation the gap is production function without startup risk (source: Menashe and Yakhin (2001)) (LOG).

GAP is positive in a recession and negative in a boom.

$(\Delta w\text{-}\Delta Y_L)MA$ is the average nominal business-sector wage *divided by* GDP prices (LOG) *less* labor productivity (LOG). Labor productivity is defined by the total labor input in the business sector. A moving average for the last four quarters (MA) was calculated for the series (source: Bank of Israel).

NEWR – the number of new firms divides by the number of active companies on the register (LOG), (source: Ministry of Justice.).

CURRENT – The balance-sheet ratio of current assets to current liabilities.

Tobin's-Q – as the market value of assets divided by their replacement value. Based on the Dukas system.

ΔEXC_$_REAL - Quarterly real dollar exchange rate. balance-sheet ratio of current assets to current liabilities (source: Bank of Israel).

Variables that were not used in the final regressions

CAR – the number of requests for liquidation by the courts divided by the number of active companies on the register (LOG), (source: Ministry of Justice.).

R3 – the quarterly average of the rate of change in the yield on 3-month T-bills. (nominal rate) (source: Bank of Israel, Monetary Department.)

$(\Delta w\text{-}\Delta Y_{EM})MA$ **Δw** is calculated exactly as in **$\Delta w\text{-}\Delta Y_L$**. Labor productivity is calculated by the total number of (Israeli, Palestinian, and foreign) employees in the business sector (EP). A moving average for the last four quarters (MA) was calculated for the series (source: Bank of Israel).

BOIEF_Q calculate from Bank of Israel key interest rate.

The quarterly average of BOIEF is the monthly frequency of the Bank of Israel's effective interest rate (in annual terms), calculated as follows:

1. Until December 1997, on the basis of the marginal bracket of the monetary loan; from December 1997, on the basis of the daily deposit auction.

2. The effective interest rate is calculated daily, and the average is calculated on a monthly basis, see also http://boisite/deptdata/pikuah/ribit/boiribhgh.htm .

PROP- a series of real capital prices.

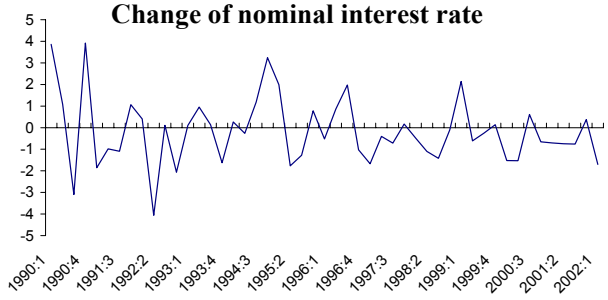
CHECK– the number of checks returned due to lack of cover, divided by number of checks. The data for at the beginning of the nineties is distorted.

SHR_LABOR- L*W/GDP- The share of wage payments in GDP. The nominal business-sector wage *divided by* nominal business-sector product, TW_BS.Q/GDP_BS.Q_N.

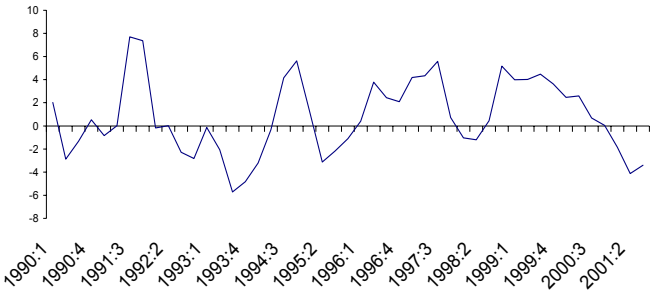
DUM_W- a dummy variable for the Minimum-Wage Law and its updating. The Minimum-Wage Law was introduced in April 1987, so that there is a need for a dummy variable for this date. When it was first amended in 1997, the change was not great. However, I can consider another dummy for this year.

Appendix B: Description of the variables

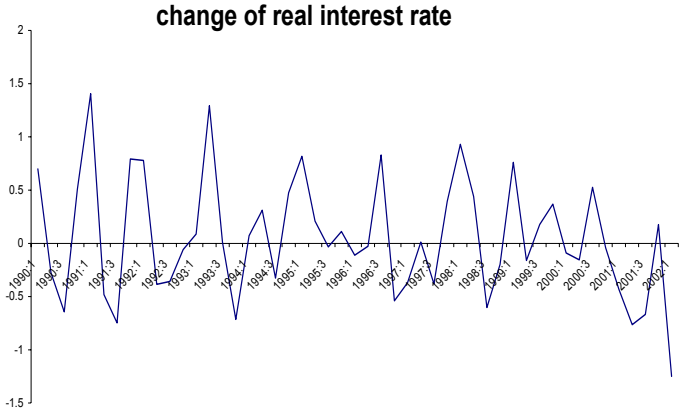
ΔR
Change of nominal interest rate



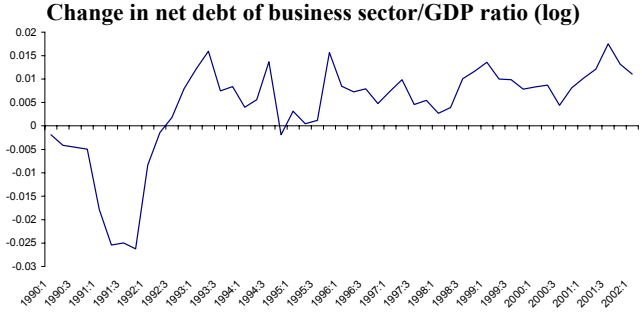
$(\pi^e-\pi)$MA
Unexpected inflation



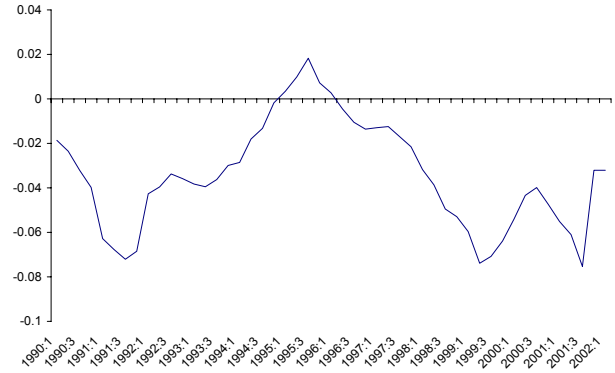
Δr5
change of real interest rate



ΔDEBT_RMA
Change in net debt of business sector/GDP ratio (log)

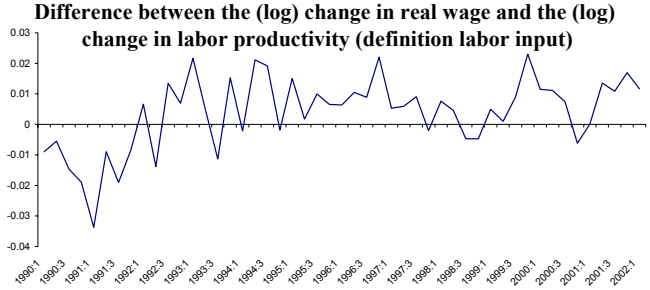


GAP_{PF}- GDP gap business sector (definition production function) - log



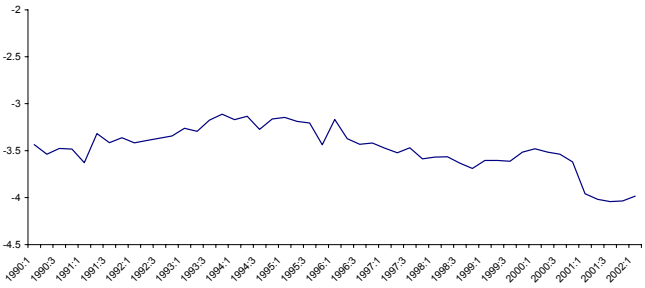
$(\Delta w - \Delta Y_L)MA$

Difference between the (log) change in real wage and the (log) change in labor productivity (definition labor input)



NEW_R

Birth rate of new companies (log)



Appendix C: Description of the variables

Request for liquidation by the courts (CAR)

Industry[1]	Total no. of companies in the economy 2002	Number of request for liquidation 1990:1-2002:1	Industry share in economy (percent)	Industry share of request liquidate in total liquidations requests	Liquidation request tendency by industry (average = 1.00)
Community, social, personal and others services	2,521	105	3.2	2	0.66
Health and welfare services	2,717	41	3.4	1	0.28
Education	682	35	0.9	1	0.93
Business services	21,890	915	27.5	18	0.58
Banking and insurance	2,918	107	3.7	2	0.50
Transport, storage and communications	4,030	235	5.1	4	0.96
Hotels and catering	3,444	228	4.3	4	1.09
Wholesale and retail trade and repairs	20,407	1,138	25.7	22	0.94
Construction, electricity and water	9,312	910	11.7	17	1.34
Manufacturing	10,436	1,447	13.1	28	2.16
Agriculture	1,186	62	1.5	1	0.78
Total	79,543	5,224	100.0	100	

1. For definitions see table 1.

First sub-period (1990:I to 1997:I inclusive), total of 1,349 liquidations in the period.

Industry[1]	Industry share in economy (percent)	Industry share of liquidated companies in total liquidation	Liquidation tendency by industry (average = 1.00)
Community, social, personal and others services	3.2	1	0.45
Health and welfare services	3.4	1	0.29
Education	0.9	1	0.91
Business services	27.5	17	0.61
Banking and insurance	3.7	2	0.56
Transport, storage and communications	5.1	4	0.81
Hotels and catering	4.3	4	0.98
Wholesale and retail trade and repairs	25.7	24	0.95
Construction, electricity and water	11.7	14	1.18
Manufacturing	13.1	**30**	**2.28**
Agriculture	1.5	1	0.90
Total	100.0	100	

1. For definitions see table 1.

Second sub-period (1997:II to 2002:I inclusive), total of 1,731 liquidations in the period.

Industry[1]	Industry share in economy (percent)	Industry share of liquidated companies in total liquidation	Liquidation tendency by industry (average = 1.00)
Community, social, personal and others services	3.2	2	0.64
Health and welfare services	3.4	1	0.25
Education	0.9	1	0.66
Business services	27.5	19	0.69
Banking and insurance	3.7	2	0.48
Transport, storage and communications	5.1	5	0.89
Hotels and catering	4.3	4	0.85
Wholesale and retail trade and repairs	25.7	22	0.86
Construction, electricity and water	11.7	17	1.47
Manufacturing	13.1	**27**	**2.05**
Agriculture	1.5	1	0.83
Total	100.0	100	

1. For definitions see table 1.

Appendix D: Unit root tests

Table 1 Unit root tests ADF Test[1] PP Test[1]

		p-value to reject unit root	
	Max Sample	ADF Test	PP Test
CLR	1990:2 2002:1	.0005	.0006
ΔR	1990:2 2002:1		.0000
$\Delta r5$	1988:2 2002:1	.0000	.0000
$(\pi^e - \pi)$	1989:4 2001:3		.0012
$\Delta DEBT\_R$	1986:3 2002:1		.0000
GAP_{PF}	1987:1 2002:1		.1637
GAP_{HP}	1986:2 2002:1		.0190
$(\Delta w - \Delta Y_L)$	1986:3 2002:1		.0000
NEWR	1988:2 2002:1	.9338	.7353

		p-value to reject unit root	
	Research sample	ADF Test	PP Test
CLR	1992:1 2002:1	.0032	.0033
ΔR	1990:2 2000:1	.0000	.0000
Δr5	1991:1 2000:4	.0000	.0000
$(\pi^e - \pi)$	1990:3 2000:3	.0004	.0038
ΔDEBT_R	1988:1 2000:1	.0000	.0000
GAP_{PF}	1991:2 2001:2	.1691	.3315
GAP_{HP}	1991:2 2001:2	.0140	.0185
$(\Delta w - \Delta Y_L)$	1988:4 1999:4	.1433	.0000
NEWR*	1989:2 1999:2	.1053	.3790
NEWR**	1990:2 2000:2	.0318	.3467

[1]MacKinnon critical values were used to reject the null of a unit root. For all the variables except $\Delta w - \Delta Y_L$ it was hypothesize that there is an exogenous constant but no time trend. For $\Delta w - \Delta Y_L$ it was hypothesize that there is neither exogenous constant nor a time trend.
GAP_{PF} and GAP_{HP} should be stationary in the long run because they are constructed accordingly (see Menashe and Yahin, 2001). The GAP variable, as defined by production function, describes the business cycle better than the deviations of GDP from the trend, hence it is preferable to use it to describe the business cycle. In the sample period, however, it was diagnosed as non-stationary, even though according to the theory it should have been stationary
NEWR should be stationary in the long run. The optimal number of lags was chosen on the basis of the Akaike criterion.
The adjusted sample of the variable is always the same sample that was used in the regression.
In regressions 1 and 2 the sample period for NEWR is 1989:2-1999:2, while in regression 3 the sample period is 1990:2-2000:2.

Appendix E: Financial distress -Fundamentals Regression coefficients

Table 1: Fundamentals Regression coefficients and Diagnostic tests of the linear model

1992:1 2002:1

Method LS Newey-West HAC

	Fundamentals 1	Fundamentals 2
Dependent variable	Hitayvoyot_shotef	Rehosh_shotef
Constant	0.311090 (37.27799)	0.5647 (147.2307)
ΔR(-3)	-0.001948 (-2.634090)	-0.0019 (-2.5770)
Δr10		
Δr5	-0.007730 (-2.771299)	
$(\pi^e - \pi)$MA(-1)		-0.000620 (-1.615278)

$(\pi^e - \pi)MA(-2)$	0.001486 (1.6970)	
ΔDEBT_RMA		
GAP_{HP}		
$(\Delta w - \Delta Y_L)MA(-2)$	0.189054 (2.51437)	-0.179860 (-1.7128)
ΔEXCH_$REAL(-1)		0.549364 (1.291152)
AR(1)	1.125402 (11.6274)	0.771631 (8.024611)
AR(2)	-0.289676 (-2.0778)	
Adj R^2	0.722372	0.67091
S.E.	0.007699	0.005612
F-sta	15.74433	14.86342
DW	1.942863	2.024003

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