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The determinants of aggregate creditors' voluntary liquidations

Peter L. Jones*

This article investigates the determinants of creditors' voluntary liquidations (CVLs), an area of research that has received comparatively scant attention in the literature despite the fact that, at least in the UK, this form of insolvency has consistently comprised the majority of company failures. It develops an equilibrium correction model to explain variations in the aggregate number of creditors' voluntary liquidations in England and Wales between 1963 and 1995. This is then subjected to out-of-sample testing over the subsequent ten-year period. The results indicate that in both the short-run and the long-run, changes in the level of liquidations can be explained by two main explanatory variables namely: the nominal after-tax cost of borrowing and changes in the overall level of economic activity. In addition, confirmatory evidence is provided of the dampening effect of the 1986 Insolvency Act on the number of liquidations. The model retains its forecasting accuracy in the out-of-sample period although there is possibly some preliminary evidence of a further mitigating effect associated with the Enterprise Act 2002.

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I. Introduction

The empirical evidence regarding the factors that determine company failure has historically been divided into those studies whose primary focus is on company-specific characteristics such as financial performance and managerial efficiency and those whose main emphasis is on the macroeconomic determinants of aggregate failures. This study follows in the latter tradition.

Whilst the academic literature is replete with cross-sectional models which attempt to predict failure at the individual company level¹, it remains the case that there is a relative paucity of time-series studies into the macroeconomic determinants of aggregate company failures. In order to identify the salient issues surrounding this topic, it would seem apposite to review the extant evidence within the context of the particular legal form of company failure being considered. In this respect, traditionally in the UK there have been two types of insolvency procedure, namely, compulsory and creditors' voluntary liquidations.²

An alternative procedure was introduced in the 1986 Insolvency Act whereby a company can be placed into administration rather than liquidation. An administration order is a means of using the protection of

¹ See Dimitras *et al.* (1996), Morris (1997) and more recently, Balcaen and Ooghe (2006) for excellent reviews of this literature.

² The *primary* difference between the two procedures is that a compulsory liquidation is usually initiated by one of the company's creditors for non-payment of debts whilst the catalyst for a CVL is a decision by the directors that the company is in an insolvent position and can no longer continue to trade.

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the courts in order to provide a period of respite during which the company's affairs can be restructured. This was amended by the Enterprise Act 2002 which introduced changes to the procedure with Part II of the 1986 Insolvency Act being replaced with Schedule B1. These amendments included the introduction of additional routes into administration for companies that do not necessitate an administration order and also a streamlining of the process whereby, in some instances, companies can be dissolved without recourse to liquidation. These amendments came into force in September 2003.

Although there have been a number of studies into the determinants of compulsory liquidations (Hudson, 1986; Cuthbertson and Hudson, 1992; Turner *et al.*, 1992); Sharabany, 2004; Fabling and Grimes, 2005), there is far less substantive empirical evidence regarding the incidence of CVLs. This, despite the fact this form of company liquidation has consistently accounted for more than 60% of all liquidations in England and Wales over the last forty years (see Fig. 1). In terms of the studies that have been undertaken, Hudson *op. cit.* suggests that the key determinant of the rate of CVLs is the share of non-oil and gas profits in company Gross Domestic Product (GDP), with real interest rates having a negative, but only marginally, significant influence. Meanwhile, Turner *et al.* (1992) identified the one-year lagged dependent variable and real gross trading profits as the primary influences on the rate of CVLs with the lagged level of the three-month inter-bank rate

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3 being of only marginal, positive significance. In addition, both a
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6 continuous and split time trend were found to be important explanatory
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8 factors.
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12 [INSERT FIGURE 1 APPROXIMATELY HERE]
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19 Some authors have not distinguished between different types of
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21 company failure in the manner identified above, preferring instead to
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23 adopt a more aggregated approach even though there are clearly distinct
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25 legal processes involved in the alternative forms of company insolvency.
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27 In this respect, Desai and Montes (1982) analysed business bankruptcies
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29 from a monetary perspective. Their results suggest that the number of
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31 failures is positively related to the lagged dependent variable and the
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33 prevailing level of nominal interest rates and negatively to the annual
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35 rate of growth in the money supply. Wadhvani (1986) identified the
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37 lagged liquidation rate, the nominal after-tax interest rate, real wages in
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39 manufacturing, real raw materials prices, a measure of company
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41 indebtedness and relative producer prices as having significant positive
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43 impacts on the rate of liquidations. In addition, world income, a fiscal
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45 stance variable and a time trend were significant negative influences.
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47 Perhaps the main finding of this study is that the inclusion of a nominal
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49 interest rate measure indicates a significant role for inflation in
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3 determining the probability of liquidation, implying the existence of
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5 imperfect capital markets.³
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11 Wadhvani's model was re-estimated by Cornelius and Wright
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13 (1995) using quarterly data for the period 1965 to 1994. The significant
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15 positive long-run impacts on the liquidation rate were found to be net
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17 firm debt to market value, producer price inflation and the real interest
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19 rate which was estimated on the basis of the yield on short-dated treasury
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21 bills. These results, at least partially confirm those of the Wadhvani
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23 study.
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32 Davies (1987) applied Wadhvani's framework to annual business
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34 failures in the UK, US, Germany and Canada. The results indicate that the
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36 main significant influences on the annual rate of business failures were
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38 the level of nominal interest rates and changes in real GNP, real wages,
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40 real raw material prices and corporate debt to GNP. In addition, it was
41
42 found that the US bankruptcy law of 1978 had reduced the costs of
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44 bankruptcy.
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60 ³ This is based on the perspective that under perfect capital market conditions, firms can offset the negative cash flow effects of increases in expected inflation and hence nominal interest rates by borrowing more against the higher nominal value of their assets. As a consequence, the impact of inflation is essentially neutral.

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Young (1995) extended the work of Wadhvani by examining the impact of changes in the levels of both real and nominal interest rates on the solvency of the firm. In particular, a distinction is drawn between the effects of anticipated and unanticipated changes. The main influences on the liquidation rate were found to be: the lagged dependent variable; a measure of short-term debt to capital stock; the growth rate in the number of registered companies; the current level of aggregate demand; lagged real materials prices; the change in nominal interest rates; the lagged level of nominal interest rates; and three terms in unanticipated real interest rates. The inclusion of the nominal interest rate variables confirms the finding of Wadhvani in terms of the role of inflation in explaining the rate of company liquidations. In addition, unanticipated changes in real interest rates were found to have had a particularly significant effect during the period from the late 1970s to the mid 1980s when companies relied more heavily on variable rather than fixed-rate debt.

Vlieghe (2001a, 2001b) employed a variation of Wadhvani's model to analyse the key factors influencing the rate of corporate liquidations in the UK between 1975 and 1999. The key long-run explanatory factors were identified as being the proportion of net debt to GDP, the deviation of real GDP from trend, the real interest rate, real unit wages and the 1986 Insolvency Act. Furthermore, the short-run determinants were the nominal interest rate, the birth rate of new companies and property

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3 prices. Vlieghe also compared the factors responsible for the significant
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5 increase in the rate of liquidations during the period from 1988 to 1992
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7 with those determining the subsequent decline between 1992 and 1997.
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9 The results indicate significant temporal variations in the nature of the
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11 key influences. Specifically, the single most important factor in explaining
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13 the increase in the liquidation rate was found to be the level of corporate
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15 indebtedness relative to GDP. In addition, declining GDP relative to
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17 trend as well as increasing real wages and real interest rates were also
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19 identified as being significant determinants. Moreover, the 1986
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21 Insolvency Act was found to have had a dampening effect on the rise in
22
23 the rate of corporate liquidations. In contrast, the key influence on the
24
25 decline in the liquidation rate was the fall in real unit wage costs with the
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27 increase in GDP relative to trend and the reduction in the real interest
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29 rate over the period also being significant factors.
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42 In light of the findings of the above studies regarding the role of
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44 aggregate debt levels in explaining total liquidations, Kearns (2003)
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46 examined the situation in Ireland. Concentrating primarily on the period
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48 of increasing corporate indebtedness between 1995 and 2002, he
49
50 concluded that there was no definitive impact on the rate of insolvent
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52 liquidations as a result of the increasing corporate debt burden. However,
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54 this was a qualified conclusion as data availability problems prevented
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56 any formal statistical testing of the relationship.
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3 Liu and Wilson (2002) specifically tested for the effect of the
4 introduction of the 1986 Insolvency Act on the overall rate of liquidations
5 in the UK by means of an error (equilibrium) correction model (ECM).
6
7 The findings confirmed that this legislation was a significant factor in
8 reducing the liquidation rate up until the beginning of 1990. Other
9 important determinants were found to be the lagged dependent variable,
10 the level of interest rates, lending to the corporate sector, the level of
11 inflation, corporate profitability and the company birth rate. These results
12 were largely confirmed by Liu (2004).
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29 In a similar vein to Fabling and Grimes *op. cit.*, Gaffeo and Santoro
30 (2006) examine business failure from a regional perspective using annual
31 data for the twenty Italian regions. Employing a panel cointegration
32 approach they identified significant long-run relationships between trend
33 output, vertical interest spreads, a measure of 'surprise' inflation and the
34 rate of company liquidations. Specifically, the former was found to be
35 negatively related to the failure rate and the latter two impacted
36 positively. In addition, their results also indicate that changes in both real
37 wages and the new business formation rate were significant positive
38 influences during the movement to the long-run equilibrium position.
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56 Finally, Rose *et al.* (1982) modelled business failure in the US and
57 hypothesised a generalised linear model whereby the failure rate was
58 linked to external factors related to the business cycle. The independent
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3 variable set reflected the alternative theoretical explanations of failure
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5 and included leading and coincident indicators as well as supply or cost-
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7 push, monetary and savings-investment variables. The rate of business
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9 failure was found to be positively related to the lagged value of the S & P
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11 composite index, the contemporaneous ratio of retail sales to GDP and
12
13 the lagged ninety-day Treasury bill rate. Those factors exerting a
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15 significant negative impact were identified as the lagged prime interest
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17 rate, lagged gross private domestic investment as a proportion of GNP
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19 and a measure of after-tax company profitability.
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29 The findings of these studies enable us to identify the key debates
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31 in relation to the determinants of company liquidations that will form the
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33 basis of the analysis presented here. Firstly, it is apparent that there is
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35 some dubiety concerning the role of interest rates in terms of the relative
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37 importance of real and nominal rates as well as the significance of levels
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39 or changes. Secondly, there appears to be no general consensus regarding
40
41 the relative importance of general macroeconomic conditions, company
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43 sector performance and input-cost considerations within the failure
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45 process. Finally, the use of the number of company births as a means of
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47 capturing the 'age-structure' effect associated with company failure
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49 represents another potentially contentious issue given the alternative
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3 methods available to measure entry rates.⁴ Many of these issues are
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5 explored in this study however perhaps the main rationale for this paper
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7 is to attempt to bridge the obvious gap in the literature in terms of the
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9 specific analysis of the determinants of aggregate CVLs.
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16 The remainder of this article is organized as follows. Section II
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18 presents the theoretical framework. The selection of the variables, data
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20 sources and statistical methodology are detailed in Section III. The results
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22 of the modelling procedure are reported and discussed in Section IV.
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24 Finally, Section V summarizes the main findings and presents some
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26 concluding remarks.
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33 **II. Theoretical Framework**

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35 The theoretical framework employed in this study is based on that used
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37 by Vlieghe (2001a, 2001b), Sharabany (2004), Fabling and Grimes (2005)
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39 and Gaffeo and Santoro (2006) amongst others who, in turn, employ
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41 variants of the approach adopted by Wadhvani (1986).
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⁴ See Love (1995) and Audretsch and Fritsch (1995) for an informative discussion of the relative merits of the 'ecological' and 'labour market' approaches to the measurement of entry rates.

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3 Firstly, the nominal level of pre-tax profits for the k th firm in time
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6 period t , (P_{kt}) is given by:
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$$10 \quad P_{kt} = R_{kt} - W_{kt} - M_{kt} - i_t D_{kt} \quad (1)$$

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16 Where R_{kt} is nominal total revenue, W_{kt} represents the level of wage costs,
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19 M_{kt} is the cost of material inputs, i_t is the prevailing nominal interest rate
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21 and D_{kt} is the firm's level of indebtedness.
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26 Assuming that the liquidation process will be initiated by the
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28 directors when the firm's net asset value (or net worth) becomes negative
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30 and letting V_{kt} represent the net asset value of the k th firm, then the
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32 liquidation condition is given by:
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$$39 \quad V_{kt} + P_{kt} < 0 \quad (2)$$

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43 Combining (1) and (2) and denoting real constructs in lower case terms
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46 whilst retaining the nominal interest rate i_t yields:
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$$51 \quad v_{kt} + r_{kt} - w_{kt} - m_{kt} - i_t d_{kt} < 0 \quad (3)$$

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56 Furthermore, real total revenue is assumed to be a direct function
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59 of real aggregate economic activity (y_t), the rate of inflation (Π_t) as well
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3 as a random disturbance term (ε_{kt}). Clearly, it would be expected that
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5 economic activity would be positively correlated with total revenue and
6
7 *ceteris paribus*, firm profitability. As far as the role of inflation is concerned
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9 Wadhvani (1986) identified that where borrowing limits exist, firms that
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11 have exceeded their limit will face increasing pressures on internally
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13 generated cash flows. With non-indexed variable rate debt, for a given
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15 level of real interest rates, an increase in the rate of inflation will result in
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17 a proportionately larger increase in the nominal interest rate. As Davis
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19 (1987) identifies, this effect can be captured by incorporating both
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21 nominal and real interest rates into the modelling procedure. This is
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23 taken into account in (3) above and consequently does not have to be
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25 considered independently.
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36 One of the interesting features of the aggregate company failure
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38 literature is that the role of company taxation is largely ignored. For
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40 example, Vlieghe (2001a) refers to the potential impacts but does not
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42 incorporate a tax variable into the modelling process. However,
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44 Wadhvani *op. cit.* did examine the role of taxation by means of the after-
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46 tax cost of borrowing and found the nominal cost to be a significant
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48 explanatory factor under conditions of both perfect and imperfect
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50 competition. This approach is replicated here and again, the nature and
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52 significance of any impact can be analysed by means of the interest rate
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54 term in (3).
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Thus, real total revenue for the k th firm in period t is denoted by:

$$r_{kt} = \alpha_1 y_t - \alpha_2 \Pi_t + \varepsilon_{kt} \quad (4)$$

The combination of (3) and (4) indicates that firm k will face liquidation when the following pertains:

$$\varepsilon_{kt} < i_t d_{kt} + w_{kt} + m_{kt} - v_{kt} - \alpha_1 y_t + \alpha_2 \Pi_t \quad (5)$$

Therefore, the probability of the directors of firm k initiating a creditors' voluntary liquidation in period t , ($PCVL_{kt}$) is given by:

$$PCVL_{kt} = f(i_t, d_{kt}, w_{kt}, m_{kt}, v_{kt}, y_t, \Pi_t) \quad (6)$$

which implies that the aggregate economy-wide number of creditors' voluntary liquidations (CVL_t) can be expressed as:

$$CVL_t = g(i_t, d_t, w_t, m_t, v_t, y_t, \Pi_t, \mathbf{X}_t) \quad (7)$$

where \mathbf{X}_t is a vector of non-stochastic variables specifically consisting in this study of dummy explanatory variables designed to capture the potential impacts of the 1981 Civil Service Strike, the Insolvency Act of 1986 and seasonal variations in the dependent variable.

III. Variable selection and methodology

A detailed description of the variables used in the modelling process is provided in the appendix. The change in the number of CVLs in England and Wales between 1963Q1 and 1995Q4 is taken to be the dependent variable rather than the liquidation rate due to the lack of published quarterly data on the stock of companies over the estimation period. Furthermore, company 'births' are also excluded from the analysis for the same reason.

As suggested in the preceding section, two interest rate measures (i_t) are employed, the base rate (IR) and a proxy for the after-tax cost of debt financing ($COSTD$). The latter is used in order to reflect the fact that many companies fail for reasons other than lack of profitability and, consequently, the tax-shield effect associated with the use of debt constitutes a potentially significant explanatory factor.

Secondly, corporate indebtedness (d_t) is measured by means of both the company net borrowing requirement (NBR) and the level of company bank borrowing ($BANKB$).

Two measures of real wages (w_t) are employed namely: the IMF index of relative unit labour costs in manufacturing ($RULC$) and the general index of unit labour costs ($GULC$) which is defined as whole economy average wages and salaries divided by output per worker. The

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3 cost of material inputs (m_t) is measured by the index of relative producer
4 prices ($RELPP$).
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11 As far as the aggregate net asset value or net worth is concerned
12 (v_t) the Office for National Statistics publishes figures for changes in net
13 worth for private sector non-financial corporations however, the series
14 only dates back until 1965. Therefore, the overall company financial
15 surplus/deficit position ($SURDEF$) is used as a proxy (the correlation
16 between the two series is 0.88).
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29 Real aggregate economic activity (y_t) and the rate of inflation (Π_t)
30 are measured by GDP and the Retail Prices Index (RPI) respectively.
31 Finally, the vector of non-stochastic variables (X_t) includes a dummy
32 variable designed to assess the influence of the 1986 Insolvency Act
33 ($1986DUM$) which is assigned a value of 1 between 1986Q4 and 1990Q4
34 and 0 elsewhere. A dummy variable is also used in order to take account
35 of the effects of the 1981 Civil Service strike ($1981DUM$) and the 'missing
36 data' problem is addressed by means of a zero-order approach (Pindyck
37 and Rubinfeld, 1991).
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54 Summary descriptive statistics for both the dependent variable
55 and the explanatory variables are provided in Table 1. As far as the
56 former is concerned, the number of CVLs has increased steadily,
57 particularly since the early 1980s, reaching a maximum of 3867 in the
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third quarter of 1992. The main feature of the statistics for the independent variables is perhaps the volatility exhibited by the company indebtedness measures reflecting the diverse nature of the macroeconomic conditions experienced in the UK during the estimation period.

[INSERT TABLE 1 APPROXIMATELY HERE]

The data were tested for the presence of unit roots by means of both the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test statistics the results for which are detailed in Table 2. Unsurprisingly, the null hypothesis of a unit root cannot be rejected in the majority of cases and, as a consequence, the modelling approach employed is the Engle-Granger two-step procedure.

[INSERT TABLE 2 APPROXIMATELY HERE]

The general-to-specific methodology of Hendry and Doornik (2001) was adopted and the final estimating equation is given by:

$$\Delta CVL_t = c + a_1(L)\Delta CVL_t + a_2(L)\Delta X_t + a_3(L)X_t + \gamma\varphi_{t-1} + \mu_t \quad (8)$$

Where: $a_i(L)$ are polynomials in the lag operator; a_1 is the estimated regression coefficient on the lagged dependent variable; a_2 and a_3 are the

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estimated regression coefficients on changes in, and levels of, the lagged independent variables respectively; φ_{t-1} is the cointegrating vector and γ is the associated estimated coefficient; c is a constant term; and μ_t is an error term. This formulation is broadly equivalent to that employed by Vlieghe (2001a, 2001b).

IV. Empirical analysis and discussion

The estimation results and diagnostic statistics for the preferred specification are detailed in Table 3. All of the estimated regression coefficients are statistically significant at the 0.05 level or better and the associated signs are intuitively plausible. Furthermore, all of the diagnostic tests are satisfactory. It is evident that the two main macroeconomic determinants of the change in CVLs are the lagged changes in GDP and the one-period lagged level of the nominal after-tax cost of debt (*COSTD*). The former observation is generally in accordance with the findings of Cuthbertson and Hudson (1992) for UK compulsory liquidations.

[INSERT TABLE 3 APPROXIMATELY HERE]

The inclusion of the nominal after-tax cost of debt in the model in preference to the real measure tends to confirm the results of both Wadhvani (1986) and Young (1995) amongst others concerning both the significance of inflation in contributing to company liquidations and the

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existence of imperfect capital markets. In addition, the fact that it is significant in levels rather than differences implies that any change in the rate of inflation is likely to have a long-run impact on the level of CVLs. Finally, the after-tax formulation suggests that the small-firm corporation tax rate does influence the level of liquidations. Specifically, a higher rate of corporation tax, will, *ceteris paribus*, produce a greater tax-shield effect which, in turn, results in a lower after-tax cost of debt. As a consequence, the probability of failure amongst tax-paying firms will be reduced.

It should also be noted that the relatively short lag structures associated with these two variables would appear to indicate that the decision by the directors to initiate a CVL is taken on the basis of short-term economy-wide influences. In addition, this could be symptomatic of the acute vulnerability of the firms involved to both short-term downturns in economic growth and/or increases in the after-tax cost of borrowing. Alternatively, it may simply reflect the fact that the initial formal phases of a CVL can generally be completed in a comparatively short period of time.

The significance of the 1986 Insolvency Act dummy variable provides further confirmatory evidence that this legislation had a dampening effect on the number of liquidations. In this instance, the coefficient value implies that the short-run effect was a reduction of 11.07%. This is of the same order of magnitude as the reduction of 8.6%

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estimated by Vlieghe (2001a) and considerably larger than the figures reported in both Cuthbertson and Hudson (1992) and Liu and Wilson (2002).

The coefficient on the error correction term of -0.21 implies convergence to the long-run equilibrium at a rate of 21% per quarter which again is broadly similar to the rate reported in Vlieghe (2001a, 2001b). Finally, the significant positive coefficient on the seasonal dummy variable indicates that there is a tendency for the number of CVLs to be higher in the first quarter of the year.

The solved static long-run regression equation is detailed below (*t*-statistics in parentheses):

$$\begin{aligned}
 CVL = & -0.111 - 5.177(GDP) + 0.085(COSTD) - 0.097(1986DUM) \\
 & (-2.42) \quad (-4.44) \quad (3.35) \quad (-3.25) \\
 & + 0.081(Q1DUM) \quad (9) \\
 & (4.21)
 \end{aligned}$$

Wald statistic = 69.32 (0.000)

It is evident from the above that all of the long-run coefficients are well determined and the Wald test statistic indicates that the null hypothesis that they are all zero (except the constant) is rejected. The above formulation illustrates the dominant long-run impact of economic

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3 growth on the number of CVLs and the estimated coefficient is again
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5 consistent with that reported in Vlieghe (2001a, 2001b). Moreover, the
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7 significance of the 1986 Insolvency Act indicates that this legislation has
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9 had a long-term impact on the number of CVLs which is consistent with
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11 the findings of Liu (2002).
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19 The Chow test of statistical parameter constancy and a forecast test
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21 of numerical parameter constancy (Hendry and Doornik, 2001) were
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23 employed in order to further assess the robustness of the estimated
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25 model. The results are detailed in Table 4 and they clearly indicate that
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27 the null hypotheses of both statistical and numerical parameter constancy
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29 cannot be rejected for any of the test periods.
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36 [INSERT TABLE 4 APPROXIMATELY HERE]
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41 Finally, the out-of-sample forecasting performance of the model
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43 was tested over the ten year period 1996Q1 to 2005Q4 by means of Theil's
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45 U statistic and the associated decomposition advocated by Granger and
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47 Newbold (1973). The test statistic for the period is 0.04 which is
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49 sufficiently close to zero so as to suggest reasonably effective forecasting
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51 accuracy. Decomposing this measure into the proportions of inequality
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53 produces a bias proportion of 0.05, a variance proportion of 0.02 and a
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55 covariance proportion of 0.93. These figures indicate respectively, that the
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57 degree of systematic error is relatively low, the variability in the actual
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3 series is largely being replicated in the forecast series and, as a
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5 consequence, deviations between the actual and fitted values are
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7 primarily due to unsystematic errors. This out-of-sample accuracy is
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9 confirmed by the root-mean-square percentage error of 8.1%. Whilst it is
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11 not possible to compare this performance with the vast majority of
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13 previous studies due to the lack of out-of-sample testing, Turner *et al.*
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15 (1992) did produce *ex post* forecasts for the rate of CVLs between 1980 and
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17 1989. The reported mean absolute error was 36%. Finally, plots of both
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19 the actual and fitted values of the number of CVLs for both the estimation
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21 and forecast periods are provided in Fig. 2.
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31 [INSERT FIGURE 2 APPROXIMATELY HERE]
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36 In general, the graph illustrates that the forecast values track the
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38 actual values extremely closely over the entire period thereby reinforcing
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40 the preceding analysis and evaluation. However, one caveat should be
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42 introduced at this stage in relation to the performance of the model in
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44 light of the introduction of the amendments enshrined in the Enterprise
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46 Act 2002 during the third quarter of 2003. Since this date it can be seen
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48 that the model appears to exhibit a tendency to over-predict the actual
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50 number of CVLs. Although the root-mean-square percentage errors for
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52 the pre- and post- 2003Q3 forecasts of 8.03% and 8.16% respectively are
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54 virtually identical, it may be that the changes in the legislation could have
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56 a further dampening effect on the number of CVLs. Indeed, the number
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3 of companies in England and Wales entering administration under the
4 provisions of the 2002 Act has increased from 1,601 in 2004, the first full
5 year of operation, to 3,560 in 2006. However, clearly a longer time period
6 is required before definitive conclusions can be drawn regarding this
7 potential effect.
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18 **V. Conclusions**

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20 This article has investigated a somewhat neglected aspect of the analysis
21 of company failure, namely, the key factors affecting the level of
22 aggregate CVLs in England and Wales. The rationale for limiting the
23 study to this particular legal form of failure is that CVLs have
24 consistently represented the largest proportion of all company
25 liquidations. The results indicate that the two main significant
26 macroeconomic determinants are the rate of economic growth and the
27 level of nominal, after-tax interest rates. This latter finding lends support
28 to the view that nominal factors have a significant influence on company
29 liquidations and can be further interpreted as providing evidence to
30 support the existence of imperfect capital markets. These two
31 macroeconomic influences were found to be significant in both the short-
32 and long-run.
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56 In addition, the final estimated equation includes a dummy
57 variable for the 1986 Insolvency Act confirming the evidence from some
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3 of the previous studies that this legislation has had a dampening effect on
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6 the number of liquidations.
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11 The within- and out-of-sample performance of the model was
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13 tested and the results of the latter in particular suggest that the
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15 parsimonious equation reported here provides a reasonably effective
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17 means of capturing variations in, and hence forecasting the level of CVLs
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19 over time. However, the model did exhibit a tendency to over-predict
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21 during the period since the third quarter of 2003 suggesting that the
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23 change in insolvency legislation incorporated in the Enterprise Act 2002
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25 may have had a further mitigating effect on the number of CVLs.
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34 Clearly, there are a number of policy implications arising from this
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36 analysis. Firstly, in terms of limiting the number of CVLs, it is imperative
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38 that government policy is directed at providing an environment of
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40 macroeconomic stability which reduces the likelihood of significant
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42 reductions in economic growth. Secondly, in terms of the macroeconomic
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44 policy instruments, the evidence suggests that it is the conjoint impact of
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46 the level of nominal interest rates and the small firm corporation tax rate
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48 that are the primary influences on the level of CVLs. This implies that,
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50 where a policy of lower interest rates is combined with one of reducing
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52 the corporation tax rate levied on small businesses, then, *ceteris paribus*,
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54 the resultant decrease in the number of CVLs will be at least partially
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tempered by the impact of a reduction in the tax shield caused by the latter.

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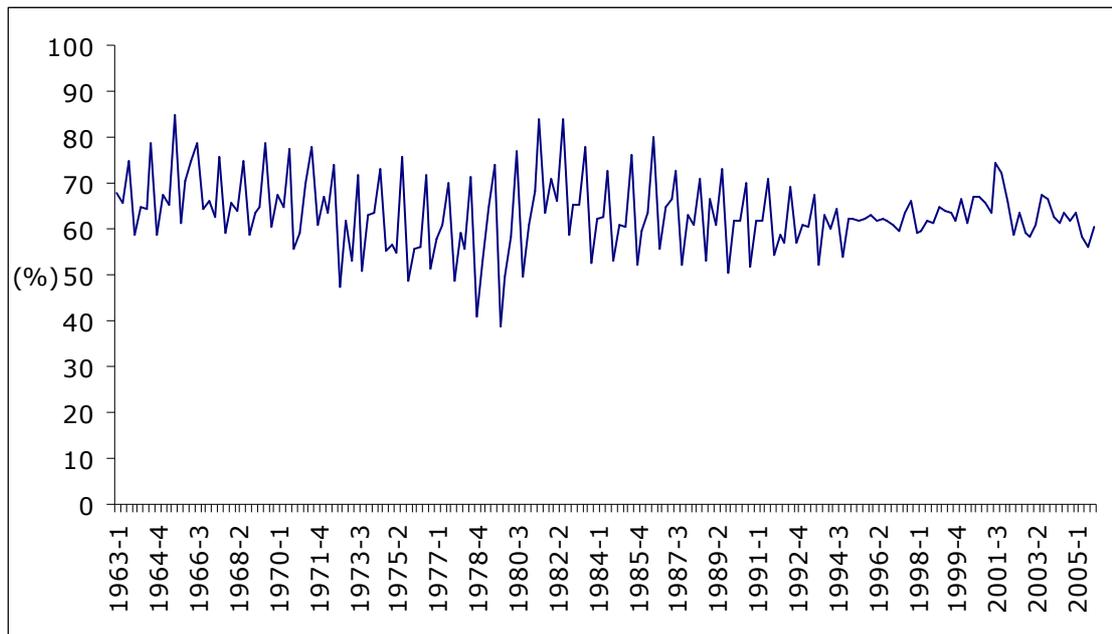


Fig. 1. Ratio of creditors' voluntary liquidations to total liquidations in England and Wales, 1963 (Q1) to 2005 (Q4)

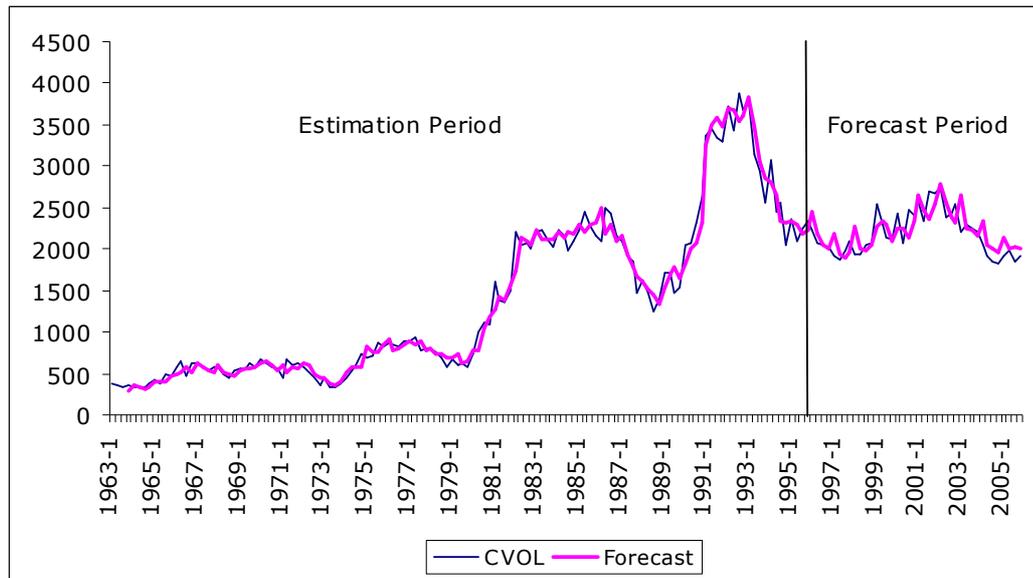


Fig. 2. Actual and forecast numbers of creditors' voluntary liquidations in England and Wales, 1963 (Q1) to 2005 (Q4)

Table 1. Descriptive statistics

Variable	Mean	SD	Minimum	Maximum
<i>CVL</i>	1372.60	965.69	325.00	3867.00
<i>IR (%)</i>	8.21	2.92	3.36	14.28
<i>COSTD (%)</i>	6.12	2.30	2.40	11.30
<i>NBR (£m)</i>	2947.60	3621.10	-4911.20	15417.00
<i>BANKB (£m)</i>	1732.20	2310.60	-2988.00	10561.00
<i>RULC (1990 = 100)</i>	93.06	12.37	69.20	132.50
<i>GULC (2003 =100)</i>	37.18	25.93	7.30	80.80
<i>RELPP (1990 = 100)</i>	92.19	8.49	69.60	110.50
<i>SURDEF (£m)</i>	-28.46	1969.40	-6327.80	4289.00
<i>GDP (1990 = 100)</i>	77.90	15.84	50.00	107.50
$\Delta RPI (%)$	7.71	5.49	1.30	26.60

Table 2. Unit root tests

Variable	Level		First difference	
	ADF	PP	ADF	PP
<i>CVL</i>	-1.50	-1.26	-4.34***	-13.05***
<i>IR</i>	-2.62*	-2.73*	-10.65***	-10.65***
<i>COSTD</i>	-2.55	-2.61*	-10.40***	-10.40***
<i>NBR</i>	-2.38	-8.74***	-6.94***	-25.25***
<i>BANKB</i>	-3.53***	-6.70***	-10.98***	-19.88***
<i>RULC</i>	-2.09	-2.03	-9.69***	-9.68***
<i>GULC</i>	-3.31**	-3.41**	-14.06***	-14.03***
<i>RELPP</i>	-2.37	-2.25	-9.97***	-9.98***
<i>SURDEF</i>	-3.75***	-9.71***	-5.34***	-32.82***
<i>GDP</i>	-0.65	-1.39	-5.11***	-11.61***
<i>RPI</i>	-2.06	-2.05	-4.82***	-8.19***

Note: * = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$.

Table 3. Determinants of creditors' voluntary liquidations

Explanatory variables	Estimated coefficients	<i>t</i> -statistics ^a
Constant	-0.135	-2.02 **
$\Delta_1 \ln(CVL)_{t-2}^b$	-0.208	-2.76 ***
$\Delta_1 \ln(GDP)_{t-2}$	-3.140	-3.12 ***
$\Delta_1 \ln(GDP)_{t-3}$	-3.115	-2.99 ***
$\ln(COSTD)_{t-1}$	0.102	2.89 ***
1986DUM	-0.117	-3.29 ***
φ_{t-1}	-0.210	-5.32 ***
Q1DUM	0.097	4.31 ***
Diagnostics:		
Adjusted R ²	0.4185	
Standard Error	0.11	
Model F-Test (7,121)	12.44(0.00)	
Z ₁ (5,116)	1.50 (0.20)	
Z ₂ (4,113)	0.38 (0.83)	
Z ₃ (2)	1.86 (0.39)	
Z ₄ (12,108)	1.55 (0.12)	
Z ₅ (33,87)	1.04 (0.43)	
Z ₆ (1,120)	0.40 (0.53)	

Notes: ** = $p < 0.05$ and *** = $p < 0.01$

^a *t*-statistics based upon White's (1980) asymptotic heteroscedastic consistent covariance matrix estimates.

^b The *j*th-difference operator is defined as, $\Delta_j X_t = X_t - X_{t-j}$

^c Z₁ is the *F*-form of the Lagrange multiplier test for first order serial correlation of the residuals. Z₂ is the ARCH test. Z₃ is a test for normality of the residuals, see Hendry and Doornik (2001). Z₄ is the White test for heteroscedasticity. Z₅ is a general test for functional form misspecification/heteroscedastic errors. Z₆ is the RESET test due to Ramsey (1969).

Table 4. Parameter estimates and constancy tests

Period	$\Delta \ln(\text{GDP})_{t-2}$	$\Delta \ln(\text{GDP})_{t-3}$	$\ln(\text{COSTD})_{t-1}$	1986DUM	Chow test	Forecast test
1964(Q1) - 1982(Q4)	-3.296 (-2.87)	-3.240 (-2.56)	0.085 (1.77)		0.59 [0.98]	36.48 [0.95]
1964(Q1) - 1984(Q4)	-3.141 (-2.82)	-3.211 (-2.75)	0.083 (1.86)		0.73 [0.87]	37.32 [0.75]
1964(Q1) - 1986(Q4)	-2.904 (-2.88)	-3.090 (-3.06)	0.089 (2.35)	-0.092 (-4.95)	0.54 [0.98]	21.60 [0.97]
1964(Q1) - 1988(Q4)	-2.889 (-2.70)	-3.149 (-2.96)	0.092 (2.36)	-0.143 (-3.91)	0.59 [0.94]	19.36 [0.89]
1964(Q1) - 1990(Q4)	-3.074 (-2.88)	-3.092 (-2.91)	0.097 (2.59)	-0.114 (-3.12)	0.40 [0.99]	8.61 [0.99]
1964(Q1) - 1992(Q4)	-3.024 (-2.92)	-3.103 (-2.99)	0.095 (2.64)	-0.113 (-3.14)	0.53 [0.89]	6.85 [0.87]
1964(Q1) - 1994(Q4)	-3.136 (-3.08)	-3.103 (-2.97)	0.101 (2.87)	-0.117 (-3.27)	0.27 [0.90]	1.09 [0.90]

Note: (.) are the t -statistics and [.] are the marginal significance levels.

Appendix: Data definitions and sources

Description	Definition	Source
Creditors' voluntary liquidations (CVL)	The number of liquidations, unadjusted.	Financial Statistics
Interest Rate (IR)	Base Rate: Selected Retail Banks	Financial Statistics
Cost of Debt (COSTD)	Base Rate \times (1 - Small Firm Corporation Tax Rate).	
NBR	Company net borrowing requirement (£m).	Financial Statistics
BANKB	Company Bank Borrowing (£m)	Financial Statistics
Relative Unit Labour Costs (RULC)	The IMF index of relative unit labour costs in manufacturing (1990 = 100).	Economic Trends
Unit Labour Costs (GULC)	The general index of unit labour costs (2003 = 100).	Economic Trends
Producer Prices (RELPP)	The index of relative producer prices (1990 = 100).	Economic Trends
Funding (SURDEF)	Company financial surplus/deficit (£m).	Financial Statistics
Gross Domestic Product (GDP)	Gross Domestic Product (output measure 1990 = 100).	Economic Trends
Inflation (RPI)	Retail Prices Index (1995 = 100).	Economic Trends
Insolvency Act of 1986 (1986DUM)	Dummy variable of 1 from 1986Q4 to 1990Q4 and 0 elsewhere.	
1981 Civil Service Strike (1981DUM)	Dummy variable of 1 for 1981(Q2) and 1981(Q3), 0 elsewhere.	

References

Audretsch, D.B. and Fritsch, M. (1995) The measurement of entry rates: reply, *Empirica* **22**, 159-161.

Balcaen, S. and Ooghe, H. (2006) 35 years of studies on business failure: an overview of the classic statistical methodologies and their related problems, *The British Accounting Review*, **38**, 63-93.

Cornelius, M. and Wright, K. (1995) Company insolvencies and inflation, *Bank of England Quarterly Bulletin*, 274-275.

Cuthbertson, K. and Hudson, J. (1992) The determination of compulsory liquidations in the UK: 1972-1989, Department of Economics, Universities of Newcastle upon Tyne and Bath and Economics Division, Bank of England Working Paper No. 92-01.

Davis, E.P. (1987) Rising sectoral debt/income ratios: a cause for concern?, *BIS Economic Papers*, No. 20.

Desai, M.J. and Montes, D.E. (1982) A macroeconomic model of bankruptcies in the British economy, 1945-1980, *British Review of Economic Issues* **4**, 1-14.

1
2
3 Dimitras, A.I., Zanakis, S.H. and Zopounidis, C. (1996) A
4 survey of business failures with an emphasis on prediction
5 methods and industrial applications, *European Journal of*
6 *Operational Research*, **90**, 487-513.
7
8
9
10
11
12

13
14
15
16 Fabling, R. and Grimes, A. (2005) Insolvency and economic
17 development: regional variation and adjustment, *Journal of*
18 *Economics and Business*, **57**, 339-359.
19
20
21
22
23
24

25
26 Gaffeo, E. and Santoro, E. (2006) Macroeconomic conditions
27 and business failures in Italy: a panel cointegration
28 approach, Paper delivered at Dipartimento di Economia,
29 Università Degli Studi di Trento, December 14-15.
30
31
32
33
34
35

36
37
38 Granger, C.W.J and Newbold, P. (1973) Some comments on
39 the evaluation of economic forecasts, *Applied Economics*, **5**,
40 35-47.
41
42
43
44
45
46

47
48
49 Hendry, D.F. and Doornik, J.A. (2001) *Empirical Econometric*
50 *Modelling Using PcGive*, London: Timberlake Consultants
51 Ltd..
52
53
54
55
56
57
58
59
60

1
2
3 Hudson, J. (1986) An analysis of company liquidations,
4
5
6 *Applied Economics*, **18**, 219-235.
7
8

9
10
11 Kearns, A. (2003) Corporate indebtedness and liquidations
12
13 in Ireland, *Quarterly Bulletin*, 91-105.
14
15

16
17
18 Liu, J. and Wilson, N. (2002) Corporate failure Rates and the
19
20 impact of the 1986 Insolvency Act: an econometric analysis,
21
22
23 *Managerial Finance*, **28**, 61-71.
24
25

26
27
28 Liu, J. (2004) Macroeconomic determinants of corporate
29
30 failures: evidence from the UK, *Applied Economics*, **36**, 939-
31
32
33 945.
34
35

36
37
38 Love, J. H. (1995) The measurement of entry rates:
39
40 reconsideration and resolution, *Empirica* **22**, 151-157.
41
42
43

44
45
46 Morris, R. (1997) *Early Warning Indicators of Corporate*
47
48 *Failure: A Critical Review of Previous Empirical Research and*
49
50 *Further Empirical Evidence*, Aldershot: Ashgate.
51
52
53

54
55
56 Pindyck, R.S. and Rubinfeld, D.L. (1991) *Econometric Models*
57
58
59 *& Economic Forecasts*, McGraw-Hill, New York.
60

1
2
3 Ramsey, J.B. (1969) Tests for specification errors in classical
4 least squares regression analysis, *Journal of the Royal*
5
6
7
8
9
10
11
12
13
14
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16
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51
52
53
54
55
56
57
58
59
60

Ramsey, J.B. (1969) Tests for specification errors in classical least squares regression analysis, *Journal of the Royal Statistical Society, Series B*, **31**, 350-371.

Rose, P.S., Andrews, W.T. and Giroux, G.A. (1982)
Predicting business failure: a macroeconomic perspective,
Journal of Accounting, Auditing and Finance, **6**, 20-31.

Sharabany, R. (2004) Business failures and macroeconomic risk factors, Discussion Paper No. 2004.06, Bank of Israel.

Turner, P., Coutts A. and Bowden, S. (1992) The effect of the Thatcher government on company liquidations: an econometric study, *Applied Economics*, **24**, 935-943.

Vlieghe, G.W. (2001a) Indicators of fragility in the UK corporate sector, Bank of England Working Paper, No. 146.

Vlieghe, G.W. (2001b) Corporate liquidations in the United Kingdom, *Financial Stability Review*, 141-147.

Wadhwani, S.B. (1986) Inflation, bankruptcy, default premia and the stock market, *The Economic Journal*, **96**, 120-138.

1
2
3 White, H. (1980) A heteroscedasticity – consistent
4
5
6 covariance Matrix estimator and direct test for
7
8 heteroscedasticity', *Econometrica*, **48**, 817-838.
9

10
11
12
13 Young, G. (1995) Company liquidations, interest rates and
14
15 debt, *The Manchester School Supplement*, **63**, 57-69.
16
17
18
19
20
21
22
23
24
25
26
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30
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