A STUDY OF THE EFFECTS OF MACROECONOMIC POLICY VARIABLES ON THE RATE OF BUSINESS FAILURE IN THE UNITED STATES

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INTRODUCTION

The effect of economic policy is generally regarded as influencing the rate of unemployment, diminishing inflationary pressures and stimulating macroeconomic growth. As important as these macroeconomic goals are to society, attempting to attain these goals have many residual effects on other sectors of the economy. The stabilization policies of the Federal Reserve System and the Congress can greatly influence the solvency of businesses in the United States. The intent of this paper is to empirically examine that effect through an investigation of the macroeconomic policy variables on the rate of business failure.

The multi-trillion dollar a year American economy is composed of approximately 14.3 million non-farm businesses of which approximately 99.7 percent are classified as "small" by the U.S. Small Business Administration. In recent years, according to the U.S. Small Business Administration [25], more than 40,000 of the approximately 400,000 businesses that dissolve each year do so involuntarily. Over the past thirty years, the rate of business failure has varied from a low of about five failures per 10,000 existing businesses to a high of about sixty-five per 10,000. Currently failures are at an all-time high with an estimated 60 percent of new businesses failing in the first year and 95 percent failing in the first five years [11].

Several important studies of business failure are found in the literature. Most of these studies examine the predictors of failure for an individual business by investigating various financial ratios. One widely regarded and frequently quoted microeconomic study is by Altman [1]. Altman chooses five financial ratios and uses discriminant analysis to evaluate the likelihood of a business's failure. Other microeconomic studies have been undertaken by Blum [4], Deakin [10], Libby [15], Mayer [16], Moyer [17], Scott [20], and Taffler and Tisshaw [22]. In each of the above, the study attempts to define financial factors that will predict impending failure for a particular firm.

Cumming and Saini [9] study the macroeconomic determinants of bankruptcies in Japan and the United Kingdom. The authors view corporate bankruptcy as a liquidity problem for each firm. They specify a linear failure model for an individual firm and then aggregate by assuming separability. Cumming and Saini find that consumer expenditures, government investment expenditures, export profitability, labor costs in manufacturing and interest payments are significant determinants of bankruptcies. They also find that bankruptcies lag economic activity by two to three quarters. Using quarterly data from 1951 through 1978, Altman [2] uses a polynomial

distributed lag to estimate the determinants of changes in the rate of business failure. Altman finds that four variables are significant determinants of the rate of business failure: economic growth (measured by the change in real GNP), stock market performance (measured by changes in the Standard and Poors' index), the money supply (measured by changes in real M2) and the rate of new business formation (measured by changes in the Dun & Bradstreet index of new business formation). Each of the four variables is found to be statistically significant with the rate of new business formation being more remotely significant. Altman allows the lag to run over eight quarters and reports a coefficient of determination of only 0.26.

A major problem encountered with the above studies is that an important independent variable, interest rates, did not vary sufficiently to permit an accurate assessment of its significance. This lack of variation in interest rates is often attributed to credit rationing, which is difficult to observe and quantify. Bach [3] and Hodgman [13] provide excellent descriptions of credit rationing as a means of maintaining rather stable interest rates during periods of tight money. Studies by Gupta [12] and Silber and Polakoff [21] from the 1970's again confirm credit rationing as a means of maintaining stable interest rates. As a result, the effect of interest rates had to be excluded from the above studies of business failure. The practical effect of excluding an important independent variable in these estimating equations is to cause the resulting coefficients, t-statistics and R-squared's to be biased. In the present study, however, the time period 1977 through 1981, when interest rates did vary sufficiently to permit the assessment of their importance, is examined separately.

The remainder of this study is organized in the following manner: Part I - theoretical expectations, Part II - econometric model, Part III - data and the variables, Part IV - results, and Part V - conclusion.

PART I: THEORETICAL EXPECTATIONS

Effect of the GNP Variable

The level of GNP should be an important determinant of the rate of business failure. GNP, which is a measure of economic activity or aggregate demand, indicates the volume of goods and services produced. Generally speaking, fewer firms fail at higher levels of production than at lower levels. Therefore, the authors expect a negative sign to be associated with the GNP variable.

Effect of the Money Supply Variable

The size of the money supply is expected to be a major determinant of the rate of business failure. Keynesian economic theory suggests that there will be an inverse relationship between changes in the money supply and changes in the rate of business failure. The Keynesian IS-LM model implies that an increase in the money supply will lead to an increase in aggregate demand and economic activity. This assumes,

of course, that the economy is not in a liquidity trap where the increase in the money supply goes into idle cash balances, rather than reducing interest rates. The higher level of aggregate demand in the Keynesian model should lead to a temporary drop in the rate of business failure.

On the other hand, the quantity theory version of monetary theory suggests that changes in the money supply only lead to changes in the price level with real aggregate demand and real aggregate supply being unaffected. Therefore, changes in the size of the money supply should have little effect on the rate of failure in the long run. Immediate effects could include a temporary reduction in the rate of failure until prices adjust. Again there should be a negative sign associated with the money supply variable.

Effect of the Interest Rate Variable.

Interest rates, which represent the cost of funds to operate a business, should also play a major role in the rate of business failure. Businesses must borrow funds in order to meet employee payroll, purchase and hold inventory, and finance plant expansion. As interest rates increase, the rate of business failure should increase because of higher operating costs. Smaller, weaker businesses that are most vulnerable will be the first to be denied credit or required to pay high interest rates [6] [7] [14] [18]. Higher interest rates also have the effect of reducing sales in industries where the product sold is traditionally financed, such as appliances, automobiles, and homes. Higher (or lower) interest rates are expected to result in changes in the rate of business failure in the same direction. Thus, a positive sign should be associated with the interest rate variable.

PART II: ECONOMETRIC MODEL

Ordinary least squares regression analysis is used to estimate how important GNP, money supply, and interest rates are in explaining variations in the rate of business failure. To correct for autocorrelation contained in the time series data, the Cochrane-Orcutt procedure is used. Since one would expect that a change in a policy variable may have a lagged effect on the rate of failure, the authors choose to lag the explanatory variables. A polynomial distributed lag model is used with various end point restrictions to determine the number of periods over which to lag each explanatory variable and the weight attached to each explanatory variable for each period.

The model is expressed as a standard polynomial distributed lag. A more complete discussion can be found in Pindyck and Rubinfeld [19].

$$(1) \quad F_t = B_0 + \sum_{j=1}^3 B_j(W_{j,0}X_{j,t} + W_{j,1}X_{j,t-1} + \dots + W_{j,t-n}X_{t-n}) + E_t$$

Where: The F_t variable is the rate of business failure per 10,000

businesses.

The X_j 's are the three explanatory variables; GNP, money supply and interest rates.

The $W_{j,i}$'s are the assigned weights for the lag variables and the length of the lag is n quarters.

A polynomial of degree m is fitted to the weights by:

$$(2) \quad W_{j,i} = a_0 + a_1 i + a_2 i^2 + \dots + a_m i^m$$

Where $i = 0, 1, 2, \dots, n$

Substituting (2) into (1) yields:

$$(3) \quad F_t = B_0 + \sum_{j=1}^3 \{B_j a_0 X_{j,t} + B_j (a_0 + a_1 + \dots + a_m) X_{j,t-1} +$$

$$B_j (a_0 + 2a_1 + \dots + 2^m a_m) X_{j,t-2} + \dots$$

$$B_j (a_0 + na_1 + \dots + n^m a_m) X_{j,t-n}\} + E_t$$

(3) can be rewritten as:

$$(4) \quad F_t = B_0 + \sum_{j=1}^3 \{B_j a_0 (X_{j,t} + X_{j,t-1} + X_{j,t-2} + \dots + X_{j,t-n}) +$$

$$B_j a_1 (X_{j,t-1} + 2X_{j,t-2} + \dots + nX_{j,t-n}) + \dots +$$

$$B_j a_m (X_{j,t-1} + 2^m X_{j,t-2} + \dots + n^m X_{j,t-n})\} + E_t$$

The Cochrane-Orcutt iterative procedure is used to estimate the $B_j a_i$ variables from equation (4). Since the B_j 's are generally assumed to be equal to unity, the values from equation (4) can be substituted into equation (2) to obtain estimates of the weights.

PART III: DATA AND VARIABLES

The business failure rate is reported monthly in failures per 10,000 existing businesses by Dun & Bradstreet [11]. On page 15 of the 1981 Dun & Bradstreet Business Failure Record [11] failed businesses are defined as those businesses that "ceased operations following assignment or bankruptcy; ceased with loss to creditors after such actions as execution, foreclosure or attachment; voluntarily withdrew leaving unpaid obligations; were involved in court actions such as receivership, reorganization or arrangement; or voluntarily compromised with creditors." Some of the "failed" businesses could

fall into the last category and might not truly represent a failed business but rather the discontinuation of a solvent business. Also, recent changes in the laws facilitate bankruptcy filings and could artificially raise the 1980 and 1981 failure rate data [26]. Lack of adequate data on the effects of the new bankruptcy laws or on the proportion of businesses actually failed to solvent businesses simply discontinued precludes any further adjustment of the failure rate data. An average failure rate over the quarter is calculated and used in this study.

The funds available by the banking system to businesses can be measured by a rather liquid data variable. The authors choose the highly liquid measures of M1 and M2 for use in equation (4) in both real and nominal terms. In any case, the money supply variable is seasonally adjusted. Another attempt to adjust the money supply data involves calculating the growth rates of M1 and M2. The authors feel that businesses might be more likely to respond to changes in FED policy vis-a-vis the level of the money supply. The nominal value of M1 provides the best results in all regressions and is the reported money supply for Tables I and II. The seasonally adjusted GNP provides the measure of economic activity for the study. Since GNP is only defined on a quarterly basis, the study is limited to quarterly data. Both real and nominal GNP and the growth rate of GNP were tried in equation (4) with nominal GNP providing optimal results. Data for the money supply and GNP are found in the Economic Report of the President [8], Business Statistics [23] and the Survey of Current Business [24]. The data for the interest rate variable are the prime rate from the Federal Reserve Bulletin [5]. Although the prime rate is the rate charged to the banks' best customers and not an average rate on business loans, the authors feel that the prime rate is a very accurate indicator of the level and changes in interest rates on business loans. Even though the prime rate is an upwardly biased indicator of the true rate, any attempt to "clean" the data would probably only introduce new biases.

PART IV: RESULTS

Equation (4) is estimated over the time period 1955 through 1981. Although the GNP and money supply variables perform reasonably well, the interest rate variable is not significant. The authors feel that the insignificant interest rate variable is due to a lack of variability prior to 1977. Various definitions of the money supply were attempted. The nominal level of M1 performs the best. With interest rates dropped, equation (4) is estimated using the level of nominal GNP and the money supply as explanatory variables. The results of this regression are shown in Table I. The R-squared is maximized when the length of the lag is four periods.

As can be seen from Table I, the money supply and GNP variables are highly correlated with the failure rate for the period 1955-1981. The weighted coefficients of the money supply have a much greater absolute value than the weighted coefficients of GNP. In the current time period, a \$10 billion increase in the money supply will cause the

TABLE I
Estimates of Equation (4) for GNP and the Money Supply
(1955-1981)

Lag (in quarters)	GNP	Money Supply
0	-0.05447 (-2.637)	-0.2903 (-2.590)
1	-0.01639 (-3.526)	-0.1243 (-2.709)
2	-0.00809 (-1.225)	-0.01229 (-0.2232)
3	0.01899 (1.808)	0.04578 (0.6847)
4	0.01629 (1.954)	0.04987 (1.003)
Mean Lag (standard error)	-4.43279 (13.1707)	-0.56733 (2.86765)
Sum of Lags (standard error)	-0.02750 (0.00927)	-0.33126 (0.17492)

(t-statistics are shown in parentheses)

R-Squared = 0.9386
F-Statistic = 351.308
Durbin-Watson Statistic = 2.1590
Sum of Squared Errors = 717.414
Final Value of Rho = 0.85498
Degree of the Polynomial = 2
End Point Restrictions = Right Only
Intercept Value = 150.319
(t-statistic) = 4.34270

failure rate to decline by about 2.9 firms per 10,000, but the same \$10 billion increase in GNP will cause a decrease of only about 0.5 firms per 10,000. The money supply, and hence, the policies of the Federal Reserve seem to be the more significant determinant of the failure rate over this time period.

Although the model is structured to allow the relative magnitude of the weighted coefficients to increase or decrease from period to period, the magnitude of the weighted coefficients of both the money supply and GNP declines as the lagged time period increases. Hence,

the effect of changing the money supply and/or changing GNP will occur with greatest intensity in the immediate time period. The effects of both the money supply and GNP diminish as the lagged periods increase. Also, the t-statistics for both the money supply and GNP are insignificantly different from zero after the first lagged quarter. Even though the mean lag for GNP is over four quarters, the standard error of the mean lag is relatively high at 13.1707. The mean lag of the money supply, on the other hand, is only 0.5673 quarters with a standard error of 2.868. The effects of GNP changes might be somewhat longer lasting than the effects of money supply changes, although it is not an obvious conclusion to be drawn from the data.

Since interest rates have been higher and more variable in recent years, the authors estimate equation (4) over the 1977-1981 time period with GNP, money supply, and interest rates as explanatory variables. The results of this regression are shown in Table II. Again, the M1 definition of money and the degree of the polynomial of two provide optimal results.

Although interest rates are insignificant over the entire time period, they became very important in the 1977-1981 time period. Several interesting points can be seen from Table II. The absolute value of the weighted coefficients for GNP and the money supply are monotonically decreasing during the 1955-1981 time period which is not the case in the 1977 to 1981 time period. From Table II, changes in GNP appear to have their most intense impact one quarter after the change in GNP occurs. The more astonishing finding is that the intensity of the effects of changes in the money supply on the failure rate increases throughout the lagged period. The immediate effect of a \$10 billion increase in the money supply should decrease the failure rate by about 1.5 firms per 10,000 in the current time period. However, by the fifth quarter, the decrease is about five firms per 10,000.

The effects of the money supply and GNP appear to last longer in the 1977-1981 time period than they last in the 1955-1981 time period. The money supply variable in particular appears to affect the failure rate for five quarters. While the length of the lag appears longer over the 1977-1981 time period, the magnitude of the weighted coefficients is quite different than over the 1955-1981 time period. The weighted coefficient of the money supply over the 1955-1981 time period for the immediate time period is much greater (-0.2903) than the weighted coefficient over the 1977-1981 time period (-0.1513). However, the effects of the money supply in the lagged periods are greater in the 1977-1981 time period than in the 1955-1981 time period. For example, the weighted coefficient for the money supply from Table I for the third period is 0.04578 while its counterpart from Table II is about ten times as large at 0.4424.

The model seems to suggest that the lags are longer in recent years and that the magnitude of the money supply and GNP are greater than in the earlier periods. The mean lag of the GNP variable from Table II is 3.529 quarters which is slightly shorter than the 4.433 quarter mean lag from the 1955-1981 time period. Also, the standard error of the GNP variable is smaller (4.163) over the 1977-1981 time period than it is over the 1955-1981 time period (13.171). The mean

TABLE II

Estimates of Equation (4) for GNP, the Money Supply and Interest Rates:
(1977-1981)

Lag (in quarters)	GNP	Money Supply	Interest Rates
0	-0.05006 (-3.918)	-0.1513 (-1.469)	0.8733 (3.092)
1	-0.07275 (-4.076)	-0.2754 (-1.699)	1.297 (3.370)
2	-0.06806 (-4.447)	-0.3724 (-2.079)	1.272 (4.051)
3	-0.03598 (-5.852)	-0.4424 (-2.774)	0.7978 (5.200)
4	0.02347 (1.593)	-0.4852 (-3.835)	-0.1258 (-0.2714)
5	0.1103 (2.742)	-0.5009 (-3.114)	-1.499 (-1.389)
Mean Lag (standard error)	-3.5292 (4.1629)	3.0493 (0.9284)	-0.6733 (2.3674)
Sum of Lags (standard error)	-0.09309 (0.0224)	-2.2275 (0.7149)	2.6162 (0.9392)

(t-statistics are shown in parentheses)

R-Squared = 0.9524
 F-Statistic = 33.3533
 Durbin-Watson Statistic = 1.7191
 Sum of Squared Errors = 20.3027
 Standard Error = 1.4249
 Final Value of Rho = 0.2280
 Degree of the Polynomial = 2
 End Point Restrictions = Left Only
 Intercept Value = 648.304
 (t-statistic) = 3.9869

lag of the money supply variable increases from 0.567 quarters to 3.049 quarters from Table I to Table II. One might expect that the money supply variable has a mean lag of several quarters and hence the mean lag of 3.049 is more realistic than a mean lag of 0.567. The change in the standard error of the mean lag seems to bear out the above point as

it falls from 2.868 in Table I to 0.928 in Table II.

Interest rates appear to be very significant over the 1977-1981 time period. Changes in interest rates have a lagged effect for three quarters and are insignificant thereafter. The effect of interest rate changes is relatively small in the current year where a one basis point rise in the rate of interest will cause the failure rate to rise by 0.08733 firms per 10,000. The strength of interest rate changes increases from the current period to the first lagged period where the weighted coefficients diminish. The t-statistics for the interest rate weighted coefficients are highly significant throughout the current period and the first three lagged periods. Whereas the mean lag of the interest rate variable is only 0.6733 quarters with a standard error of 2.3674.

PART V: CONCLUSION

The United States government uses economic policies such as the money supply and interest rates to change the level of unemployment, rate of inflation, and alter the business cycle. The social cost of restrictive economic policies nearly always includes higher unemployment, interest rates and business failures. These are business failures that result from forces over which even the most prudent managers have no control. The purpose of this paper is to investigate the impact the variables through which these policies occur on the rate of business failure.

All three of the economic policy variables investigated are found to have an significant effect on the rate of business failure. A change in the money supply is a cause of failure with effects that last up to five quarters. This study suggests that in 1983 every \$1 billion increase in the money supply would have saved approximately 318.5 businesses from failure. Likewise, a \$1 billion decrease would have lead to 318.5 additional failures. Interest rates have an equally dramatic effect on the rate of business failure. The effect of a one percentage point (100 basis points) increase in interest rates would result in approximately 374.1 business failures. Finally, every \$1 billion decrease in GNP would result in about 13.3 more failures of existing businesses.

Probably the most astounding conclusion that can be drawn from this study is that United States economic policies in attempting to control inflation during the 1977-1981 time period probably had a greater impact on the rate of business failure than did the business cycle.

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