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DETERMINANTS OF BUSINESS FAILURE: A TIME SERIES ANALYSIS

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I. Introduction

The purpose of this paper is to empirically analyze the determinants of the business failure rate, i.e., the proportion of businesses that fail. This issue is of obvious importance due to its ramifications for resource allocation, especially that of financial capital, physical capital and labor. There have been a number of studies of aggregate business failures (see Simpson and Anderson, 1975; Zarnowitz and Lerner, 1961; Altman, 1971, 1983; Rose, Andrews and Giroux, 1982; Platt, 1985; Post and Moon, 1988; Archibald and Baker, 1988). This analysis uses annual time series data for the period 1955-1989 to revisit the topic. A variety of findings are provided and analyzed.

II. Model

In the short run, the firm is treated as a simple profit maximizer, attempting to maximize profit (π) which equals revenue (R) less cost (C):

(1) $\pi(Q) = R(Q) – C(Q)$

where Q is output per period. Over time, profit depends upon revenue growth and cost growth. Revenue growth (RG), according to conventional microeconomics, depends upon a variety of factors:

(2) $RG = f(Popgr, P, Incgr, \ldots)$

where Popgr represents population growth, P is the inflation rate of output prices, and Incgr represents the growth rate of per capita real income. The latter, in turn, reflects the growth rate of per capita personal consumption. Conventional analysis argues that:

(3) $F_{Popgr} > 0, f_p > 0, f_{Incgr} > 0$

Cost growth (CG) in turn is presumably a function of the growth in factor prices (F), such that:

(4) $CG_F > 0$.

The interest rate and the growth rate of the produce price index, among other variables, are representative of F. However, the growth rate of the producer price index is excluded from the empirical model in Section III based on the strong correlation between the latter and P.

The probability of business failure (Bus) is a function of <u>negative</u> profits. Accordingly,

(5) Bus = g(Popgr, P, Incgr, F, …..)

such that

(6) $g_{Popgr} < 0$¸ $g_p < 0$,
$g_{Incgr} < 0$, $g_f > 0$.

Alternative explanatory variables include the percentage growth rate of the wage rate ($Wagr_t$) and the capacity utilization rate (Cap_t). On the one hand, higher values of $Wagr_t$ may potentially reflect cost growth through changes in factor prices. Alternatively, an increase in $Wagr_t$ represents greater growth in consumer purchasing power and, hence, greater revenue growth. The former interpretation is the more conventional view of the effect of $Wagr_t$ (see Post and Moon, 1988). A higher Cap_t would reflect more prosperous economic times and a greater revenue growth rate.

III. Results

Our basic empirical model is given by:

(7) $Bus_t = a_0 + a_1Popgr_t + a_2P_t + a_3Incgr_t + a_4F_t + u_1$

where Bus_t = the business failure rate; the number of failed firms per 10,000 listed enterprises in year t

a_0 = constant

$Popgr_t$ = percentage growth rate of the total population during year t

P_t = inflation rate of the CPI in year t

$Incgr_t$ = percentage growth rate of per capita real income in year t

F_t = the nominal average interest rate yield on Moody's Aaa-rated corporate bonds in year t, expressed as a percent per annum

u_1 = stochastic error term.

The time period studied is 1955-1989. The data are all annual and were obtained from the Economic Report of the President, 1990.

To allow for the endogeneity of the variables P_t and F_t, we estimate equation (7) using an instrumental variables technique (as well as the Cochrane-Orcutt procedure, to correct for serial correlation), with the one year lag of the inflation rate (P_{t-1}) and the one year lag of the profit-to-equity ratio ($Prof_{t-1}$) as the instruments.

The 2SLS estimate of equation (7) is given by:

$$(8)\quad Bus_t = 63.25 - 1400.8Popgr_t - 7.86P_t - 267.86Incgr_t - 7.79F_t$$
$$(-1.88) \quad (-4.34) \quad (-4.79) \quad (4.79)$$

where terms in the parentheses are t-values.

All four of the estimated coefficients exhibit the expected signs. Three of these coefficients are significant at one percent level, with the remaining one significant at the seven percent level. Overall, the model identifies key factors in the business failure rate.

If the model is expanded to include the capacity utilization rate in manufacturing (Cap_t), the model in (7) becomes:

$$(9)\quad Bus_t = b_0 + b_1Popgr_t + b_2P_t + b_3Incgr_t + b_4F_t + b_5Cap_t + u_2$$

where Cap_t = the capacity utilization rate in manufacturing in year t, as a percentage.

Using the same instruments as above the 2SLS results are as follows"

$$(10)\quad Bus_t = 12.32 - 1543.12Popgr_t - 7.96P_t - 324.24Incgr_t + 8.22F_t + 0.62Cap_t$$
$$(-2.24) \quad (-4.82) \quad (-2.43) \quad (+4.54) \quad (+0.82)$$

In this case, all of the estimated coefficients except b_5 exhibit both the expected signs and are significant at or beyond the three percent level.

Alternately, using $Wagr_{t,}$ defined as percentage change in average weekly private earnings in year t, in lieu of $Incgr_t$ in equation (7) yields similar results to those shown above. For example, the 2SLS results are:

$$(11)\quad Bus_t = 71.63 - 1097.62Popgr_t - 4.83P_t - 5.85Wagr_t + 7.79F_t + 0.04Cap_t$$
$$(-1.90) \quad (-4.80) \quad (-3.34) \quad (+8.08) \quad (-0.09)$$

Similarly, the replacement of $Incgr_t$ in equation (7) with $Wagr_t$, along with the exclusion of Cap_t, produces the following 2SLS findings:

$$(12)\quad Bus_t = 67.62 - 1035.5Popgr_t - 4.73P_t - 6.21Wagr_t + 7.91F_t$$
$$(-1.69) \quad (-4.24) \quad (-2.74) \quad (+9.60)$$

For both models (11) and (12), the instrumental variables chosen, in order to take into account the endogeneity of P_t F_t, and $Wagr_t$, are P_{t-1}, $Prof_{t-1}$, and the one year lag of the capacity utilization rate (Cap_{t-1}).

The estimates from equations (11) and (12) are consistent with the findings in equations (8) and (10). The estimates for the coefficient of $Wagr_t$ which does not appear in the earlier models, are negative in both cases. Moreover, both estimated coefficients are significant at the one percent level or better. The results for the coefficient of variable $Wagr_t$, suggest that $Wagr_t$ is more an indicator of consumer purchasing power than it is of factor prices.

IV. Summary/Conclusions

Other specifications, including a variety of OLS estimates, yield the same basic results as those shown in equations (8), (10), (11), and (12). Namely, the business failure rate is a decreasing function of:

(a) the population growth rate
(b) the inflation rate of the CPI
(c) the per capita real income growth rate or
(d) the growth rate of the nominal wage rate

In addition, the business failure rate is an increasing function of the nominal average interest rate yield on Moody's Ass-rated corporate bonds. Among other things, given the impact of the Federal budget deficit upon the Moody's Aaa-rated corporate bond rate, it would seem that deficits can indirectly lead to a rise in the business failure rate (cf. Barth, Iden, and Russek¸[1984; 1985], Cebula [1988], Hoelscher [1986], and Zahid [1988]).

Finally, the business failure rate may also depend on the growth rate of the money supply, conditions in the stock market, and management practices, among other influences. The inclusion of these variables will be the basis for future research.

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