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Bankruptcies, Indebtedness and the Credit Crunch

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Abstract

This paper deals with Finnish bankruptcies. It shows that bankruptcies are strongly related to the business cycle and that they are perhaps even more strongly related to indebtedness, real interest rates and asset prices. The importance of these financial factors probably increased when the financial markets were liberalized in the early 1980s. Although there is a lot of seasonal and cyclical variation in bankruptcies the long run level (especially when adjusted to the number of firms) is almost constant representing some sort of "a natural rate of bankruptcies". What makes bankruptcies so important is the fact that they directly affect production, employment and credit expansion. The credit crunch effect in particular is scrutinized in the paper.

Tiivistelmä

Tutkimuksen kohteena ovat konkurssit Suomessa. Tutkuksessa osoitetaan, että konkursit liittyvät kiinteästi suhdannevaihteluihin. Ehkä vieläkin kiinteämmin ne liittyvät velkaantuneisuuteen, reaalikorkoihin ja varallisuushintoihin. Rahoitusmarkkinamuuttujien rooli on ilmeisesti tullut yhä tärkeämmäksi, kun rahoitusmarkkinat liberalisoitiin 1980-luvun alussa. Vaikka konkurssit vaihtelevat suuresti ja niissä esiintyy selviä kausi- ja suhdanvaihteiluita, konkurssien pitkän aikavälin taso, kun vielä ottaa huomioon yritysten lukumäärän, on melkein vakio edustan eräänlaista konkurssien "luonnollista tasoa", joka on analoginen ns. luonnollisen työttömyysasteen käsitteen kanssa. Konkurssien merkitys korostuu, kun ottaa huomioon, että konkurssit vaikuttavat suoraan tuotantoon, työllisyyteen ja luottojen tarjontaan. Luottojen tarjontaan liittyvän luottolaman merkitys on erityisen huomion arvoinen.

Contents

1 Introduction

One of the prime purposes of a bankruptcy is to settle accounts with creditors and to establish a market value for the company as a whole. A major task in bankruptcy settlement is to prevent a firm from running into further debt, which is the main concern of the creditors. In most bankruptcies the amount of debt is greater than the value of the assets, which leads to financing costs to both creditors and debtors. Another difficulty crops up here, since a company is usually worth more as an operational unit than as the sum of its separate parts. It has been emphasized that a firm is a functional entity, and by far the greatest part of its value is imbedded in the cooperation between its employees.

In general, it can be argued that bankruptcies result mainly from bad management, unnecessarily risky or unlucky investment projects or, as in recent times, unexpected rapidly diminishing demand. In Finland, bankruptcies have emerged as a macroeconomic problem recently as a consequence of an unforeseen rapid decline in GDP and in total domestic demand. Several factors, like the collapse in trade with the former Soviet Union, deterioration of the terms of trade, increased foreign indebtedness because of devaluations and rising real interest rates, can be seen as primary causes of recession. However, the first hints from the growth in bankruptcies can be traced back already to the start of financial liberalization in 1983. There seems to be some evidence that the easening of bank lending and weaker ties to clients, and hence less control feedback from firms to banks, is responsible for the large losses seen during the recent recession.

The overheating of the Finnish economy occured after 1986, as interest rate regulation was abolished and the obstacles to capital movements were gradually removed. During the period of overheating, which lasted from late 1986 up to the spring of 1989, a very large number of new firms were started up. Most of the financing came in the form of bank loans. Thus, bank lending increased at a real rate of 20–30 % during this period, which obviously induced a huge increase in the prices of all financial and real assets. At the same time, indebtedness increased, of course, and when income and asset prices started to fall, indebtedness became a very serious problem.

Indebtedness, in the face of an exceptionally deep recession, was an obvious cause of the wave of bankruptcies and the credit crunch which are studied in this paper. The Finnish case is not, of course, exceptional, although the magnitude of the crisis makes it an interesting case for empirical analysis (for the shake of comparison, see e.g. Gunther, et al. 1995 and Shrieves and Dahl 1995 for the U.S. case).

In this paper we try to develop a macroeconomic model of bankruptcies. For this purpose we first look at certain stylized facts regarding Finland. We make use of data which cover a relatively long period, 1920–1994. The data are monthly, although we use mainly annual frequencies in the empirical analysis. The modelling is based on a cointegration analysis which deals with bankruptcies and certain important macroeconomic variables, both financial and non-financial. In addition to bankruptcies we model bank lending, or strictly speaking credit expansion, and total output. The purpose of this type of modelling is to see the extent to which financial variables, along with cyclical macroeconomic variables, affect bankruptcies and what kind of feedback effect exists between bankruptcies

and these variables. Specifically, the credit crunch hypothesis is subjected to testing.

2 Some background on bankruptcies

2.1 Historical background

Under the law, bankruptcy petitions and proceedings are registered by the courts and related data is gathered by Statistics Finland. The number of monthly bankruptcy proceedings[1] have been available since 1922 (see Figure 2). The previous large boom in bankruptcies can be linked with the Great Depression in the early 1930s. The current high level of bankruptcies is clearly unprecedented. Even if the total number firms in existence is taken into account, the level is very high - something one could probably not forecast a decade ago (for U.S. evidence, see e.g. Meehan 1993).

Bankruptcy proceedings can also be analysed using time series components like trend, seasonal component and irregular variation. The original monthly series look quite volatile even in logs. Analysis of the structural time series model shows that the level of bankruptcies has a large variance, but the trend is fairly stable. There is clearly also seasonal variation in bankruptcies, but the pattern of seasonal variation has changed significantly over the decades. Currently, the seasonal peaks are in January and September - November, while the lowest level of proceedings are in the summer and in December. The model estimations also show that the irregular variance of bankruptcies has been a major component of the total variation of bankruptcy proceedings (see Takala and Virén 1994). It could be argued that the process of generating bankruptcies during the Second World War was quite different at least from the period of financial regulation, which lasted from after the war up to 1983.

It is useful to compare the number of bankruptcies to the total number of firms. The number of firms itself has increased faster than population (see Table 1). The structure of production could also affect the number and share of bankruptcies. Industrial companies have been relatively big in Finland, but the increased amount of small service companies may also have raised the number of bankruptcies relative to firms. This may reflect the change in the structure of production, as the number of service firms has increased with rising GDP.

[1] A conceptual distinction could be made between two measures of bankruptcies. We speak of bankruptcy petitions (applications) registered by the courts and bankruptcy proceedings accepted by the courts for further action. In practice there could be several bankruptcy applications made by several creditors regarding the same firm, whereas proceedings register only one case for each firm. It is also possible that the debtor himself could apply for bankruptcy. The bankrutcy resettlement procedure available from 1993 must be applied and approved by the debtor himself.

Table 1. **Bankruptcies and number of firms in Finland**

Year	Number of bankruptcies	Number of firms	Population in thousands	Bankruptcies/ population, %	Bankruptcies/ firms, %
1922	725	6763	3228	.022	1.97
1930	1945	10410	3463	.056	2.66
1940	265	15068	3696	.007	0.33
1950	406	24030	4030	.010	0.69
1960	829	32011	4446	.019	1.06
1970	1361	45352	4598	.030	1.24
1980	1057	56134	4788	.018	1.16
1985	2122	109806	4911	.043	2.57
1990	3588	133321	4998	.072	2.12
1991	6155	125121	5029	.122	4.18
1992	7348	125700	5055	.145	5.02
1993	6769	117295	5080	.133	4.93
1994	5502	118000*	5099	.108	3.77*

Starred values are forecasts. Bankruptcies/firms (i.e., the business failure rate) is computed in terms of corporate bankruptcies (i.e., bankruptcies concerning individuals are excluded).

The number of bankruptcies varies with the phase of the business cycle. When GDP grows rapidly the ratio of bankruptcies to number of firms is small. This is a result of both a smaller number of bankruptcies and a larger number of new firms start-ups. In a recession the number of bankruptcies will increase while the number of firms increases slowly or even decreases.

The number of bankruptcies depends on various factors. Firms that go into bankruptcy are mainly small companies with heavy debt with respect to cash flow or net profits. In these small companies the personal losses of entrepreneurs are also the largest. Even if we leave out those bankruptcies that have taken place without further demands on debt capital, the equity of bankrupt firms is on average only half of their total debt. In addition to the size of the firm, the industry, the phase in the business cycle and the capital structure predict the probability of bankruptcy.

In addition to these macroeconomic indicators, a few microeconomic indicators have proved to be useful in predicting bankruptcies. The number of payment failures precedes bankruptcies at the firm level as well as in the aggregate. Unfortunately, the series on payment failures covered only the period 1987 to 1994 and cannot be used in the present context.

During the 1980s the distribution of new bankcruptcies in different industries was relatively stable. Most of the bankruptcies occurred in commerce (28 %) and manufacturing (23 %), followed by construction and services, each with about a 16 per cent share (see Figure 3). The devaluation of the markka in November 1991 and the float starting in September 1992 shifted bankruptcies from the export (open) to the closed sector. One worrying feature of the recent bankruptcy boom is the fact that the share of bankruptcies applied for by debtors itself has been increasing. Whereas normal bankruptcy applications are used as means of collecting debt, this is not the case when a debtor itself applies bankruptcy.

Later we cite evidence that bankruptcies could be an indicator of an equilibrium process with supply being equated to diminishing demand. If the slowdown in demand is fast enough, there is no time to cut production and other firms try to keep up their cash flows as well. In this case firms with excess debt will get into difficulties and later on will reach the final dead end. This theory is based on the fact that total demand and supply will be cointegrated in the long-run. Despite the fact that demand and supply are integrated of order one, the bankruptcies/companies ratio will be stationary as one linear combination between these variables. Bankruptcies nevertheless have a positive mean and finite variance.

Bankruptcies are obviously related to employment and unemployment. Bankruptcies directly create unemployment. The causal relationship, however, is more complicated because unemployment can cause bankruptcies via decreased demand. In this study we cannot thoroughly analyze the bankruptcy-unemployment relationship because the historical unemployment data is somewhat deficient. Suffice it to mention that for a short sample period (1960–1993) we found that the causation goes unambiguously from bankruptcies to unemployment, not vice versa.

Money market liberalization seems to have affected the bankruptcy generation mechanism in Finland and other Nordic countries. This can be seen directly from the plot of bankruptcies. The number of bankruptcies started to rise even during 1984 (although the economy grew rather fast, at the rate of 3–5 %, until 1989). The regulation of bank lending kept the bankruptcy figures low up to the mid–1980s. After this regulation was loosened, the tight control of banks ended suddenly. For firms, financing through the stock market also became more attractive. However, debt-equity ratios began to rise slowly already in 1985. In Finland an important turning point in financing was achieved when firms involved in foreign trade started to intermediate foreign loans through their accounts. Banks demanded similar operating room and started to rapidly expand their currency loan portfolios. When the regulation of lending interest rates was abolished in autumn 1986, the supply of bank loans increased rapidly.

The increase in real bank lending rose up to as high as 30 per cent p.a. in 1986–1989. Therefore, an increase in bankruptcy was to be expected sooner or later. What was unknown at the time was that the economic slowdown would be as steep as it turned out to be. Firms' indebtedness has had the effect of a rising real interest rates very sharply for firms operating in the closed sector of the economy. These problems were not relieved with the devaluation of the markka in November 1991. Firms with foreign debt suffered from the devaluation, and those firms which operated in the domestic sector, i.e. which had only domestic returns, faced the biggest problems. They had large capital costs, wages were sticky (in fact, wage costs even increased because of the unemployment compensation system) and prices could not be in increased because of the overall excess supply in the domestic markets. Bankruptcies created further bankrutptcies because some bankrupt firms continued their activities under the bankruptcy authority. In many cases, these firms created market disturbances because they demanded much lower prices – they had no cost worries!

The increasing risk of bankruptcy in the late 1980s and early 1990s is to a large extend a consequence of the rapid growth of financing and thereof of the

number of firms. Over a half of the bankrupt firms have been operating under five years. Firms 2-3 years in age have had the highest risk of ending up in bankruptcy.

2.2 The credit crunch and bankruptcies

The role of bank lending is crucial in the generation of bankruptcies, since bank debt is the major source of financing to small and medium sized Finnish firms. In every recession bank lending and credit availability decelerate. Therefore, it is useful to look at whether credit availability is now more restrictive than in similar declining phases of previous business cycles. Historically, credit crunches have started from a decline in bank deposits. The current credit crunch, however, is more or less linked to the decline in the asset prices and in collateral values and, of course, to the fall in income and the resulting failure in debt servicing. This has caused debt losses and therefore, through shrinking bank equity, forced banks to cut their lending.

In Finland, as in other Nordic countries, the state has guaranteed the BIS capital ratio requirement of 8 per cent. In this sense the credit crunch is a consequence of a capital crunch. A major reason for the debt losses has been the drop in real estate prices as well as all other asset prices. The capital crunch has especially increased bankruptcies among small and medium size firms in the closed sector. This is natural since they have relied heavily on bank credit for financing. The attendent loss in bank capital is the main difference between the current business cycle and previous ones since the Second World War.

The background for the Finnish case is such that it could come directly from a textbook. The financial markets were liberalized in a situation where the economy was experiencing one of the strongest booms since the second World War. Interest rate control was abolished, first from lending rates and, after about one year, from deposit rates. Capital controls were also abolished. Demand for credit was exceptional high because of a backlog of unsatisfied excess demand, high income growth expectations and relatively low real interest rates.

Before liberalization, there had been a very long period of excess demand and credit rationing. During that period banks had very close relationships with their customers. New customers were carefully scrutinized before they got bank loans and many of them did not get loans at all. In the case of a household, a very long history as a customer and a large downpayment were required.

With liberalization the importance of customer relationships diminished (at least temporarily). Obviously this weakened banks ability to monitor the quality of their customers. Perhaps more important, however, was the fact that banks started to compete for market shares. Banks have relatively few instruments which they can use in competition. In the Finnish case, lending was used as an instruments of competition. Thus, more advantageous lending terms were offered to new customers.[2] It comes as no surprise that those banks that competed hardest for new clients got a disproportionately large share of the bad clients with high credit risk and, in some cases, even criminal intentions (this is something one might expect

[2] There is some evidence suggesting that banks were very poor in pricing the risks of their loan contracts. The risk premia were in some cases even negative! See e.g. Murto (1993).

on the basis of the principles of adverse selection moral hazard). In particular, savings banks adopted this kind of very aggressive growth strategy which later on led to complete disaster.

Savings banks (and to some extent cooperative banks) tried to expand their lending to the corporate sector. Because of scale considerations and customer/ownership relationships, they had to concentrate on small firms operating in the domestic market. This sectoral concentration created considerable credit risk, which was unfortunately actualized during the recent recession. As for the commercial banks, also they competed heavily for market shares. Much of their
resources was used in "ownership races" in which the banks tried to gain or secure ownership in the largest firms.

Still another problem was caused by developments in the real estate market. In Finland, as in most OECD countries (see O'Brien and Browne 1992), all banks increased their lending in the real estate market relative to the industrial and commercial sectors. It would be an exaggeration to argue that the whole housing boom originated from excessive credit expansion. In Finland the housing boom in the late 1980s was perhaps the most striking in the whole OECD area (see e.g. Loikkanen et al. 1992). When the market collapsed after 1989, banks faced a huge risk exposure. There was huge overcapacity in the construction industry and a huge stock of new unsold houses. House prices fell in real terms more than 50 per cent in the early 1990s (land prices also fell considerably although the drop in stock prices was still much more dramatic.

As a consequence Finnish banks became fragile and financially vulnerable to lower credit quality, declining profitability and deflation of collateral values. Much of this change could be seen as cyclical, but the heart of the problem seems to be structural. It has been estimated that it will take at least until the end of the decade for the increased indebtedness to melt away. The Finnish experience repeats the similar history of a bad slump in the real estate business in the US, Norway and UK (for the US case, see e.g. Syron 1991).

In Finland, the depression lasted until 1993 and an upturn started in 1994. Bankruptcies have not yet, however, decreased to the pre-recession level (nor has unemployment). Perhaps the most important change which has taken place is the decrease in indebtedness (see Figure 2). Bank lending has considerably decreased since 1990 in both nominal and real terms. It can be argued that this is caused by both demand and supply effects. The demand for credit has decreased both because of reduced investment activity and the need to restore a more healthy financial structure. Increased uncertainty may also have contributed to this course of development.

On the supply side, banks have experienced unprecedented credit losses and all banks have been in serious difficulties regarding bankruptcy or merger (or, more probably, government takeover). There are several signs that banks' behaviour has changed towards the pre-liberalization period rules. This, in turn, shows up in more stringent lending conditions, choice of customers, collateral requirements etc. Thus, non-price rationing is again used to some extent. Obviously, it is very difficult to say how much of the decrease in bank lending is caused by demand and supply considerations. In the subsequent empirical analysis we try identify both effects, but quite naturally we are more interested in the supply effects. That is because it is almost self-evident that there are demand

effects. Whether there are important supply, or credit crunch, effects is already a more controversial question.

3 Empirical analysis

3.1 Outline of the analysis

In this chapter we model the behaviour of bankruptcies, credit expansion and output. The emphasis is on the analysis of bankruptcies. Thus, we try to find out to what extent bankruptcies depend on the main financial variables: indebtedness, real interest rates and stock prices. In addition, we scrutinize the importance of certain other macroeconomic variables which should matter, especially in a small open economy framework: the terms of trade, the real exchange rate, labour costs and, of course, aggregate demand.

When modelling credit expansion we pay particular attention to the reverse relationship between bankruptcies and bank credit. Thus, we try to determine whether credit expansion – when it is controlled by various determinants of the supply of and demand for bank loans – is indeed sensitive to bankruptcy risk. If a negative relationship can be asserted between bankruptcies and credit expansion, we may conclude that the credit crunch hypothesis is not completely at odds with the (Finnish) data. Finally, we consider the link between total output and bankruptcies. The question is then whether bankruptcies help in predicting output developments. This question is analyzed with the help of a relatively simple reduced form output growth equation, which also includes stock prices together with some more conventional determinants of output.

In modelling these variables an obvious starting point would the analysis of co-integration (see Engle and Granger 1987 and Johansen 1991). We make use of this analysis although – at least at this stage – we cannot fully utilize the co-integration framework in building the empirical model for all of these variables. In some earlier analyses (see Takala and Virén 1994 for details) it turned out that bankruptcies, output and credit are co-integrated with one (and no more or no less) co-integration vector.

It is obvious, however, that the cointegration relationship is more complicated, at least in a setting in which we focus on the long-run development of an economy. Complications came especially from certain measurement problems. It is very difficult to get reliable measures of the number of firms and so to get a precise idea of the true importance of bankruptcies. Other problems concern the measurement of debt and financial assets. We have relatively good data on banks' Finnish markka loans to the public but the data on foreign loans is very deficient. Unfortunately, the latter have constituted a significant portion of firms' financing in certain periods of time. We suspect that this "missing credit" problem is also the reason why it is so difficult to establish a reliable cointegration relationship for the determination of bank loans.

Although we still intend to build a complete dynamic model for the key variables in our study, at this point we adopt a more modest approach by specifying some simple single-equation models for the above-mentioned three variables. The dynamic specifications are also quite "old-fashioned" in the sense

that we apply the conventional partial adjustment approach rather than the co-integration cum error-correction model strategy. In the case of bankruptcies, however, we use both approaches in building the estimating models.

As a first step in the empirical analysis, we scrutinize the time series (unit root) properties of the data series. Most of our data are monthly although some key variables are available only on an annual basis. Hence the analysis is carried out with both frequencies. The results from these analyses are reported in Table 2.

It is not difficult to see that the data for output, financial assets and liabilities, as well as for bankruptcies, are characterized by unit roots, while interest rates, terms of trade and the real exchange rate are roughly stationary I(0) variables. This distinction between the variables should obviously be kept in mind when building the estimating models - at least to avoid nonsense regression models.

As far as bankruptcies are concerned there are two quite different alternatives. Either bankruptcies are stationary or some equilibrium error between bankruptcies and, say, indebtedness and demand is stationary. The first alternative is a not a bad approximation, in particular when the number of bankruptcies is adjusted to the number of firms. Then some sort of "a natural rate of bankruptcies" emerges. Unfortunately, the second alternative does also get some support from the data. In fact, the quality of the data is not sufficiently good to allow for discriminating between these two alternative views. Thus, in the subsequent empirical analysis, both alternatives are developed.

Table 2. **Unit root tests for the time series**

	Annual data	Monthly data
Bankruptcies (b)	-1.087	-1.307
Bank lending (l)	0.038	0.308
Gross Domestic Product (y)	-0.912	..
Industrial production (ip)	-0.243	-0.507
Terms of trade (tt)	-1.904	-3.226
Real exchange rate (fx)	-2.218	-3.038
Real interest rate (rm)	-3.126	-4.639
Consumer prices	-0.500	0.371
Money supply (m1)	-0.558	-0.559
Money supply (m2)	-1.389	-1.720
Stock prices (sx-dp)	-2.847	-2.165
Real wages (w)	0.262	-0.590
Government expenditure/GDP	-2.828	-4.860
Stock exchange transactions	-0.232	-1.559
Business failure rate (b-f)	-3.079	..
Bankrupt firms' debt (db-y)	-1.629	..
Cointegration vector (û1)	-3.380	..
Cointegration vector (û2)	-4.099	..
Cointegration vector (û3)	-4.139	..
Critical values, 5 %	-2.902	-2.865
Critical values, 1 %	-3.524	-3.440

Results are derived for the Augmented Dickey-Fuller test. The model includes a constant term and one (with monthly data four) lagged difference terms. The estimation period is 1925-1994 (1922M5-1994M12).

3.2 The analysis of bankruptcies

The model which we use for bankruptcies in this study is quite similar to earlier bankruptcy equations (see e.g. Altman 1983 and Laitinen 1990). This comes as no surprise because if we start from a standard firm's profit condition we end up with a model which depends on aggregate demand and certain cost variables. To derive the behavioural equation for bankruptcies we may use the following expression for a firm's net wealth (in real terms) as a point of departure:

$$AN_t = (1 + r_t)AN_{t-1} + \pi_t + \tau_t, \qquad (1)$$

where AN denotes the firm's net wealth. π stands for profits which are determined by pq−C(q) where p denotes the output price, q output and C(q) production costs. Finally, τ denotes (net) capital gains.

Clearly, AN_t can be negative (and the firm may face bankruptcy) if π and/or $\tau < 0$. More precisely, a negative value of AN_t may actualize if the previous period's debts are large, output prices low, output demand low, production costs high, and capital gains negative. The effect of interest rates r on AN_t is basically ambiguous, but assuming that they have a negative effect on profits, a negative wealth effect also arises.

In a small open economy setting, one may measure p with the real exchange rate fx (and/or with the terms of trade tt). Output demand may be proxied by the Gross Domestic Product y and capital gains by stock prices sx.[3] Firms' net wealth creates some measurement problems but the indebtedness ratio (debts/GDP) l−y may serve for this purpose.

We could then postulate the following relationship between bankruptcies b and possible explanatory variables:

$$b = b(\underset{(+)}{l-y},\ \underset{(-)}{y},\ \underset{(+)}{r},\ \underset{(-)}{fx\ \&\ tt},\ \underset{(-)}{sx}). \qquad (2)$$

One essential ingredient should still added to this model. That is the persistence bankruptcies. Bankruptcies today cause bankruptcies tomorrow for various reasons. First, other firms suffer credit losses. Second, some bankrupt firms continue operations with much lower operating costs creating an unhealthy competitive environment. Finally, bankruptcies change the operating procedures of other firms and banks for instance in terms of trade credit, collateral and so causing additional liquidity problems. This all implies that bankruptcies (or the business failure rate) depend on the previous periods' bankruptcies.

Here, we face the difficult problem of choosing the reference variable for the number of bankruptcies. It is not at all clear whether we should relate the number of bankruptcies to the number of firms (i.e. to consider the business failure rate) or

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[3] In an open economy setting, negative capital gains may also arise because exchange rate movements. I.e., depreciation of the domestic currency may increase the amount of foreign debt expressed in domestic currency. That is by the way exactly what happened in Finland in 1991–1992. Thus, the effect (real) exchange rate on AN_t is in principal ambiguous.

to some other scale variable. The choice is even more difficult because the number-of-firms variable is quite deficient (the definition of a "firm" has changed considerably over time). Moreover, cointegration analysis does not give a clear-cut answer to the question of whether the business failure rate is stationary or not.

For these reasons we use some alternative definitions for the dependent bankruptcy variable. The estimating equation is derived from the firm's net wealth expression (1) using in the first place a simple partial adjustment mechanism as a point of departure. The individual variables are introduced into the model so that they are (at least approximately) stationary. Thus, the equation takes the following form:

$$(b-z) = \alpha_0 + \alpha_1(b-z)_{-1} + \alpha_2(1-y) + \alpha_3\Delta y + \alpha_4 rm + \alpha_5\Delta sx + \alpha_6 fx + \alpha_7 gs + \varepsilon, \qquad (3)$$

where b denotes bankruptcies and z possible reference variables, z=n indicates population and z=f the number of firms. ϵ is the error term. The other right-hand side variables have the following definition: (1−y) is the indebtedness rate, Δy is the rate of change in GDP, rm is the real interest rate (government bond yield in real terms), Δsx is the rate of change in stock prices (deflated by consumption prices), fx the real exchange rate index and gs the central-government-expenditure share of GDP. The latter variable is introduced to take the Second World War into account. During the war years, the value of gs was close to 0.5 while in normal years the value has been around 0.1.[4]

The model is estimated with annual Finnish data covering the period 1923–1994. The corresponding OLS and Instrumental Variable estimates are presented in Table 3. In addition to aggregate figures, the table also indicates some estimates for sectoral equation although the data in this respect is quite deficient. In addition, a similar specification is estimated using an error-correction model. To obtain the error-correction term we estimated some alternative long-run (co-integration) equations (see Table 4). The following set of variables was used in these co-integration equations: equation (1): {f, y, l, gs}, equation (2): {n, y, l, gs} and equation (3): {n, y, l, w, gs}.

The results from the partial adjustment specification and from the error-correction model are qualitatively almost identical. The only difference concerns the long-run properties of these models, which by definition are different. Thus, in the case of partial adjustment specification all right-hand side variables also have a long-run effect on bankruptcies while the error correction model says that in the long run the number of bankruptcies is determined by the number of firms (or the scale of the economy), output, debt and labour costs. These variables could also be interpreted as the indebtedness ratio and the functional distribution of income. In the error-correction models the coefficient of the lagged error-correction term (co-integrating vector) is clearly significant, which suggests that the specification is

[4] One question which naturally arises here concerns the size distribution of bankrupt firms. Does the increased number of bankruptcies necessarily imply that a disproportionally large number of small firms go bankrupt. This is a difficult question and we cannot answer it because we have not enough data. We have however data on the debt of bankrupt firms (see Figure 3). The time series of real debt db and the number of bankruptcies behave quite similarly, except for the war years. This close correspondence can be interpreted as evidence of the relative invariance of the size distribution of bankrupt firms.

indeed warranted (see Kremers et al 1992). The estimated estimated co-integrating coefficients (see Table 4) also suggest that the specification makes sense. The coefficients or error-correction terms range from -0.25 to -0.48. Thus, one could argue that a disequilibrium in terms of bankruptcies takes more than two years (but probably no more than four years) to vanish.

Clearly, increasing indebtedness increases bankruptcies. This is well in accordance with a priori theorizing and it is well in accordance with the corresponding Figure 2. In the same way, the overall economic situation, measured by GDP, affects business failures. The effect is not very strong but it appears to be quite systematic in terms of different estimating specifications and estimators. The relationship between OLS and IV estimators indicates that there is indeed some simultaneity between b and Δy. Thus, a fall in output tends to increase bankruptcies, but an increase in bankruptcies tends also to decrease output. It is interesting to note that besides GDP, the real exchange rate index also enter the equation. This variable tells that foreign export markets are very important to Finnish firms. They are always important because the domestic markets are so small. In the case of a recession, this importance may become even more crucial, and from this point of view the level of competitiveness is an essential variable.

The real interest rate effect is also positive. The corresponding coefficient is relatively large and very significant. The economic interpretation is rather straightforward: higher real interest rates make debt costs much higher and if this is not compensated by an increased cash flow, firms face financial problems. Higher real interest rates also reflect tighter money markets, and under such conditions firms may not be able to obtain additional liquidity from the banking sector.[5]

The role real interest rates can also be explained by referring to the role of inflation. Altman (1983) has proposed that increasing inflation reduces competition between firms and shelters inefficiency. It has been said that with high inflation it is easier to raise prices and profits, which lowers the efficiency of the market in a sense by keeping bad products in the market too long.

It is also worth mentioning that the rate of change in stock prices is negatively related to bankruptcies. There is an obvious causal explanation for this finding: an increase in stock prices (as well as in other wealth prices) increases both the value of the firm and the corresponding collateral values, making it easier to handle the liquidity situation.

3.3 Modelling credit expansion

Credit expansion obviously depends on both the supply and demand determinants. Unfortunately, it is not easy to derive a meaningful reduced form equation for the amount of credit. This is generally true but especially so far Finland. The domestic

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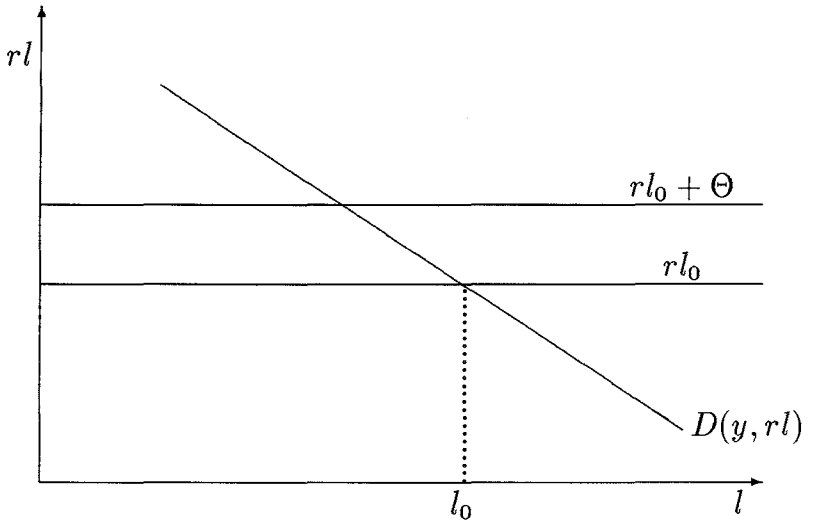
[5] We made an experiment to control the liquidity effect by introducing the rate of change in narrow money, $\Delta M1$, into the estimating equation. As one could expect, the coefficient of this variable turned out be negative (increased liquidity decreases bankruptcies) although the coefficient could not be estimated very precisely (the t-ratio remained at the level of one). Also the terms of trade variable tt was used as an additional regressor. Its coefficient could not, however, be estimated very precisely and, therefore, it was chopped from the final specifications.

bank loan market was regulated for a period of sixty years (from the mid-1930s to the mid-1980s). The basic form of regulation concerned the banks' average lending rate. Because of this regulation, the supply of and demand for loans were generally not equal. It is generally assumed that the bank loan market was characterized by excess demand. Although we cannot demonstrate that this assumption is true, we should keep it in mind in the subsequent derivation of the credit expansion estimating equation. Thus, the bank loan market is assumed to function in way which is illustrated in Figure 1.

Figure 1. **The bank loan market**



The demand for bank loans (in real terms) is assumed to depend positively on the scale variable (here, GDP) and negatively on the real interest (lending) rate (rl). Thus, $l^d = D(y, rl)$. The interest rate is exogeneously set at some level rl_0. Banks would not, however, expand their lending to l_0 because that would lower their profits. Instead, they would lend less: the more the regulated interest rate deviates from the equilibrium rate the larger the rationing effect. Rationing could be thought as an exercise in which banks set a rationing premium, say Θ, on the interest rate. In practice, this premium shows up in different non-price rationing terms, as in the downpayment ratio, required length of customer relationship and the collateral requirements. The premium is not constant but depends on the determinants of the supply of bank loans. We may assume that supply depends positively on the interest rate (or, in fact, on the interest rate margin), the stock of deposits and the expected credit losses which, in turn, may be measured by bankruptcies. If the supply of loans is also written in real terms, we may end up with a specification where real loan supply depends on in addition to interest rate(s) and bankruptcies, the real amount of deposits and (negatively) the rate of

inflation. The inflation effect comes via the eroding effect that it has on the real values of both bank deposits and loans.[6]

The rationing premium Θ would thus depend on the exogenous variables in the following way:

$$\Theta = \underset{(+)}{\Theta}(\underset{(+)}{b_{-1}}, \underset{(-)}{rl - rd}, \underset{(-)}{m_{-1}}, \underset{(+)}{\Delta p}), \tag{4}$$

where (rl−rd) denotes the interest margin (for banks) and m2 the (real) money supply. The latter variable is introduced here as a proxy for bank deposits. The bankruptcy variable appears here with a time lag. Obviously, the existence of a time lag is more an empirical question and therefore we experiment with both speculations (a model with b_t or with b_{t-1}; see Table 4). As for the interest rate margin we have some data problems and hence we cannot directly apply this variable. In fact, we have only two interest rate series available: the government bond yield, which represents the market rate (rm), and the central bank's discount rate (rd). Because the lending and deposit rates have been tied to this discount rate the difference between rm and rd might reflect an opportunity cost for banks. The higher (rm−rd) the higher banks' financing expenses and the less advantageous is bank lending relative to money market operations. This, in turn, would show up in higher Θ and in lower credit expansion.[7] In the empirical specification we also replace rl by either rm or rd. Here, rm is used mainly because we want to use the same variable in the bankruptcy and GDP equations.

Thus, we might derive the following linear estimating equation for credit expansion (rate of change in the real amount of bank credit):

$$\Delta l = \alpha_0 + \alpha_1 \Delta l_{-1} + \alpha_2 \Delta y + \alpha_3 \Delta b_{-1} + \alpha_4 \Delta rm + \alpha_5 \Delta \Delta p + \alpha_6 \Delta m2 + u, \tag{5}$$

where Δ denotes the first backwards differencing operator. m2 denotes the log real money supply in terms of M2 which is used here as a proxy for bank deposits.

Estimation results for this equation are presented in Table 5. The equation performs quite well: the parameters even seem to be stable, which is somewhat surprising given the institutional and demand/supply regime shifts which have taken place in the Finnish financial markets. All the individual variables behave well according to theory. Only the bankruptcy variable is somewhat of an

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[6] If the loan supply equation is written in terms of nominal loan supply L, which depends on the current period's nominal variables, deflation by the price level may leave the real loan supply to depend on the price level. If, however, supply also depends on the lagged values of exogenous variables, say on lagged deposits, DEP_{-1}, which are here proxied by $M2_{-1}$, then supply in real terms may also depend on the rate of change in prices.

[7] Here we ignore that fact that Θ may not be a continuous linear function with respect to the exogenous variables. Obviously, if Θ is not linear, the whole bank loan (or credit expansion) equation is not linear. If the excess demand regime changes to an excess supply regime or vice versa, we should probably try to apply genuine disequilibrium models. See, e.g., Quandt (1988). Unfortunately, the performance of such models has not been very good. All in all, there seems to be no satisfactory way of modelling credit markets which have experienced both credit rationing and deregulation (see, e.g. Basu (1994) for more detailed arguments on this problem). In fact, the existence of equilibrium credit rationing may also lead to a similar conclusion although for different reasons.

exception in a sense that the lagged level, but not the difference, enters the estimating equation. This might result from asymmetries in the adjustment of credit supply: extending credit and reducing credit might not behave in same way and at least the bankruptcy relationship might be different. The important thing, however, is that the coefficient of the bankruptcy variable α_3 is systematically negative and marginally significant. Thus, there is some evidence of a credit crunch. Notice also that the real interest rate variable is systematically significant (presumably merely reflecting demand behaviour): during depression periods real interest rates tend to increase and, together with increased bankruptcies, they may indeed have adverse credit supply effects.

One additional variable, i.e. the terms trade, turned out be quite an important ingredient in the credit expansion equation. This variable can be seen as a sort of leading indicator of the state of economy and, particularly, of firms' income expectations. It is no surprise that this variable has a strong positive effect on credit expansion.

3.4 Bankruptcies and output

Finally, we also an experimented with the modelling of total output (GDP). The purpose of this experiment was to see whether output growth is affected by bankruptcies (i.e. to see whether causality runs only from output growth to bankruptcies).

One can see that output growth is also almost a random walk, even unrelated with the level of per capita output (see, e.g., Table 2). Given this background it is somewhat surprising that bankruptcies can still help in predicting output growth. The same is not true in terms of other financial and non-financial variables. For instance, a univariate regression relationship between output growth and real interest rates turns out to be the following:

$$\underset{}{\Delta y} = \underset{(5.58)}{.052} - \underset{(2.13)}{.362}gs + \underset{(0.33)}{.022}rm - \underset{(1.14)}{.075}rm(-1) + \hat{u}1 \qquad R2 = .076,\ DW = 1.484 \tag{6}$$

By contrast, the corresponding model for b (or, in fact, b−f) turns out to be the following:

$$\underset{}{\Delta y} = \underset{(7.36)}{.072} - \underset{(3.09)}{.431}gs - \underset{(4.97)}{.041}(b-f) + \underset{(3.40)}{.029}(b-f)(-1) + \hat{u}2 \quad R2 = .349,\ DW = 1.962 \tag{7}$$

These regression relationships suggest that bankruptcies represent an essential ingredient in the transmission mechanism by which different financial and non-financial shocks affect the economy. The shocks may not show up in direct output effects (as is the case with empirical analyses using with Finnish data) but these effects may well come through bankruptcies. Thus, several VAR model studies which have shown that financial variables are rather unimportant in terms of output determination may have given misleading results just because of the omission of this.

4 Conclusions

Bankruptcies have become an important variable in many countries. The development in Finland has been particularly conspicious. Bankruptcies have been responsible for very large unemployment and output losses. More importantly, bankruptcies have caused enormous credit losses to banks, which in turn have profoundly affected the capital market and which also have placed a heavy burden on government and taxpayers.

This paper has analyzed the macroeconomic determinants of bankruptcies as well as the consequences of business failures for the financial markets. It is no surprise that bankruptcies behave cyclically. Increased demand and competitiveness reduce bankruptcies and vice versa. In the same way, one might expect that bankruptcies depend (negatively) on real interest rates and (positively) on increases in asset prices. A related factor, which we emphasize in this paper, is indebtedness. It can be argued that indebtedness itself constitutes an equilibrium error-correction term. Excessive indebtedness easily causes a wave of bankruptcies when an economy is hit by a recession with a fall in output (and asset prices) and an increase in real interest rates.

Finnish data provide strong evidence for this argument. This is true for both the stylized facts and the results of empirical analyses. Our analyses also show that bankruptcies affect the growth rate for bank loans. Thus, cyclical fluctuations may increase because bankruptcies lead to a credit squeeze, decreased liquidity, higher real rates, lower asset prices and, finally, to additional bankruptcies (as pointed out e.g. in Stiglitz 1992). Although our results are only preliminary they strongly suggest that the role of bankruptcies deserves much more attention in future analysis of the relationships between financial markets and the macroeconomy.

References

Altman, E. (1983) **Corporate Financial Distress**, John Wiley & Sons, New York.

Basu, S. (1994) **Deregulation of the Australian Banking Sector: A Theoretical perspective.** Australian Economic Papers 33, 272-285.

Bernanke, B. and Gertler, M. (1989) **Agency Costs, Net Worth, and Business Fluctuations**, American Economic Review 79, 14-31.

Engle, R.F. & Granger, C.W.J. (1987) **Co-Integration and Error Correction: Representation, Estimation and Testing**, Econometrica 55, 251-276.

Greenwald, B. and Stiglitz, J. (1986) **Information, Finance Constraints and Business Fluctuations**, in M. Kohn and S. Tsiang (eds.) Finance Constraints, Expectations and Macroeconomics, Oxford University Press, Oxford, 103-140.

Gunther, J., Lown, C. and Robinson, K. (1995) **Bank Credit and Economic Activity: Evidence from the Texas Banking Decline.** Journal of Financial Services Research 9, 31-48.

Hudson, J. & Cuthbertson, K. (1993) **The Determinants of Bankruptcies in the U.K., 1971-1988**, The Manchester School 61, 65-81.

Johansen, S. (1991) **Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models**, Econometrica 59, 1551-1580.

Koskela, E., Loikkanen, H. and Virén, M. (1993) **House Prices, Household Saving and Financial Market Liberalization in Finland.** European Economic Review 36, 549-558.

Kremers, J., Ericsson, N. and Dolado, J. (1992) **Power of Cointegration Tests.** Oxford Bulletin of Economics and Statistics 54, 325-348.

Laitinen, E. (1990) **Predicting Bankruptcies** (in Finnish), Vaasan Yritysinformaatio, Vaasa.

Meehan, J., Peek, J. and Rosengren, E. (1993) **Business Failures in New England**, New England Economic Review, Federal Reserve Bank of Boston, Nov./Dec., 33-44.

Morck, R., Shleifer, A. & Vishny, R.W. (1992) **The Stock Market and Investment: Is the Market a Sideshow?**, Quarterly Journal of Economics.

Murto, R. (1993) **Pricing Bank Credits in 1987-1992: What Went Wrong?** (in Finnish), Bank of Finland Discussion Papers 4/93.

O'Brian, P. & Browne, F. (1992) **A Credit Crunch?, The Recent Slowdown in Bank Lending and its Implications for Monetary Policy**, OECD Working Paper No. 107.

Quandt, R.E. (1988) **The Econometrics of Disequilibrium.** Blackwell, London.

Shrievers, R. and Dahl, D. (1995) **Regulation, Recession, and Bank Lending Behavior: 1990 Credit Crunch.** Journal of Financial Services Research 9, 5-30.

Starck, C. ja Virén, M. (1991) **Forecasting the Behaviour of Bankruptcies**, in R. Flavell (ed.) Modelling Reality and Personal Modelling, Physica Verlag, Heidelberg.

Stiglitz, J.E. (1992) **Capital Markets and Economic Fluctuations in Capitalist Economies**, European Economic Review 36, 269-306.

Syron, R.F. (1991) **Are We Experiencing a Credit Crunch?**, Federal Reserve Bank of Boston New England Economic Review, July/August, 3-10.

Takala, K. and Virén, M. (1994) **Macroeconomic Effects of Bankruptcies.** University of Turku, Discussion Paper No. 44.

Williamson, S. (1987) **Financial Intermediation, Business Failures, and Real Business Cycles**, Journal of Political Economy 95, 1196-1216.

Table 3. **Estimates for the bankruptcy equation**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
const.	2.966	.985	-1.071	-1.126	-.140	-.297	-1.271	-1.808	.131	.338	.527	.929
	(5.74)	(2.88)	(2.37)	(2.44)	(0.23)	(0.47)	(1.31)	(1.76)	(0.31)	(3.14)	(0.88)	(2.26)
b(-1)	.796	.797	.741	.741	.779	.781	.544	.544	.753	.913	.718	.817
	(17.88)	(17.84)	(14.52)	(14.50)	(12.39)	(12.36)	(7.01)	(6.88)	(9.31)	(21.28)	(11.74)	(15.60)
l-y	.410	.430	.491	.506	.501	.540	1.058	1.199	.867	2.821	.622	.272
	(3.22)	(3.32)	(3.77)	(3.82)	(2.28)	(2.41)	(3.22)	(3.50)	(1.80)	(1.82)	(2.62)	(3.03)
Δy	-1.196	-.723	-1.143	-.828	-5.417	-4.540	-2.810	.055	-.282	-.868	-2.007	-.784
	(1.72)	(0.82)	(1.72)	(1.00)	(4.67)	(3.14)	(1.54)	(0.02)	(1.64)	(2.70)	(1.60)	(0.93)
rm	.856	.819	1.004	.977	.739	.674	3.057	2.837	.921	.495	2.547	.630
	(2.29)	(2.16)	(2.74)	(2.64)	(1.18)	(1.06)	(3.03)	(2.74)	(1.03)	(0.20)	(3.72)	(1.40)
Δsx	-.166	-1.675	-.150	-1.510	-.333	-.335	-.231	-.233	-.246	-.117	-.253	-1.448
	(1.56)	(1.57)	(1.46)	(1.47)	(1.79)	(1.80)	(0.84)	(0.83)	(0.98)	(1.56)	(1.34)	(1.15)
fx	-.850	-.867	-.814	-.826	-1.005	-1.039	-1.259	-1.377	-.261	-3.222	-.919	-.562
	(5.11)	(5.16)	(5.21)	(5.24)	(3.63)	(3.71)	(3.10)	(3.30)	(0.66)	(2.77)	(3.30)	(2.91)
gs	-.057	-.056	-.059	-.058	-.037	-.033	-.175	-.168	-1.088	-6.698	-.066	-.044
	(5.30)	(5.11)	(5.63)	(5.54)	(2.10)	(1.95)	(5.40)	(5.07)	(0.47)	(1.03)	(3.64)	(3.50)
R2	0.963	0.963	0.960	0.960	0.908	0.907	0.909	0.905	0.793	0.940	0.934	0.920
SEE	0.199	0.199	0.192	0.192	0.333	0.334	0.523	0.533	0.487	0.134	0.360	0.240
DW	2.063	2.016	2.049	2.016	1.556	1.484	1.780	1.700	1.190	1.241	2.096	1.962
LM1	0.392	..	0.358	..	2.206	..	1.055	..	4.393	3.148	0.513	0.069
JB	4.477	4.618	2.328	2.308	2.414	4.057	0.424	0.455	629	472	253	0.269
Chow	4.074	..	3.345	..	1.657	..	3.645	..	9.033	5.483	1.910	3.799
dep.var.	b	b	b-η	b-η	b-f	b-f	db-y	db-y	BA	BI	bc	br
estimator	ols	iv	ols	iv	ols	iv	ols	iv	ols	ols	ols	ols

dep.var. denotes the definition of the dependent variable. b denotes bankruptcies, l banks' total credit supply, y real GDP, rm real yield on government bonds, sx the Unitas stock index deflated by consumption prices, fx the real exchange rate, gs the share of central government expenditure of GDP, w the real wage rate and M1 the nominal money stock. (b-η) indicates that the number of bankruptcies is divided by population (η), (b-f) that it is divided by the number of firms (f) and (bd-y) that the dependent variable is the debt of bankrupt firms in relation to GDP. In the case of (b-η) specification, also all other relevant variables are divided by population. ba, bi, bc and br denote sectoral bankruptcy variables for agriculture, industry, commerce and other branches, respectively. Due to zero observations, the first two sectoral equations are expressed in levels (not in logs). All variables, except rm and fx are expressed in logs. (-1) indicates that the variable is lagged by one year. (½), in turn, indicates a half-year lag. Numbers in parentheses are unadjusted t-ratios (heteroscedasticity/autocorrelation adjusted t-ratios are so close to these unadjusted ratios that they are not reported). LM is the Godfrey autocorrelation test statistic in the presence of a lagged dependent variable, JB is the Jarque-Bera test for residual normality and Chow is the Chow stability test statistic for the period 1945. Under the null hypothesis, the distribution of LM1 is standard normal, the distribution of JB is chi square with two degrees of freedom while the distribution of Chow is (approx.) F(9,54). OLS denotes the ordinary least squares estimator and iv the instrumental variable estimator. With this estimator, the list of instruments includes lagged Δy, the discount rate (rd), the terms of trade tt, fx, the growth rate of industrial production (ip) and money supply (m1).

Table 4. **Error-correction model estimates for bankruptcies**

(1) $$b = \underset{}{1.556} + \underset{(2.03)}{.546}f - \underset{(1.84)}{1.564}y + \underset{(4.77)}{1.698}l - \underset{(14.76)}{.131}gs + \underset{(7.78)}{\hat{u}1}$$

$R2 = 0.862$, $SEE = 0.370$, $DW = 0.576$, $ADF1 = 3.31$.

$$\Delta b = \underset{}{-.027} - \underset{(0.86)}{2.115}\Delta y + \underset{(3.29)}{2.451}\Delta l - \underset{(7.96)}{.047}\Delta gs - \underset{(3.48)}{.245}\hat{u}1(-1)$$

$R2 = 0.553$, $SEE = 0.191$, $DW = 1.628$, $JB = 2.048$, $Chow = 0.900$.

(2) $$b = \underset{}{-89.643} + \underset{(8.43)}{.143}\eta - \underset{(8.52)}{4.098}y + \underset{(10.97)}{2.327}l - \underset{(20.84)}{.119}gs + \underset{(9.52)}{\hat{u}2}$$

$R2 = 0.930$, $SEE = 0.264$, $DW = 0.864$, $ADF1 = 4.10$.

$$\Delta b = \underset{}{-.069} + \underset{(1.12)}{.172}\Delta\eta - \underset{(2.86)}{2.645}\Delta y + \underset{(4.15)}{2.372}\Delta l - \underset{(7.32)}{.042}\Delta gs - \underset{(3.10)}{.348}\hat{u}2(-1)$$

$R2 = 0.621$, $SEE = 0.177$, $DW = 1.642$, $JB = 1.615$, $Chow = 0.676$.

(3) $$b = \underset{}{-127.167} + \underset{(10.78)}{.175}\eta - \underset{(11.10)}{4.809}y + \underset{(13.72)}{1.411}l - \underset{(6.86)}{.089}gs + \underset{(7.94)}{3.103}w + \underset{(5.02)}{\hat{u}3}$$

$R2 = 0.949$, $SEE = 0.229$, $DW = 1.267$, $ADF1 = 4.23$.

$$\Delta b = \underset{}{-.080} + \underset{(1.87)}{.203}\Delta\eta - \underset{(3.63)}{3.219}\Delta y + \underset{(5.61)}{2.050}\Delta l - \underset{(7.74)}{.037}gs + \underset{(2.80)}{1.775}\Delta w - \underset{(3.32)}{.479}\hat{u}3(-1)$$

$R2 = 0.677$, $SEE = 0.164$, $DW = 1.695$, $JB = 0.407$, $Chow = 0.734$.

$$\Delta b = \underset{}{-.067} + \underset{(1.57)}{.190}\Delta\eta - \underset{(3.37)}{3.068}\Delta y + \underset{(5.31)}{1.941}\Delta l - \underset{(7.17)}{.039}\Delta gs + \underset{(3.01)}{1.446}\Delta w + \underset{(2.56)}{.487}\Delta rm - \underset{(1.59)}{.072}\Delta sx - \underset{(0.83)}{.427}\hat{u}3(-1)$$

$R2 = 0.693$, $SEE = 0.163$, $DW = 1.708$, $JB = 0.714$, $Chow = 0.497$.

The first equation is the cointegration equation and the latter equation(s) the respective error corrections model(s). ADF1 denotes the Augmented Dickey-Fuller test statistic for unit root (the 5 per cent critical value is 2.90). Otherwise, notation is the same as in Table 1.

Table 5. **Estimates for the credit expansion equation**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
const.	-.015	-.097	-.173	-.094	-.145	-.147	-.149	-.145
	(0.24)	(2.08)	(3.87)	(2.01)	(3.66)	(3.68)	(3.66)	(3.59)
Δl(-1)	.176	.404	.406	.377	.380	.364	.403	.398
	(1.94)	(4.53)	(4.52)	(4.08)	(4.28)	(3.94)	(4.49)	(4.45)
Δy	.399	.395	.403	.259	.373	.296	.425	.329
	(2.46)	(2.76)	(2.81)	(1.41)	(2.62)	(1.61)	(3.00)	(2.11)
b(-1)	-.036	-.011	-.011	-.012	-1.011	-1.165	-.518	-.952
	(3.92)	(1.82)	(1.87)	(1.98)	(2.21)	(2.29)	(1.57)	(1.78)
rm	.420	-	-	-	-	-	-	-
	(2.70)							
Δrm	-	-.192	-.192	-.205	-.188	-.192	-.195	-.189
		(2.24)	(2.22)	(2.30)	(2.17)	(2.20)	(2.19)	(2.15)
Δp	-.813	-	-	-	-	-	-	-
	(6.05)							
ΔΔp	-	-.698	-.699	-.702	-.692	-.694	-.697	-.719
		(7.96)	(7.98)	(7.94)	(7.97)	(7.97)	(7.89)	(8.16)
tt	.274	.136	.128	.144	.130	.135	.123	.129
	(7.06)	(3.65)	(3.55)	(3.78)	(3.69)	(3.74)	(3.45)	(3.57)
Δm2(-½)	.444	.474	.478	.507	.465	.483	.477	.457
	(3.23)	(4.72)	(4.74)	(4.84)	(4.76)	(4.76)	(4.64)	(4.62)
rm-rd	-	-	-	-	-	-	-	-
R2	.758	.812	.812	.809	0.816	0.815	0.809	0.811
SEE	.046	.040	.040	.041	0.040	0.040	0.040	0.040
DW	1.406	1.821	1.844	1.757	1.838	1.803	1.825	1.840
LM1	2.753	0.421	0.289	..	0.424	..	0.322	0.290
JB	0.215	0.089	0.056	0.224	0.330	0.647	0.033	0.055
Chow	0.418	1.848	2.000	..	1.794	..	2.076	1.915
dep.var.	Δl	Δl	Δ(l-η)	Δl	Δl	Δl	Δl	Δl
b.var	b	b	b-η	b	b-f	b-f	db-y	b
estimator	ols	ols	ols	iv	ols	iv	ols	iv

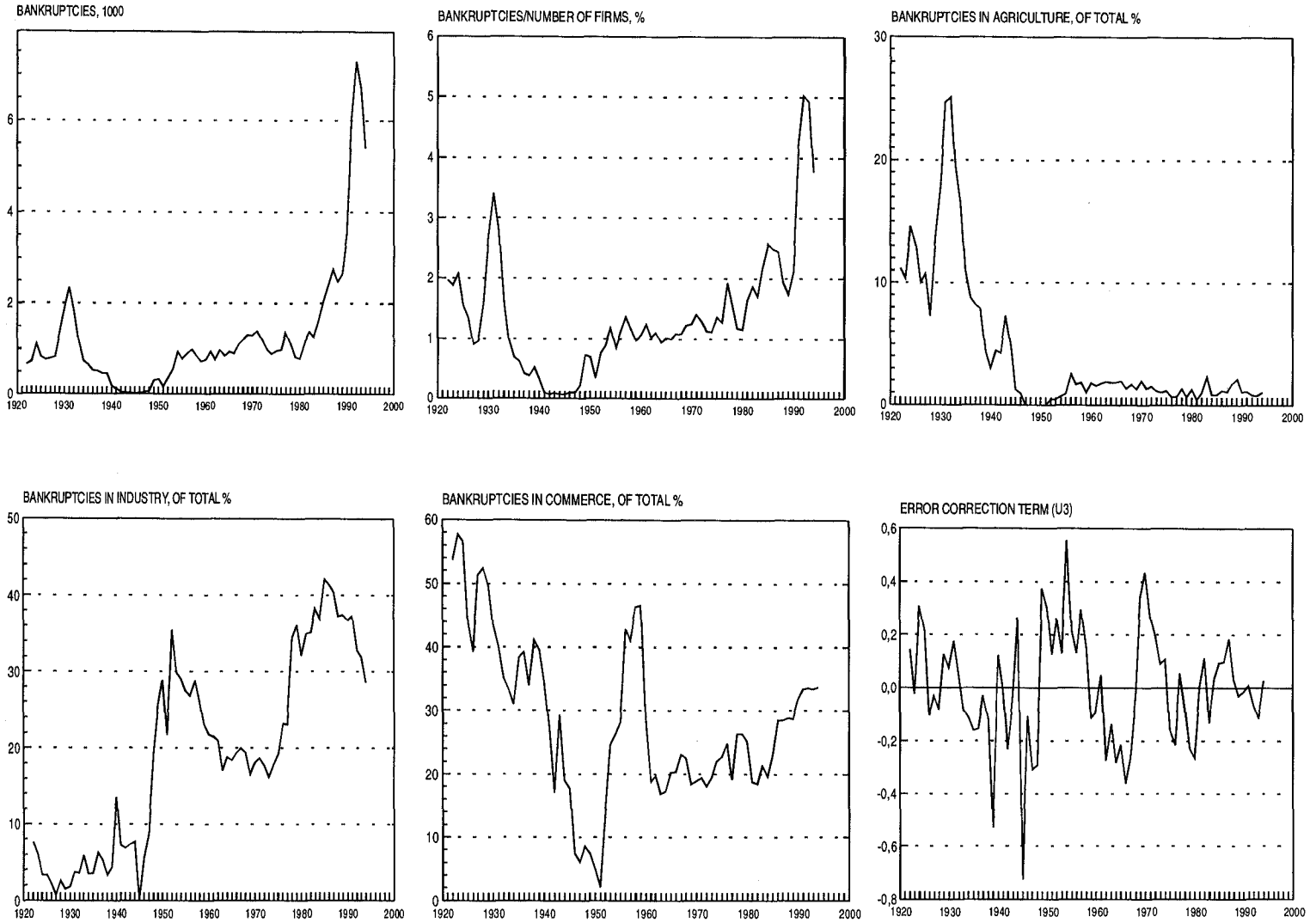
b.var denotes the definition of the bankruptcy variable. In column (8), it is not lagged (as it is in other equations). Notation is the same as in Table 1.

Figure 2.

Bankruptcies and indebtedness

1 = log of bankruptcies, 2 = log of debt/GDP ratio. Both series are STAMP trends

Figure 3


BANKRUPTCIES, 1000
BANKRUPTCIES/NUMBER OF FIRMS, %
BANKRUPTCIES IN AGRICULTURE, OF TOTAL %
BANKRUPTCIES IN INDUSTRY, OF TOTAL %
BANKRUPTCIES IN COMMERCE, OF TOTAL %
ERROR CORRECTION TERM (U3)
1920 1930 1940 1950 1960 1970 1980 1990 2000

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