

ISSN 0112-3734

**The Macroeconomic Determinants of the
Business Failure Rate in New Zealand:
Report of a Preliminary Investigation**

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Working Paper No. 2/93

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DEPARTMENT OF ACCOUNTANCY
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The Macroeconomic Determinants of the Business Failure Rate in New Zealand

Abstract.

This paper examines the business failure rate [BFR] in New Zealand over the period 1951 - 1991. It is an empirical OLS regression study that examines the extent to which the BFR can be attributed to monetary instability, because it is argued, that although inflationary pressures may appear to assist business cash flows initially it creates problems in subsequent periods. It also examines the extent to which the BFR can also be attributed to changes in central government current consumption and investment spending which result in a multiplier effect on aggregate demand. It examines the extent to which there is any empirical support for a political business cycle impact on the BFR and finally, it examines the extent to which the BFR can be attributed to a **spill over** effect of business failure impacting unfavourably on other firms. A three variable regression model which forecasts only a very slow recovery of the BFR in New Zealand is developed

Introduction

As has been periodically pointed out over the last decade, most models of corporate distress have centred on the notion that the financial statements of individual companies provide the information necessary to predict whether it is likely to fail. In this regard Altman [1968] initiated a long-term trend of research into essentially microeconomic models of business failure. More recent work [e.g., Altman, 1971 & 1983; Cumming & Saini, 1981; Rose, Andrews & Giroux, 1982; Desai & Montes, 1982; El Hennawy & Morris 1983; Levy & Bar-Niv, 1986; Melicher & Hearth, 1988; and Goudie & Meeks, 1991;] has focused in different ways on the influence of macroeconomic variables on the business failure rate and showed that firms are more likely to fail during economic recessions [a logical conclusion]. In general studies have shown that there is a negative relationship between the BFR and the rate of economic growth and the availability of credit. This New Zealand study evaluates the extent to which the incidence of business failure in the economy during the period 1951 - 1991 may be related to three groups of macroeconomic variables; exogenous aggregate demand variables, monetary variables, a

political business cycle variable and fourth variable a lagged BFR representing the **spill over** effect. The study found that, except for a modest negative relationship between the business failure rate and the level of aggregate government investment, there is only a weak relationship between the incidence of business failure and the individual exogenous components of aggregate demand found in the National Gross Domestic Product Accounts. There is a strong relationship between business failure and aggregate monetary variables and with the failure rate of the previous period. Evidence of there being something of a political business cycle involved in the failure rate resulted in several lagged variable first differences models being developed, the last being one which incorporates the **spill over** effect, M3 and an election year dummy representing the political business cycle. Finally, forecasts and the policy implications of such a model are considered.

Literature Review

Altman [1971] developed the first empirical study macroeconomic influences on the Δ BFR. His study involved the quarterly % change in the GNP, the % change in market expectations represented by the change in S&P Index, and the % change in the money supply. He concluded that *"we observe that the change in the failure rate is inversely associated with changes in GNP, stock prices, and the money supply,"* [Altman, 1971, p.48]. The R^2 's range from 0.10 to 0.24 for various model specifications. While the relationship between the change in the BFR and the change in GNP and S&P seem to be rational in that; with declining economic activity and declining investor expectations, the economic climate would seem to induce more business failures. However, it is difficult to understand why a falling money supply would result in an increase in the BFR. It could possibly be explained by the suggestion that a declining money supply results in declining aggregate demand and therefore worsening business trading conditions. In contrast, the neoclassical monetarist argument is that

increasing the money supply leads to inflationary pressures. Inflationary pressures, it would seem [at least intuitively] lead to a higher BFR during some subsequent period as businesses fail to adjust to the real underlying economic pressures, [Friedman, 1956].

The second study of the quarterly BFR and its relation to changes in key macroeconomic variables was that of Cumming & Saini [1981], who examined the phenomenon in both the UK and Japan between 1973 to 1983. They suggest that bankruptcy "*is usually precipitated by failure to pay interest on debt or failure to meet payrolls may lag default on payment obligations by some time albeit with a considerable -- and variable -- lag*" [p.4 & 5]. They also cite "*restrictive government economic policies*" as a primary cause "*with reduced government demand and scarcer, more expensive credit, marginal firms may encounter payment difficulties,*" [p.6 & 7]. Although Cumming & Saini argue that variations in private consumption are also a determinant of the BFR the New Zealand study does not investigate this phenomenon because private consumption is considered to be an induced variable. Using an OLS regression model, Cumming & Saini showed that in both the case of the UK and Japan, private consumption, government investment carried negative and highly significant signs and that high interest rates were positively related to the BFR. In the case of the UK, the percentage change in the relative profitability of exports was negative and significant, and in Japan real weekly earnings in manufacturing were positively related to the BFR. The R^2 's for the two UK models were 0.51 and 0.61 where the latter included the profitability of exports.

The third investigation of the BFR was that of Rose, Andrews & Giroux [1982]. They scanned the economic literature and collected 28 macroeconomic variables in the search for a relationship. Although they appeared to find strong links between the BFR and eight macroeconomic variables in that the

multiple R^2 equalled 0.922, their study used raw data, not first differences. Although there was no evidence of serial correlation in the residuals, raw data models are not likely to produce satisfactory models because the total variance in the dependent variable is almost invariably significantly larger than in first differences models.

Desai & Montes [1982] took a monetary approach. *"Along the path of monetary contraction, one of the likely effects is an increasing incidence of financial failure of business,"* [p.1]. Their focus upon monetary variables, percentage change in M3 and percentage change in interest rates [supplemented by an autoregressive lag of one year of the number of business bankruptcies in the UK] is supported by the fact that *"microeconomic work suggests that crucial importance of liquidity or cash flow in predicting bankruptcy,"* [p.5]. They develop several regression models reflecting the combined problems of multicollinearity and establishing cause. They concluded that the BFR is negatively related to the percentage change in M3 and positively related to the annual average bank lending rate, [$R^2 = 0.955$]. While their model has been rigourously determined and statistically evaluated the causal problem remains. Three issues seem to require further investigation. The focus on monetary variables, because business failure is primarily a monetary phenomenon as Desai & Montes argue, ignores the possibility that changes in aggregate demand may well be the primary cause of business failure, [Keynes, 1936; Levy & Bar-Niv, 1987]. Our research investigates this phenomenon. Secondly, their model suggests that the number of business bankruptcies is a positive function of high interest rates. We do not have difficulty in accepting this proposition as they seem to be plausible. What is more difficult to accept is their conclusion that business bankruptcies are negatively related to the percentage change in M3, at least as it is specified in their regression equation. A closer examination of their data reveals a positive bivariate correlation between business bankruptcies and

percentage changes in M3, [$R^2 = 0.1918$ for NB, and 0.2347 for $\ln$ NB]. It would seem that expansions in the money supply [at least beyond some unspecified rate] lead to inflationary conditions which result in business instability, [Friedman, 1956; Levy & Bar-Niv, 1987]. Clearly further research is required.

Altman's second model [1982] again used a first differences approach to develop a distributed lag model using the four macroeconomic variables; % change in real GNP, % change in the money supply, % change in the Standard & Poor sharemarket index, and the % change in new business formations. The adjusted R^2 was 0.26 indicating "that a firm's propensity to fail is heightened due to the cumulative effects of reduced (1) real economic growth, (2) stock market performance, (3) money supply growth, and (4) business formation." [p.98] The influence of new business formations "was found to have more remote but rather important lengthy lagged association with the failure rate," [p.98]. Like Desai & Montes Altman [1983] produces a regression equation with a negative coefficient for the change in the money supply [in Altman's case M2]. If, as we have suggested already, the underlying relationship is positive, then multicollinearity would seem to be the problem.

Levy & Bar-Niv, [1986], suggest that "the study of business cycles or variations in aggregate economic variables can further enhance understanding of the determinants of the probability of firm failure. In particular, fluctuations in national income affect the demand for the firm's products ... Fluctuations in prices might also affect a firm's net cash flow when payments and receipts are not linked to relevant price indices." [p.408]. Altman established a negative relationship between the BFR and % changes in GNP. Their theoretical rationale is found in their use of the Dornbusch - Fischer [1990] model "which is capable of generating fluctuations in major aggregate variables such as income and inflation rate," [p.409]. In establishing a series of OLS regression models they suggest that "the underlying rationale is that the probability of firm failure increases with the fluctuations in demand for the firm's product, and that the latter in turn are intensified by the

variation in the public purchasing power," [p.412]. This suggests that investigating changes in aggregate demand may lead us to a more insightful understanding of the BFR.

Melicher & Hearth [1986] used *"a data-based multiple time series approach to develop an explanatory model for describing changes in aggregate failure activity relative to changes in financial markets variables during 1950 through 1983 time period,"* Like Desai & Montes, they contend that *"failures are essentially a credit or money market conditions phenomenon,"* [p.319]. In essence, as interest rates rise and become more volatile, credit availability becomes restricted, economic conditions worsen and the likelihood of business failure increases. Our study recognises the monetary aspects of business failure but seeks to include the volatility of aggregate demand as a causal factor.

Collapsing companies have almost invariably obtained credit [either long-term loans or working capital in the form of trade credit] from more than one source, including from firms which are not primarily in the financial sector. This phenomenon may cause the collapse of creditor companies in due course. The third part of the study investigates the extent to which the BFR relates to earlier business failures and the study also focuses on this lagged auto-regressive aspect. This **spill over** effect, first mooted by Marx [1887], has been used by several authors, [Friedman & Schwartz, 1963; Desai & Montes, 1982; Platt, 1989]. Platt investigated this extensively by testing the hypothesis that *"for vertically integrated industries, failure rates of selling industries are positively associated with failure rates in buying industries."* This **spill over** factor is included in the New Zealand study by using the BFR of the previous period.

Although as far as we know the notion of a *political business cycle* has not been related to the BFR, we find the possibility worth investigating. Keil's [1988] work shows that although such a business cycle has not been

identified in the USA, there is evidence of an election year influence in the UK economy. If this is the case, it seems reasonable that it might have an influence on the success and failure rate of firms. Our New Zealand study incorporates the concept with an election year dummy variable.

The Research Problem

Both because the problem is intrinsically interesting and because understanding the relationship between business failure and macroeconomic variables is important to institutions providing credit and to those who determine government policy, this study focuses upon the relationship between the BFR as defined by Altman [1983] and Rose et. al., [1982], and three classes of macroeconomic variables. It investigates the extent to which the BFR in New Zealand is related to several real aggregate demand variables contained in the demand side of the system of National Accounts *viz a viz*, Government Current Consumption, Central Government Investment and Exports. These variables are, amongst others, those with which Keynesian economists have been concerned.

The study also investigates the extent to which the failure rate of firms relates to real expansions and contractions in the money supply [M3 definition], to inflation and to real interest rates, essentially representing those variables with which neo-classical monetary economists have been concerned.

Furthermore the study investigates the extent to which the previous year's BFR is a factor in the present failure rate [i.e., the **spill over** effect].

Finally the study investigates the extent to which there is any political business cycle involved. Although not always, this variable is related to aggregate demand factors. Other factors might include legislative changes that

change business conditions for example. Before discussing the variables in detail a brief resume of the New Zealand economy should prove helpful.

The New Zealand Economy in Brief:

The New Zealand economy over the period 1951 - 1984 was one in which government consumption, government investment, and government transfer payments comprised approximately 36 - 42% [Lane & Lane, 1991] of gross domestic product. One of the major objectives of central government budgetary policy has been to stimulate or dampen aggregate demand in a Keynesian manner. Associated with a Keynesian managerial approach was a strongly regulated economy in which budget deficits were largely financed through a regulatory system imposed upon financial institutions.

Since 1984 the New Zealand government has adopted a markedly more *laissez faire* approach to economic management and associated with this, neoclassical monetary policy aimed at eliminating inflation, [Lane & Lane, 1991]. The high inflation of the late 1980s has been reduced to about 1%.

The Hypotheses

Four sets of hypotheses are evaluated. The first relates to the **spill over** effect of collapsing companies causing yet others to collapse in a subsequent time period, the second to the notion of a political business cycle, the third to aggregate macroeconomic demand, and the fourth to monetary policy.

Consistent with Platt's findings it is argued that collapsing firms cause a **spill over** effect because they cannot meet the financial demands of their creditors. During times when the business failure rate is low, creditor firms may be able to sustain the collapse of a single, or perhaps a few, debtor companies. During periods of a high BFR even the creditor firms are likely to collapse as their

assets are eroded. As this is likely to take place in a subsequent period, the relationship is lagged. The resultant hypothesis then is:

Ha₁ : That there is a spill over effect of collapsing companies which contributes to the failure rate in a subsequent period.

Although the notion of a *political business cycle* is fairly well rejected in the USA, Keil [1991] found evidence of its existence in the UK. It is possible that it does exist in New Zealand especially in an economy where Keynesian demand management has been extensively used since the Second World War. It is likely to relate negatively to the BFR, for a government's objective is to stimulate the economy during election years. The second hypothesis is;

Ha₂ :, that the political business cycle relates negatively to the BFR.

If we define the simple Keynesian aggregate demand model as:

$$Y = C + I + G + X + M$$

Where Y = Gross Domestic Product

C = Private Consumption

I = I_p + I_g

I_p = Private Sector Investment

I_g = Central Government Investment

G = Central Government Current Consumption.

X = Exports

M = Imports

We are able to classify the major components of aggregate demand into endogenous aggregates and exogenous aggregates. C, I_p and M are defined as endogenous variables and I_g, G, and X are defined as exogenous aggregates. Cumming & Saini argue that "*restrictive government economic policies can be reflected fairly quickly in rising numbers of bankruptcies.*" In taking this approach we are examining the extent to which the exogenous variables influence not only the

total level of aggregate demand, but also the BFR itself. As exogenous aggregate demand increases, business conditions can be expected to result in fewer business failures. An hypothesis flows from here.

Ha₃ : That the New Zealand BFR relates to changes in the exogenous aggregate macroeconomic demand variables. Specifically, the BFR is expected to relate negatively to:-

Ha₃(1): changes in government consumption expenditure [G],

Ha₃(2): changes in central government investment expenditure [Ig],

Ha₃(3): changes in export receipts [X].

The fourth hypothesis evaluates the impact of government monetary policy. Although it is suggested by some that there is a negative relationship between inflation and changes in the money supply and the BFR we postulate the opposite relationship. The advantages of increasing cash flows might well be positive in the initial stages of an inflationary spiral. It would seem, however, that firms eventually need to replace capital equipment and thus may well face unbudgeted extra fixed costs, [Cumming & Saini, 1981,p.16]. We suggest that during inflationary periods firms find it difficult to understand the real monetary values of costs, prices, and the associated lags. This results in an increased rate of collapse. Altman [1983] used new business registrations, and a form of life cycle theory as an indicator of an increased failure rate. In contrast this paper suggests that the causes are found in changing monetary conditions.

Behind the inflationary pressures is expected to be rapid expansions in the money supply. Neoclassical monetary theory asserts that a rapid expansion in the money supply is the primary cause of inflation, [Friedman, 1956]. This study attempts to evaluate not so much the link between inflation and the expansion of M3, but rather the effects of inflationary pressures on the BFR. If

inflation leads to an increase in the BFR, and increases in the money supply lead to inflation, then it follows that increases in the money supply lead also to a higher BFR. The specific hypothesis is:

H_{a4} : That the BFR will relate to inflationary conditions in the economy:-

Specifically, it is expected that the BFR will change positively in relation to:

(1) annual level of inflation, [Infl]

(2) changes in the money supply, [M3].

(3) changes in the bank overdraft interest rate [Int]

The hypotheses define the data requirements.

The Data

While most studies have been able to use quarterly data, [e.g. Altman, 1971, 1983; Rose et. al., 1982; Melicher & Hearsh, 1988], information on business failure rates and the independent macroeconomic variables used in this study was only available on an annual basis. Availability of data also limited the period under investigation to 1951 - 1991.

The number of business failures was obtained both from the *Official New Zealand Year Books* and the Commercial Affairs Division of the New Zealand Justice Department. The total number of private and public companies was also obtained from the former source just mentioned. Although it was possible to obtain the complete series for the number of liquidated companies, the figures were not available for the registered companies for the period 1952 - 1954. As the failure rate during those years was quite low the linear interpolation seems to be unlikely to have created any distortions.

The aggregate economic data for government consumption, [G], government investment, [Ig], and export receipts, [X], was also obtained from the New Zealand National Accounts published annually in the *Official New Zealand Year Book*. Unlike the other data used in the study, the measures for the variables G, Ig, and X were only available for the years ended 31 March. This introduces a minor confusion, if any, we believe.

Because of the possibility of government actions, other than those included in the aggregate demand variables, influencing the incidence of business failure, an election year dummy was included with a value of one [zeros elsewhere] for every third year commencing with 1951. This was included in order to evaluate the extent to which a political business cycle might be involved, [Keil, 1988].

As there is no publicly available gross national product deflator in New Zealand the Consumer Price Index was used. Several series, all published in the *Official New Zealand Year Book*, had to be linked and adjusted to a base of 1991 = 100 in order to provide a single series for the 41 years under study. This provided a basis for measuring the annual rate of inflation.

The interest rate variable used was an amalgam of the Reserve Bank of New Zealand annual average Official Overdraft Rate, for the period 1951 - 1987, and a very similar variable now called the Base Lending Rate for the period 1988 - 1991. The familiar Fisher equation

$$\text{Real Interest Rate} = (1 + r)/(1 + i) - 1.0$$

where r = the money rate of interest,

where i = the rate of inflation,

[Fisher, 1930] was used to calculate the real annual rate of interest.

Although figures for the M1 definition of the money supply have been available for considerably longer, the variable representing the broad definition of the money supply [M3] only appears to have been available since 1960. As the correlation between M1 and M3 for the period 1960 - 1991 were unacceptably low, and a multiple regression of M3 against the other variables used in the study provided an R^2 of 0.87, the values for M3 for the earlier nine years was estimated. Although unavoidable, this weakens our study somewhat.

Apart from the BFR, the rate of inflation and the interest rate variable, all of the data was converted to first differences in 1991 prices. Because lagged relationships of up to three years were expected this restricted the actual OLS regression study period to changes occurring 1954-55 to 1990-1991.

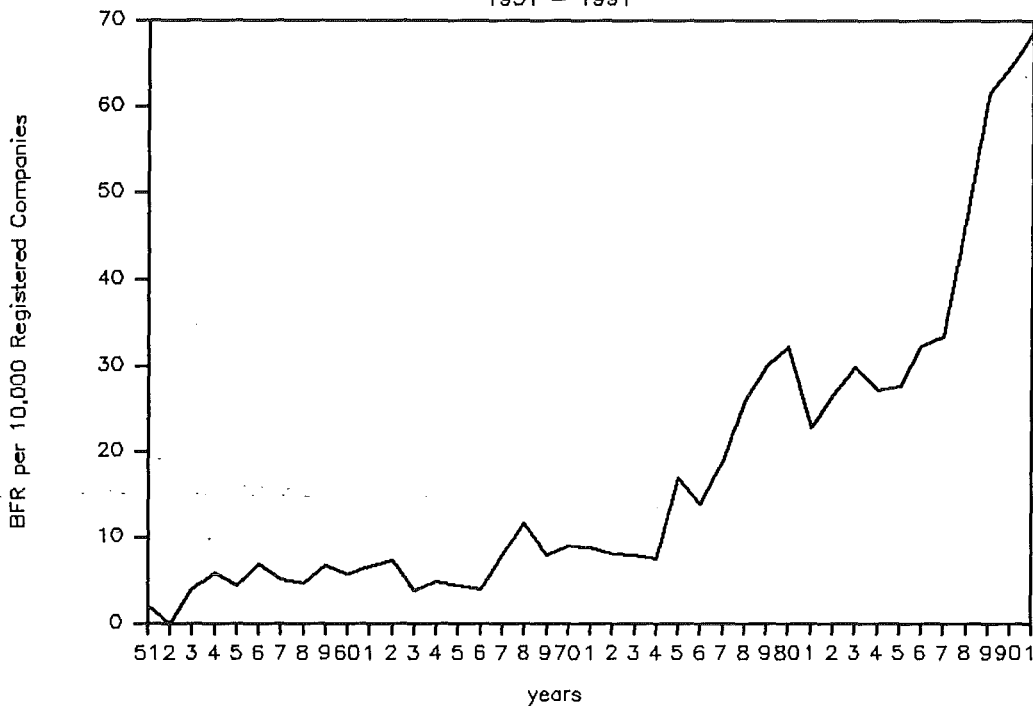
The BFR was calculated in the commonly expressed manner, i.e., failed businesses per 10,000 registered companies, [e.g., Altman, 1971].

The Business Failure Rate in New Zealand:

The data on business failures in New Zealand is tabulated in Appendix 1 and the BFR is presented in figure 1.

Figure 1**Business Failure Rate in New Zealand**

1951 – 1991



The period is characterised by more than 20 years of a relatively low level of business failures followed by a dramatic rise in the incidence. It is the causes of both the level and the fluctuations in the BFR over time that this paper attempts to identify. These were investigated using OLS regressions to evaluate the hypotheses already discussed. Before discussing the actual findings in relation to the specific hypotheses we need to point out an inherent problem with the research.

An Inherent Problem with the Research:

Like many other studies, the purpose of this research is not merely to establish that high correlations exist between the various phenomena and the dependent variable, the BFR. The purpose is to establish a causal relationship. The difficulty of this is exemplified in the work of several other authors, [e.g. Desai & Montes], who show that several statistical models are able to be

developed. Our hypotheses are couched in such a manner that they might be able to be related to some theoretical framework relating to cause. We also found that the R²'s for several models are very high indeed. The first question investigated relates to the hypothesis about the **spill over** effect.

The Findings: - The Spill over Effect.

An examination of the extent to which the BFR of previous periods provides a partial explanation for the subsequent BFR is provided in Table 1.

Table 1				
Periods	Correlations Between the BFR and the BFR of Previous			
Lag	t - 1	t - 2	t - 3	t - 4
Variable				
BFR	0.972	0.936	0.906	0.850

Despite the difficulties associated with establishing cause, table 1 seems to provide reasonable evidence to support Ha₁. Claims of a **spill over** effect [Desai & Montes, 1982] may be justified. However, for regression modelling purposes, the existence of autoregression provides major difficulties in that the estimates of the betas are usually biased, [Greene, 1990]. The problem with rejecting autoregressive lagged models is that they may well in fact correctly represent the actual situation. A high failure rate in one period may contribute to a significant proportion of the failure rate in the next period, [Desai & Montes, 1982]. Although the associated OLS regression model provides a very high R², [0.944], with a single lag and a beta of 1.085, such a variable, it seems, would be most unlikely to be the sole determinant of the BFR. Secondly, with a coefficient of greater than one, there is a suggestion that the BFR will increase indefinitely. This is impossible. Such a model is clearly misspecified. Despite this obvious weakness, the lagged BFR may well provide

a very useful variable in a more comprehensive model that incorporates the **spill over** effect as well as other aggregate demand determinants and monetary variables.

While a first differences model of the **spill over** effect may have certain preferred statistical qualities, the actual raw data provides a better explanation for the phenomenon. If, for example, a period of high business failure in one year is followed by an equally high BFR in the second year, the Δ BFR would be close to zero, indicating little or no **spill over** effect in the next period. This inadequately describes the scenario. A high BFR contributes to a high BFR in the next and subsequent periods. For this reason the lagged BFR and not the Δ BFR is retained as the causal variable in a more complete model.

The Findings: The Political Business Cycle:

On the surface there does not seem to be any support for the existence of a three yearly business cycle. National elections are held on a triennial basis in New Zealand and the election-year dummy variable was also lagged both one and two years. No correlations could be found between the BFR and any lagged or non-lagged election dummy. These findings do not show that a political business cycle does not exist however as the objective of the study was to ascertain whether or not such a variable related to the BFR. The notion of a political business cycle and its relevance to business failures is discussed again later in the paper.

The Findings: - Aggregate Demand Variables

An examination of the data reveals the following correlations between the BFR and the exogenous macroeconomic variables set out in the first hypothesis. Table 2 presents the data.

Table 2				
Correlations Between the BFR and Aggregate Demand Variables				
Lag	t-1	t-2	t-3	t-4
Variable				
Δ G	0.142	0.170	0.106	-0.052
Δ Ig	-0.280	-0.254	-0.174	-0.064
Δ X	0.006	0.005	-0.023	-0.061

The evidence is clear. The relationship hypothesized in Ha₂ (1) and (3) cannot be supported by the evidence. The relationships between changes in government consumption expenditure, and between changes in export receipts as reflected in the New Zealand National Accounts and the BFR are extremely weak.

There is stronger support for Ha₂ (2). Changes in government investment impacts negatively, although weakly, on the BFR, a finding consistent with the studies of both UK and the Japanese BFR also [Cumming & Saini, 1981]. Changes in the level of government investment both stimulate and depress the economy depending on whether the change is positive or negative.

Consistent with the above findings, a stepwise OLS multiple regression using only the aggregate demand variables found only a weak relationship between these and the BFR. This is summarised in table 3.

Table 3
Model 1: A Regression of BFR on Aggregate Demand Variables

BFR =

19.784

-0.0104

$\Delta \lg_{t-1}$

-0.0097

$\Delta \lg_{t-2}$

(7.105)

(-1.741)

(-1.648)

Adjusted R² = 0.0946

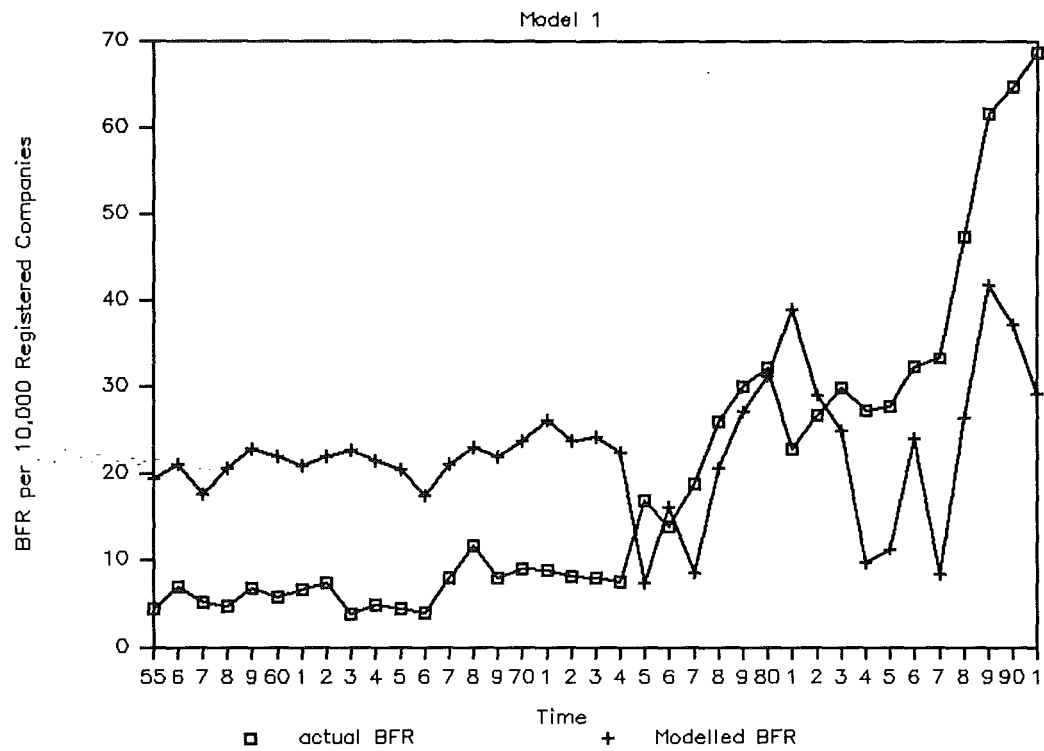
F Ratio = 2.881

p = 0.0699

D.W = 0.204

The modelled BFR was graphed alongside the actual BFR. It is presented in figure 2.

Figure 2
Business Failure Rate



Clearly the model is poor. The extent to which aggregate demand variables might provide a satisfactory relationship to the BFR if the dependent variable was specified in a log-linear model was examined also. A stepwise OLS

regression resulted in no variables being entered into the model at the 0.1500 level. H_{a3} has to be substantially rejected.

When an autoregressive model using the dependent variable BFR with a lag of one period was introduced into the stepwise process model 1A was developed. Table 4 shows the results:

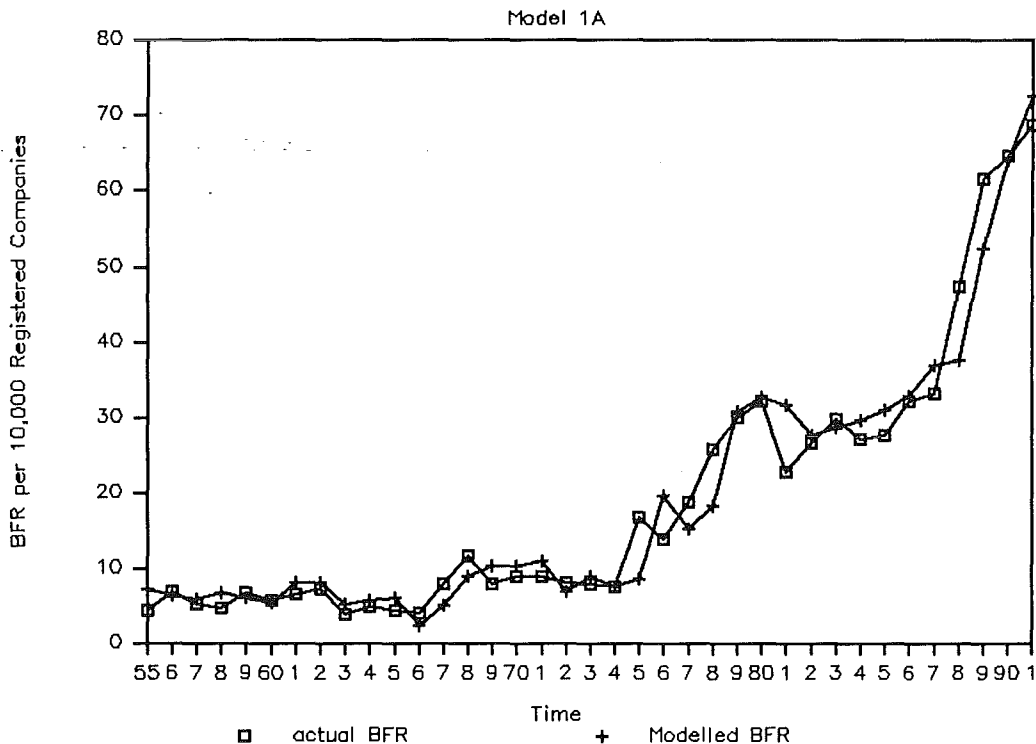
Table 4				
Model 1A: A Regression of BFR on Aggregate Demand Variables and BFR_{t-1}				
BFR = 1.735 + 1.115 BFR_{t-1} -3.842 Ed -0.003 Δ G_{t-2}				
t =	(1.488)	(25.420)	(-2.579)	(-1.690)
Adjusted R^2 = 0.9488 F Ratio = 223.368 p = 0.0001				
D.W = 1.799				

Model 1A is a marked improvement. While the hypothesis that the BFR is a purely a function of aggregate demand variables alone cannot be substantiated [model 1] once the lagged BFR_{t-1} is used as an autoregressive independent variable both the political business cycle dummy [Ed] and the level of government current consumption [lagged two periods] enter the equation. Although the R^2 is very high, the F ratio equally satisfactory, [although there is some evidence of serial correlation in the residuals], we suggest that in any correctly specified model the coefficient for BFR_{t-1} should be both positive and somewhere between zero and one. The existence of a highly significant coefficient for the political business cycle dummy is interesting. Despite the fact that in itself it had a zero correlation with the dependent BFR, this model at least suggests that when analysed with other factors, something of a political business cycle is influential. The level of government current

consumption has a low t value. The coefficient is quite small indicating perhaps only a marginal influence on the incidence of business failure.

The estimated BFR is graphed along side the actual BFR and presented in figure 3.

Figure 3
Business Failure Rate



Although the model has some rather nice statistical properties about it we feel that it should be rejected on the grounds that it forecasts a indefinite increase in the BFR. With a coefficient for BFR_{t-1} of greater than one and with only a very low value for the coefficient for ΔC_{t-2} it would require massive and probably unrealistic increases in government current consumption to stem the trend in business failures. The model, it would seem, must be rejected on these grounds alone. Monetary variables, on the other hand, may provide better insights into the factors that lie behind the business failure rate in New Zealand.

The Findings: - The Monetary Variables.

The bivariate correlations between the BFR and the three monetary variables, the rate of inflation [Infl], the change in the money supply [M3], and the real rate of interest [Int] are presented in table 5.

Table 5				
Correlations Between the BFR and the Monetary Variables				
Lag	t-1	t-2	t-3	t-4
Variable				
Infl	0.411	0.528	0.652	0.742
Δ M3	0.619	0.758	0.859	0.852
Δ Int	0.413	0.328	0.214	0.044

Clearly there is a high positive relationship between both the rate of inflation, changes in M3, and to a lesser extent real interest rates, and the BFR. As the lag increases the relationship between the rate of inflation and change in M3 and the BFR gets stronger indicating that failure resulting from inflationary pressures takes some time to take effect. Companies obviously do not collapse over night. As values for M3 were estimated for the period 1951 - 1959 the correlations for the data for the period 1960 - 1991 were also calculated. They were not significantly different from the ones reported in table 5.

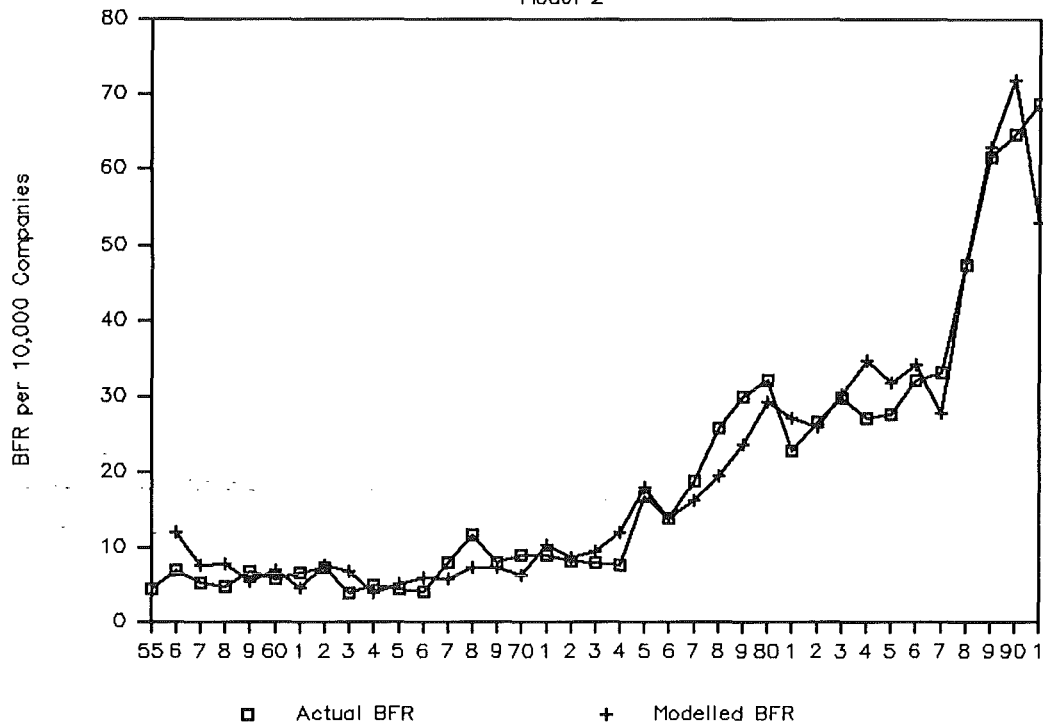
The monetary hypotheses can be accepted. Both Ha₄ (1) and (2) are supported by strong empirical evidence. As the correlations are high it seems reasonable to accept the hypothesis that there is a causal relationship between the BFR and high rates of inflation. Now that inflation in New Zealand has been reduced to low single digit figures through firm monetary control,

[although some may argue that aggregate demand has been markedly reduced through reductions in government spending], the relationship between the BFR and monetary variables would indicate that the rate of business failures is likely to decline. *Ex poste* tests over the next few years will help confirm the extent to which the BFR relates causally to monetary factors. The resultant stepwise regression model including only these two monetary variables is detailed in table 6.

Table 6				
Model 2: A Regression of BFR on the Monetary Variables				
BFR = 2.328 + 2.319 M3 _{t-2} + 1.340 M3 _{t-3} + 3.377 Δ M3 _{t-4} + 117.27 Infl _{t-4}				
t =	(1.642)	(4.167)	(1.816)	(5.726) (6.736)
Adjusted R ² = 0.9354		F Ratio = 127.67 p = 0.0001		
D.W = 1.530				

A graphical presentation [figure 4] allows us to examine the model more closely.

Figure 4
Business Failure Rate
Model 2



The model does not pick up the sharp increase in the business failure rate which occurred in 1967 and 1968, nor does it reflect the circumstances of the decade from about 1977. Furthermore, the model is somewhat condemned by the predicted sharp down turn in the failure rate in 1991. This could be due to the failure to include BFR_{t-1} reflecting the **spill over** effect.

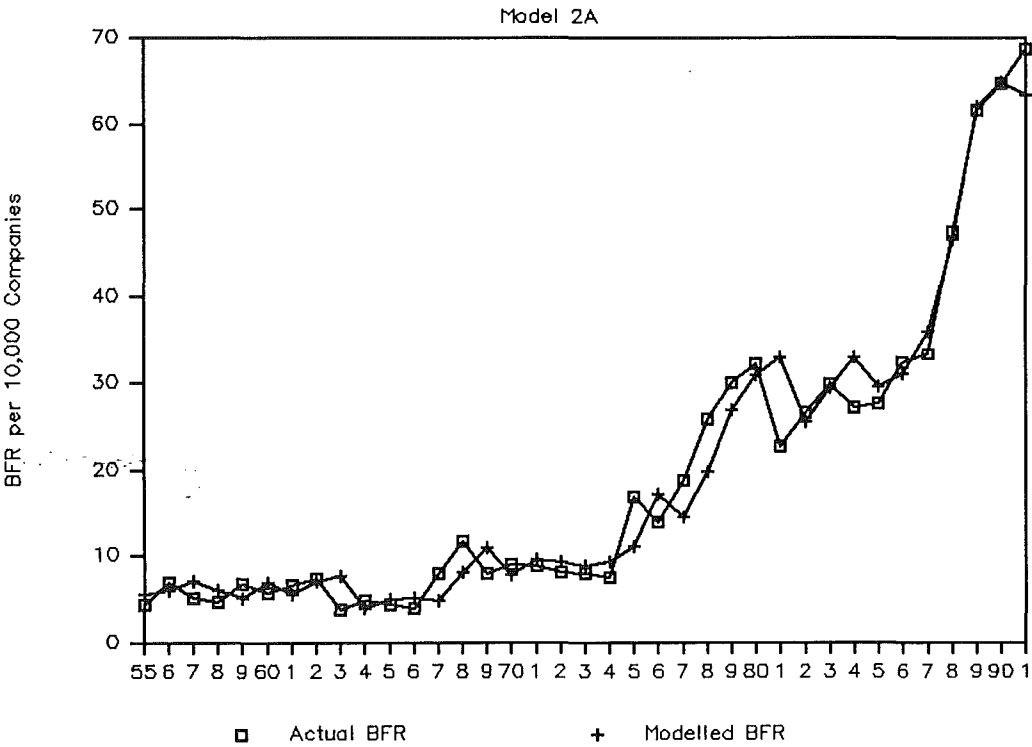
When BFR_{t-1} is introduced to the stepwise regression process involving the monetary variables the model [table 7] has some better properties.

Table 7					
Model 2A: A Regression of BFR on the Monetary Variables and BFR _{t-1}					
BFR = 1.335 + 0.871BFR _{t-1} + 1.170Δ M3 _{t-2} + 1.051Δ M3 _{t-3} + 25.898 Infl _{t-4}					
t =	(0.670)	(14.148)	(2.786)	(1.984)	(1.476)
Adjusted R ² = 0.9643		F Ratio = 237.47			p = 0.0001
D.W = 2.102					

Model 2A appears to be encouraging. The R^2 is very high, even higher than that of model 2. The signs of the coefficients are all appropriate and consistent with the respective hypotheses. The coefficient of BFR_{t-1} is positive and less than one, reflecting the **spill over** nature of business failures, the signs of the monetary variable M3 are positive [H_{a4}], and the constant is small. The t values of each of the coefficients, particularly the one for BFR_{t-1} , are all significant. There is however evidence of serial correlation indicating that the model is misspecified.

Again an examination of the graphical presentation enables us to observe weaknesses in the model, [figure 5].

Figure 5
Business Failure Rate



The modelled data departs from the actual data to the greatest degree during the period 1975 - 1981, and to a similar extent 1967 and 1968. Business failures during these periods may relate to two fairly major crises experienced

by the New Zealand economy. The first was the wool price collapse during 1966 and 1967. During this period export receipts from wool fell by approximately 30%. If this was a determining factor we would probably expect the level of exports to be more significant. Secondly, the oil crisis of the mid 1970's may well have had a delayed impact on firms. The introduction of a dummy variable to account for major nation crises improves the regression, but has been left out of the equation because the causal links are tenuous. Finally, the introduction of the lagged BFR has improved the modelled value for 1991. There is only a small decline in the business failure rate and the residual value for that year can be seen to be small.

There is statistical evidence to support the monetary arguments, there is statistical evidence to support the **spill over** argument, there is much weaker statistical evidence to the aggregate demand argument and finally, there is no bivariate evidence to support the notion of a political business cycle affecting the business failure rate in New Zealand. Because all of these factors seem to be relevant all of the variables were submitted to a stepwise OLS regression procedure. The outcome was a simple three variable model, model 3.

Model 3: A Three Variable Model

Model 3 includes the BFR_{t-1} , $M3_{t-2}$ and Ed , the political business cycle variable, [table 8].

Table 8

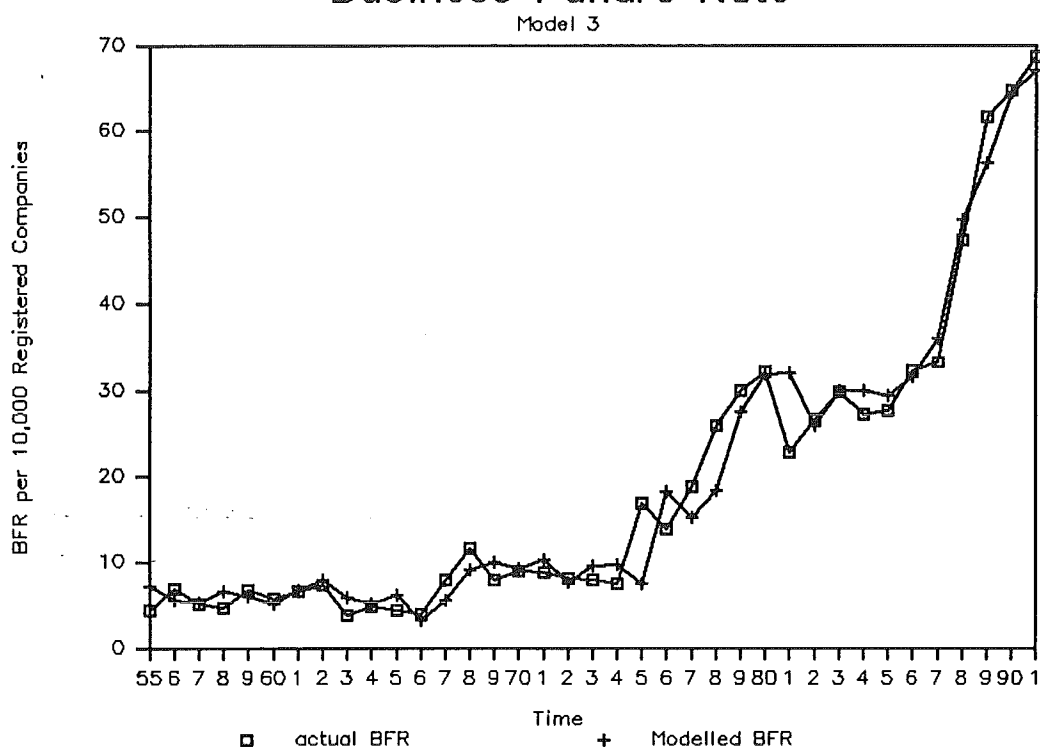
Model 3: A Stepwise Regression of BFR on All Variables

BFR =	1.456	+ 0.957BFR _{t-1}	+ 1.537Δ M3 _{t-2}	- 2.679 Ed
t =	(1.611)	(19.986)	(4.319)	(-2.270)
Adjusted R ² =	0. 9645			
F Ratio =	326.63			
p =	0.0001			
D.W =	2.183			

This model is both parsimonious and plausible. The R² is acceptably high, particularly for a first differences model [c.f. Altman, 1983], the signs of the coefficients are all as hypothesized and the t values are highly satisfactory. It suggests that the BFR is a function of the BFR for the previous period, changes in the money supply two years prior, and a function of the tendency for governments to make election year decisions that are advantageous to businesses.

The magnitude of the coefficient for the lagged BFR seems to indicate that in the small New Zealand economy the effects of a high BFR are chronic. Stability was characteristic of the first half of the period, but once instability among firms was high, it seems that it will take quite some time to return to lower levels. The time series is graphed in figure 6

Figure 6
Business Failure Rate



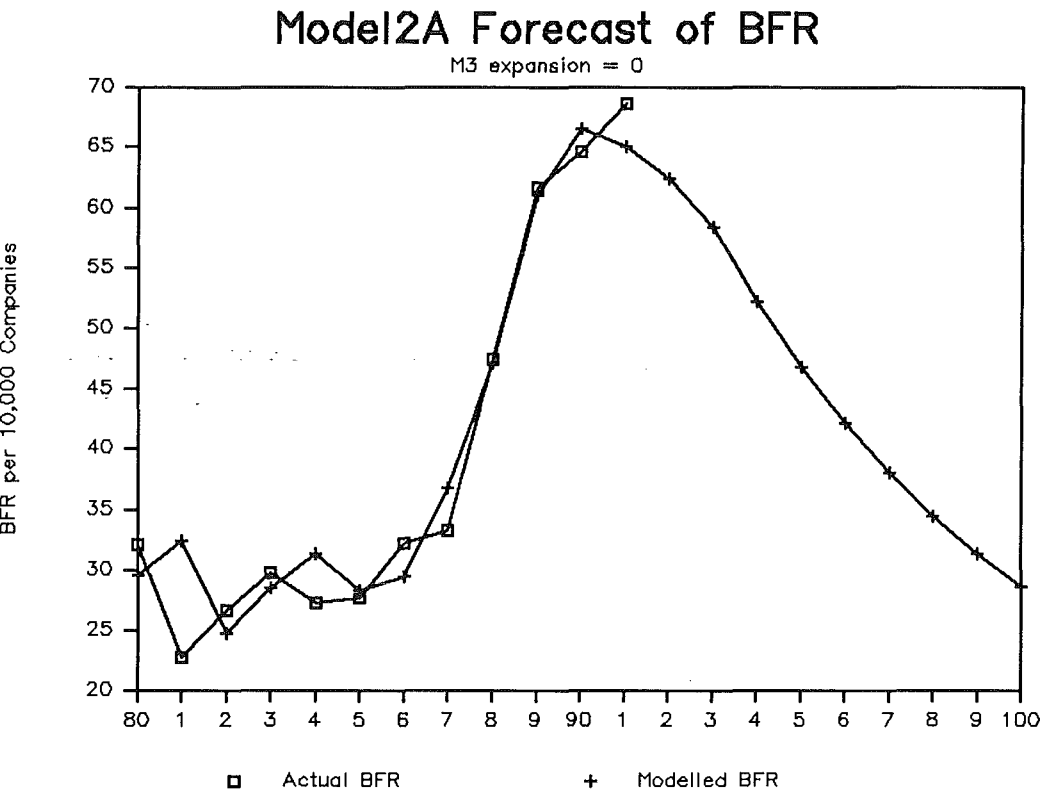
Policy Implications: Forecasting with a Three Variable Model.

Despite some serial correlation, the model fairly accurately tracks the actual BFR over the 1955 - 1991 period. As always forecasting remains a hazardous process, nevertheless, having developed a model we are obliged to extrapolate. The failure rate of businesses in New Zealand seems to be primarily a function of the conditions brought about by rapid expansions of the money supply M3. The model forecasts that the BFR in New Zealand has risen to a peak in 1991, and will subsequently decline slowly over the next decade. The rate of decline is primarily a function of the changes in M3.

Current New Zealand Government monetary policy is aimed, amongst other things, at keeping government spending in check and controlling inflation. If

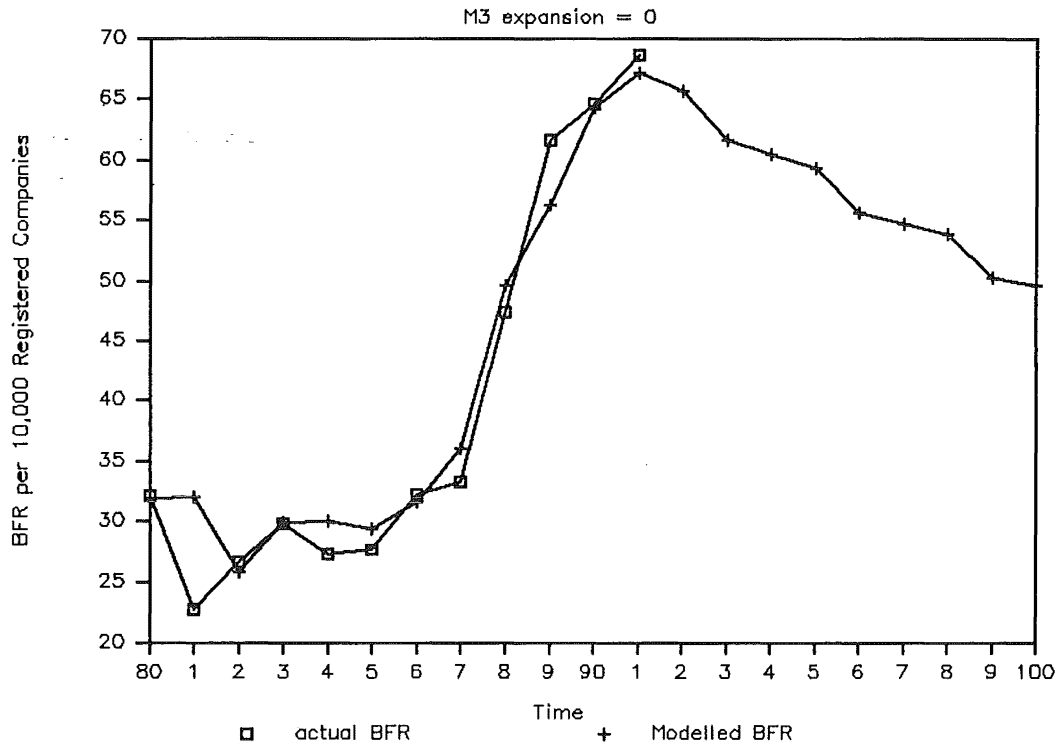
this remains the case then the rate of business failure will decline slowly over the next decade. Both models 2A and 3 forecast this scenario, [figures 7 & 8].

Figure 7



This monetary model [model 2A] indicates that with no M3 expansion and an associated low or zero inflation rate the BFR will decline moderately rapidly. In this case the rate of expected decline is determined solely by the *spill over* factor. In contrast, under essentially the same conditions, model 3 forecasts a slower but definite decline in the BFR.

Figure 8
Model3 Forecast of BFR

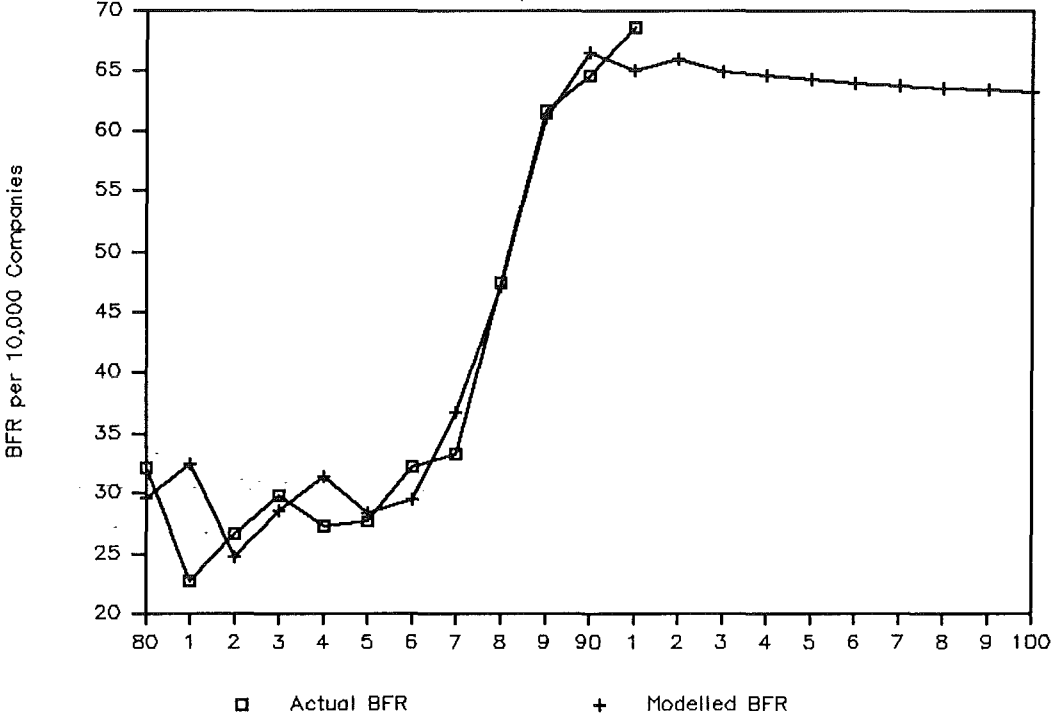


If, however, M3 is not firmly controlled, business conditions will be such that the recovery of the failure rate will slow down quite markedly. It is even possible with monetary expansion, whatever the cause of that expansion, that the business failure rate will remain at the very high levels experienced during 1990 and 1991. If M3 is allowed to expand at a rate of \$3 billion each year, for example, both models 2A and 3 predict markedly different scenarios, [figures 9 & 10].

Figure 9

Model2A Forecast of BFR

M3 expansion = 3

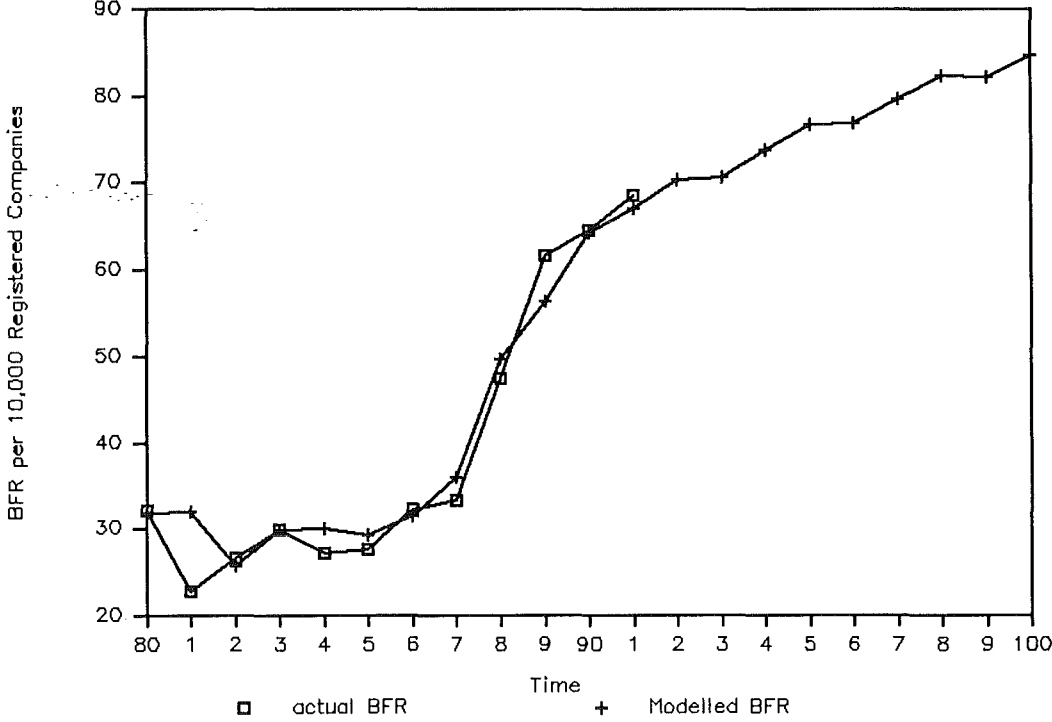


Model 2A forecasts a continuation of the high levels of the BFR.

Figure 10

Model3 Forecast of BFR

M3 expansion = 3



Model 3, our preferred model, forecasts under conditions of a steady and significant growth in M3 there will be an increasingly higher BFR in the foreseeable future. The high levels of the New Zealand BFR developed over a considerable period from 1975 - 1991. Extrapolations show that only a slow recovery to levels experienced prior to this period is possible, and that only if the level of changes in M3 are kept low. While a political business cycle has existed in the past it seems that this only provides minor fluctuations in the secular trend.

Further Research and Conclusions

Although it may have been more appropriate to use a Box-Jenkins approach this was ruled out by insufficient data points due to the non-availability of quarterly data for the period, [Hanke, Reitsch & Dickson, 1984]. Further work may be warranted to evaluate the extent to which stationary mean values can be achieved. The limitation of insufficient data for a Box-Jenkins approach may be less of a problem than the limitation of using the one period lag for the BFR in the OLS autoregressive model presented in this paper. The problem has already been discussed however. I suggest that the nature of the causal relationship hypothesized excludes the use of a first differenced dependent variable in the *independent* variable set.

Apart from the obvious need to *ex poste* test the model, further research is needed to investigate the extent to which such a simple model [i.e., model 3] might be derived from data from other countries. A comparative study would be desirable.

This should ascertain whether a positive sign for the M3 coefficient can be justifiably established for models developed in other countries. While different countries have experienced different economic conditions during the post war period, the high levels of inflation in recent times might allow us to examine

the causal nature of the BFR under similar conditions. Earlier models using data which does not include volatile M3 figures, for example, may not have allowed us to examine the true effects. Some consistency in model specification across countries might also allow us to fix upon a satisfactory theory of the macroeconomic determinants of the business failure rate.

We are surprised that the aggregate demand data does not feature significantly in our models. In our view it should do so. This needs further examination both within the New Zealand data base and with an internationally comparative study.

Finally, further work on both the **spill over** and the **political business cycle** factors seem warranted. While the **spill over** explanation seems plausible more detailed work is required to identify the extent and nature of the relationship. The latter factor may or may not be significant but warrants some investigation.

In conclusion, there seems to be sufficient support for the argument that the BFR is a function of the **spill over** effect [although some other explanation is always possible], positive lagged changes in M3, and some evidence of the existence of the effect of a political business cycle.

**Appendix 1:
Business Failures in New Zealand**

Year	Companies Liquidated	Companies Registered
1951	4	19617
1952	0	20930
1953	9	22244
1954	14	23557
1955	11	24870
1956	19	27525
1957	16	30431
1958	16	33750
1959	24	35339
1960	22	37667
1961	27	40886
1962	32	43547
1963	18	46571
1964	24	49335
1965	24	54247
1966	24	58752
1967	50	62532
1968	77	65913
1969	56	70604
1970	68	75560
1971	75	84392
1972	72	88071
1973	75	94233
1974	75	98399
1975	171	101666
1976	148	106106
1977	205	109305
1978	285	110484
1979	337	112224
1980	371	115226
1981	269	117957
1982	316	118589
1983	367	122892
1984	347	127387
1985	375	135545
1986	441	136533
1987	490	147158
1988	749	158032
1989	992	160988
1990	1033	159922
1991	1052	153275

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