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IS THERE A BANK LENDING CHANNEL OF MONETARY POLICY IN NEW ZEALAND?

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IS THERE A BANK LENDING CHANNEL OF MONETARY POLICY IN NEW ZEALAND?

Abstract:

The effectiveness of the bank lending channel of monetary policy hinges on the extent to which changes in the availability of bank credit relative to non-bank credit are systematically transmitted to the real sector of the economy. On this count, there is no evidence of a link between three finance mix variables and economic activity in New Zealand during selected intervals over the 1967-87 period. Similar, unfavourable results are reported by the investigation of the connection between movements in an interest rate spread and real economic performance between 1975 and 1994. Moreover, neither the finance mix variable nor the spread respond consistently to changes in various indicators of monetary policy. The results reported in the paper cast serious doubt on the existence of a potent bank lending channel of monetary policy in New Zealand either before or after the reforms of the mid-1980s.

JEL Classification:

E44, E51.

I. Introduction.

Recently there has been renewed interest in the way changes in monetary policy affect the real side of the economy. The current debate focuses on the transmission mechanism of monetary policy. Central to the current debate is the question of whether a change in monetary policy results merely in a change in the cost of capital - the traditional money view - or whether a change in monetary policy has broader and more far-reaching implications for the process of financial intermediation - the credit view.[1] Both the money and the credit view acknowledge the existence of a standard channel of monetary transmission through changes in real interest rates. However, proponents of the credit view argue that relatively large fluctuations in aggregate spending such as inventory investment and business fixed investment cannot be explained satisfactorily by minor changes in real interest rates. Accordingly, the credit view analyses in greater detail the ways in which monetary policy can influence the interaction between borrowers and lenders in financial markets and the resulting consequences for economic activity. The credit view encompasses two distinct channels: a bank lending channel and a balance sheet channel. Proponents of the credit view argue that a bank lending channel exists because banks actively reshuffle their portfolio of assets following a change in the stance of monetary policy(Bernanke and Blinder(1988, 1992)). In particular, a tightening of monetary conditions entails a reduction in the supply of bank loans relative to other sources of credit such as commercial bills. Bank lending declines primarily because banks cannot offset completely the drain of reserves by issuing managed liabilities such as certificates of deposit. With access to the short-term capital market restricted

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[1] Romer and Romer(1989,1990) give a detailed account of the standard monetary transmission mechanism. Cecchetti(1995), Hubbard(1995) survey the literature on the credit channel of monetary policy while the papers contained in Peek and Rosengren(1995) address issues pertaining to the bank lending channel only.

primarily to large firms, small firms which depend on bank loans for the financing of investment spending are deprived of their primary source of financial capital. As small firms account for a major portion of aggregate output, aggregate economic activity declines. Supporters of the credit view maintain further that monetary policy has non-neutral effects on the balance sheets of firms. (Bernanke and Gertler(1989)). A monetary contraction causes the net worth of firms to decline for two reasons. First, as tighter monetary policy causes interest rates to rise, the servicing of outstanding debt becomes more expensive and firms experience decreasing cash flows. Second, rising interest rates are accompanied by declines in asset prices. As a consequence, the value of marketable collateral declines. These adverse developments lead to more stringent conditions under which external finance becomes available. In practice, the external cost of finance rises which ultimately causes interest-sensitive expenditures such as investment to decline.

The empirical relevance of a bank lending channel of monetary policy has been verified by attempting to link changes in financial quantity variables or price variables to subsequent changes in economic activity. Empirical evidence pointing to the existence of a bank lending channel of monetary policy in the United States is reported by, amongst others, Bernanke and Blinder(1992), Kashyap, Stein, and Wilcox(1993), and Friedman and Kuttner(1993). Empirical evidence in support of the balance sheet channel of the credit view is provided by Fazzari, Hubbard, and Petersen(1988), Gertler and Hubbard(1988), Oliner and Rudebusch(1994), and Bernanke, Gertler and Gilchrist(1995).[2]

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[2] This list is by no means exhaustive. Also note that the strength of the bank lending channel of monetary policy has been questioned by, amongst others, Romer and Romer(1990,1993), Ramey(1993), and Oliner and Rudebusch(1996). The latter caution against interpreting changes in aggregate debt mixes as proof of the existence of a bank lending channel.

The objective of this paper is to establish whether a bank lending channel was operative in the transmission of monetary policy in New Zealand in the recent past. The study considers various episodes of the 1967-1994 period and relies on data primarily from the manufacturing sector of the New Zealand economy and from the Reserve Bank's Model XII database.

The New Zealand economy of the 1970s and the early-to-mid 1980s provides an almost ideal testing ground for the strength of the bank lending channel of monetary policy. This period was characterised by a tight regulation of the banking sector. These controls had been imposed in an attempt to manage the flow of bank credit to the private sector of the economy. The monetary policy restrictions of the day spurred the development and expansion of alternative sources of short-term financial credit, the commercial bill market and finance companies. Against this background it seems important to ask whether the propositions underlying the bank lending view held true in New Zealand. Did monetary policy contractions alter substantially the composition of financial intermediation and lead to an eventual slowing down of economic activity? Or did private sector companies succeed in escaping the brunt of monetary tightenings by switching from bank loans to finance company loans or commercial bills?

The examination of the importance of the lending view in New Zealand proceeds in two stages. First, we gauge the impact of changes in monetary policy on the level of financial intermediation in the banking sector relative to the non-bank financial sector of the economy. In the second stage, we examine movements in the volume of bank and non-bank credit to see whether they can be linked to changes in real economic activity. In particular, we investigate the predictive ability of various quantity-based indicators of conditions in the market for short-term credit up to 1987. Relying on price-based indicators, we carry out a similar

analysis for the period through 1994. Overall, our empirical findings show that the systematic relationship between economic activity and various quantity-or price-based measures of credit conditions observed in other countries, particularly in the United States, is absent from NZ data.

The remainder of this paper is organized as follows. Section II contains a simple model describing the effects of a change in monetary policy on the quantity and price variables. The empirical findings for the NZ economy are presented in Section III while Section IV offers a brief summary and conclusion.

II. The Finance Mix and Monetary Policy.

The lending view assigns bank loans a central role in the transmission process of monetary policy. Bank loans are special in that firms are not indifferent about the way they finance their operations. All things equal, firms prefer borrowing from a bank to borrowing from other financial intermediaries or issuing their own short-term debt. Underlying this preference for bank loans is the simple fact that firms derive a material benefit from a close working relationship with a bank. As shown by Fama(1985) and Diamond(1991), banks have a special advantage in monitoring the behaviour of a firm. For instance, over time a bank accumulates inside information about the financial transactions of the firm which pass through its accounts. The bank thus acquires some expertise in evaluating the firm's performance and credit risk. More importantly, in its capacity as a financial intermediary, the bank transmits valuable information about the firm to the market. By granting credit to the firm, the bank signals the firm's creditworthiness to the market.[3] The existence of such a

[3] It can also be argued that firms enjoy a material benefit from a close working relationship with a bank because a bank can offer much speedier access to credit than the commercial bill market. For instance, access to overdraft facilities or bank loan commitments reduce the possible reputational damage associated with unexpected financial difficulties.

relationship benefit forms the basis of the following model which illustrates the cost-minimization problem faced by the firm.

In financing a given level of activity, the firm must choose the optimal mix of bank loans and non-bank debt.

$$\min_{B,N} C = r_B B + r_N N - f(B/D)D$$

$$\text{s.t. } B+N=D$$

where C = total cost
B = volume of bank loans
N = volume of non-bank debt
D = B+N= level of short-term debt outstanding
r_B = bank lending rate
r_N = interest rate on non-bank debt
f(B/D) = relationship benefit enjoyed by firm.

The term f(B/D) measures the benefit to the firm from a close working relationship with a bank.[4] The relationship benefit is increasing in the proportion of bank loans relative to total short term debt, implying that $f'(B/D) > 0$. However, the benefit accruing to the firm is subject to diminishing returns so that $f''(B/D) < 0$. Minimizing total cost with respect to the choice variables B and N, we obtain two first order conditions, which, after subtracting one from the other, yields the following expression:

$$r_B - r_N = f'(B/D) \tag{1}$$

The spread between the bank lending rate and the interest rate on non-bank debt is positive as the marginal benefit of additional bank loans is strictly positive. If firms derive a material benefit from a working relationship with a bank, then the interest rate on bank loans

[4] This relationship benefit figures prominently in Kasyhap, Stein and Wilcox(1993) and Oliner and Rudebusch(1995).

always exceeds the interest rate on non-bank debt.

To investigate how changes in monetary policy affect the financing mix B/D, we perform a simple comparative statics exercise. Let MP stand for the stance of monetary policy. Then differentiating the above FOC with respect to MP yields:

$$\frac{d(\frac{B}{D})}{dMP} = \frac{1}{f''(B/D)} \frac{d(r_B - r_N)}{dMP} \tag{2}$$

A change in the stance of monetary policy affects the optimal finance mix in just the opposite way as the interest rate spread because $f'(B/D) < 0$. If the lending view is correct and a tightening of monetary policy causes a contraction of bank loans , then the spread between r_B and r_N will increase but the ratio of bank loans to total short-term debt will decrease. A change in monetary policy is thus reflected in a change in the spread between the bank lending rate and the interest rate on non-bank debt, a price-based variable, and a change in the optimal finance mix, a quantity-based variable. Hence it can be argued that both the finance mix and the interest rate spread are informative signals about the stance of monetary policy. This insight suggests that at the aggregate level the potency of monetary policy in the short-run can be gauged by measuring the impact of changes in the finance mix variable and/or changes in the interest rate spread on economic activity.

III. The New Zealand Experience.

This section presents econometric evidence on the existence of a bank lending channel of monetary policy in New Zealand based on monthly and quarterly data for selected intervals of the 1967-1994 period.[5] We begin our investigation with an overview of the

[5] A detailed account of the statistical properties of the data is provided in the appendix. The data was analysed for the existence of unit roots and cointegrating relationships.

composition of financial intermediation in New Zealand during the 1970s and 1980s. Next, we check movements in both a finance mix variable and an interest rate spread for the existence of a consistent pattern which suggests that both constructs responded to changes in the stance of monetary policy over the 1974-1987 period.[6] For the 1987 onward period we rely only on the interest rate spread as an information variable. This is done for two reasons. First, data on commercial bills is not available for the period after March 1987. Second, relative to the preceding subsample period, interest rates should contain more accurate information about changes in the stance of monetary policy from the mid-1980s onward when controls on interest rates were lifted.

Section III then proceeds with the empirical analysis of the causal structure between changes in credit conditions and real economic activity. Following Kashyap, Stein, and Wilcox(1993) (henceforth KSW), we examine whether movements in economic activity are correlated with past changes in a finance mix variable, defined as the ratio of bank loans to the sum of commercial bills and bank loans. As KSW's definition of the finance mix is rather narrow, we propose two additional measures of the finance mix and test for a systematic relationship between these mix variables and aggregate economic activity. The section concludes with an assessment of the effect of changes in the interest rate spread on economic activity.

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[6] When we examine the link between changes in the tools of monetary policy and the finance mix variable and interest rate spread, we will actually consider an additional subperiod which is contained entirely within the 1975-1987 subperiod. The choice of this subperiod, which covers the 1975-1984 period, is motivated by an attempt to evaluate the effect of changes in monetary policy on the finance mix before the onset of structural changes in the New Zealand economy.

III.A. The Finance Mix and the Interest Rate Spread in New Zealand: A Closer Look at Their Behaviour During Selected Intervals.

The empirical evidence reported by KSW(1993) on the existence of a bank lending channel of monetary policy in the United States rests primarily on the ability of a particular finance mix variable to predict changes in economic activity.[7] Figure 1 tracks the behaviour of the New Zealand equivalent(henceforth called Mix_{KSW}), defined as the ratio of bank loans to the volume of dealers' commercial bills outstanding and bank loans from December 1973 to March 1987.[8] There is a clearly recognizable downward trend in this ratio over the whole period.[9] From a high of approximately .93 the ratio decreases steadily after 1980 to reach a low of approximately .81 in 1986. The secular fall in the KSW ratio reflects the extent of the process of disintermediation which the banking sector of the NZ experienced during that period.[10] By the same token, it underscores the increasing importance of the commercial bill

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[7] KSW interpret the decline of bank loans outstanding relative to commercial paper in the wake of a monetary tightening as a reduction in the supply of bank loans. Coupled with the ensuing downturn of economic activity, this is taken as evidence in favour of a bank lending channel of monetary policy.

[8] Data on the volume of commercial bills outstanding for the post-1987 period appears not to exist. In an earlier version of the paper the total volume of commercial bills outstanding entered into the calculation of the finance mix variable. However, trading banks became a major player in the commercial bill market in 1978. To get a clear indication of whether changes in monetary policy led to a shift in the composition of bank relative to non-bank credit, the level of dealers' commercial bills is employed in the calculation of the finance mix variables. I thank a referee for bringing this point to my attention. For further details the reader is referred to the data appendix.

[9] Between 1976 and 1978 bank loans recovered some of the ground they had lost to commercial bills. The upsurge in bank loans was due to two reasons. First, Securitibank, a major player in the commercial bill market collapsed in 1976. Second, nearly all interest rate controls on deposit rates were removed during that time(only to be reimposed in 1982).

[10] The shift away from bank loans towards commercial bills came about partly as a result of the tight regulation of trading banks in the 1970s and continued through the mid 1980s. Due to the artificially low interest rates on loans in effect during the early 1970s, trading banks were unable to meet the demand for bank-financed credit. The private non-financial sector of the economy responded to the shortage of credit by issuing commercial bills, giving rise to the

market as an alternative competitive source of short-term credit for companies. The dramatic change in the role of open-market credit is also evident in the figures arranged in Table 1. Between 1975 and 1987 the volume of dealers' commercial bills rose from NZ$ 156.9 to 1397.3 million while the volume of bank loans outstanding grew from NZ$1168.3 to 7360.5 million. The change in the amount of finance company loans is even more dramatic. Between 1975 and 1987 finance company loans increased almost twentyfold.

Arguably, the measure of the finance mix proposed by KSW is a narrow one as it does not take account of alternative sources of short-term non-bank credit apart from the commercial paper market.[11,12] As indicated above, an equally important source of short-term finance in New Zealand during the 1970s and 1980s was finance company loans. Therefore, we introduce two additional definitions of the finance mix variable. First, we redefine the finance mix variable as the ratio of bank loans to total debt where total debt is defined as the combined sum of bank loans and finance company loans. Second, we extend the definition of non-bank credit to include both commercial paper and finance company loans. More

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establishment of a burgeoning market for non-bank short-term credit.
A similar shift in the ratio of bank loans to commercial paper is reported for the United States by Calomiris, Himmelberg and Wachtel(1994) who point out that commercial paper increased its share of commercial and industrial loans from 10.6 percent in 1979 to 21.2 percent in 1991.

[11] Oliner and Rudebusch(1996) question the relevance for small firms of changes in the finance mix devised by KSW. They claim that KSW's definition of the aggregate finance mix variable is too narrow as it encompasses only commercial paper as the sole substitute for bank loans. Small firms do not issue much commercial paper but suffer disproportionately in the wake of monetary tightenings.

[12] Another important source of short-term credit is trade credit. However, data on aggregate levels of trade credit outstanding in New Zealand does not appear to exist. Loans from insurance companies and issuing bonds constitute sources of long-term finance for firms. The issue of whether a change in monetary policy causes firms to shift away from long-term financing to short-term financing is worthy of consideration in its own right but beyond the scope of this paper.

specifically, we propose the following alternative definitions of the finance mix variable:

$$Mix_{FC} = \text{bank loans} / (\text{bank loans} + \text{finance company loans})$$

$$Mix_{Total} = \text{bank loans} / (\text{bank loans} + \text{finance company loans} + \text{dealers' com. bills})$$

Figures 2 and 3 track movements in Mix_{FC} and Mix_{Total}. Both figures confirm the secular downward trend of the finance mix variable apparent in Figure 1.[13] The share of bank loans as a source of credit steadily declined at the expense of commercial bills and finance company loans over the respective sample period.

Movements in the interest rate spread can be analysed up to the recent past. Figure 4 gives an indication of the behaviour of the difference between the bank lending rate and the 90-day commercial bill rate from the first quarter of 1974 to the first quarter of 1994. The behaviour of the spread is striking. Through the end of 1985 the spread remains essentially negative. It bottoms out at roughly -12 percent in the third quarter of 1985.

There is a straightforward explanation for why the spread was largely negative until 1984:4. Strict controls on the level of the bank lending rate were the order of the day. These controls kept the bank lending rate artificially low even as the rate of inflation began to rise. At the same time the commercial bill rate was determined by market forces. Consequently, with inflation being in double digits between 1974 and 1984, the nominal yield on commercial bills had to rise to relatively high levels. The large negative spike covers most of 1985 and came about chiefly because of the inertia inherent in the bank lending rate.[14]

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[13] Figures 2 and 3 are based on quarterly observations of bank loans, finance company loans, and dealers' commercial bills. Quarterly data on finance company loans exist for the 1965:1 to 1987:1 period.

[14] Controls on bank lending and deposit interest rates were lifted in July 1984.

After 1985 there is a dramatic reversal in the behaviour of the spread. It shoots up from its nadir, turns positive, changes back to negative once, and then remains positive through the end of the sample period. Indeed, the quarter during which the bank lending rate begins to exceed the bill rate by a sizeable margin, 1987:2, coincides with the taking effect of the Reserve Bank of New Zealand Amendment Act of 1986.

III.B. The Finance Mix, the Interest Rate Spread and the Stance of Monetary Policy.

The empirical investigation of the link between changes in monetary policy on the one hand and changes in the finance mix and the spread on the other necessitates the use of a standard measure of monetary policy. Put simply, we need a directly observable measure of discretionary monetary policy by means of which the monetary authorities signalled changes in the stance of monetary policy during the sample period. The task of selecting these control instruments of monetary policy is somewhat problematical for New Zealand as the framework of monetary policy underwent dramatic changes in the mid-1980s. The preferred choices for capturing the stance of monetary policy are the discount rate, the reserve asset ratio, and the target for cash settlement balances.[15] We choose the discount rate primarily for its importance as a signalling device before the reforms of the mid-1980s but also because it is the only policy instrument for which data spanning the 1975-1994 period exists.

Through publicly announcing a change in the discount rate, the Reserve Bank transmitted its intention to ease or tighten policy to the financial sector of the economy.[16]

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[15] As observations on the finance mix variable end in March 1987 and the operation of the cash settlement balances target system began in March 1986 we can ascertain the effect of changes in the cash target only on the spread.

[16] For instance, in 1972 the government instructed the Reserve Bank to reduce the discount rate in an attempt to stimulate economic growth. See Monetary Policy and the New Zealand Financial System(1992), p. 237.

Banks and non-bank financial institutions alike were spurred into action to change their lending rates and to adjust their portfolio of loans. On the assumption that the Reserve Bank relied on the discount rate as a signalling device during the two subsample periods, the bank lending view would predict that a rise in the discount rate should have led to a fall in the finance mix variable. The Reserve Bank also sought to influence financial conditions by placing direct controls on the composition of assets held by trading banks. A certain fraction of a trading bank's assets had to be held in the form of government securities which paid below-market yields. This ratio scheme was based on the principle that by controlling the flow of funds to the government, the Reserve Bank could in fact influence bank lending to the private sector. In practice, from 1973 to early 1985 the Reserve Bank attempted to ease or tighten monetary policy in part by varying reserve asset ratios.[17] For example, to keep banks from expanding their loan portfolio, the Reserve Bank would increase the reserve asset ratios. Thus, changes in the reserve asset ratio should be inversely related to the finance mix variable.

Based on monthly observations, the findings of Table 2 do not provide much support for either prediction of the lending view.[18] When changes in the Mix_{KSW} variable are regressed

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[17] Separate reserve asset ratios applied to demand and time deposits. There is no universal agreement on the adequacy of reserve asset ratios as a tool of monetary policy. Some economists would argue that changes in these ratios were implemented for the most part with a view towards funding increases in government spending rather than signalling a change in the stance of monetary policy. For a more detailed discussion of this point and a broad discussion of the conduct of monetary policy in New Zealand during the early sample periods, consult "Monetary Policy in New Zealand" in Financial Policy Reform, 1983, Reserve Bank of New Zealand.

[18] The results of Table 1 are based on Granger causality tests. Granger causality implies certain restrictions on the way lagged values of a variable enter the regression. These exclusion restrictions are tested by means of F-tests. Neutrality, on the other hand, implies that the coefficients of the sum of the lagged variables(such as the finance mix) add up to zero. The presence of neutrality is tested by means of t-tests. See Stock and Watson(1989) for further

on lagged changes in the discount rate over the 1975-1987 sample period, we find that lagged changes in the discount rate predict changes in the finance mix fairly well, as indicated by the low value of the F-test(.01).[19,20] However, changes in the discount rate appear to have had no observable secular effect on the finance mix variable as the sum of coefficients on lagged changes in the discount rate is not significantly different from zero. The shorter subsample period through 1984:12 yields a similar result for the t-test of the sum of the coefficients. In addition, there is weaker evidence of changes in the discount rate leading changes in the finance mix variable.[21] Over the same sample period changes in the reserve asset ratio appear to have no predictive content for the finance mix variable either.[22] The coefficient on the t-test for non-neutral effects is significant at the 3 percent level, but it bears the wrong sign. Tests for asymmetry in the response pattern of the finance mix and an examination of the impulse responses of the finance were equally fruitless. A summary of the findings based on these tests can be found in the appendix.

The effect of changes in the discount rate, the reserve asset ratio, and the target for

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details.

[19] Cointegration tests were performed to see whether the finance mix variable and the discount rate shared a common long-term trend. There is no indication of such a relationship between these two variables.

[20] We report only the results based on Mix_{KSW}, which is based on monthly observations, rather than Mix_{FC} and Mix_{Total} both of which are constructed from quarterly observations.

[21] In late December 1984 the determination of the discount rate changed. The Reserve Bank announced that the discount margin, the penalty for discounting securities, would be set at a certain level above prevailing market rates. Since then the discount margin has varied between .9 and 1.5 percent. Prior to the announcement, the Reserve Bank set the level of the discount rate.

[22] The reserve asset ratio scheme was in effect from June 1973 to February 1985. Hence the effect of changes in the reserve asset ratio on the finance mix could be examined only for the period through 1984.

cash settlement balances on the spread is reported in Table 3.[23] For the discount rate we distinguish among three separate sample periods: 1975:2-1994:1, 1975:2-1984:4, and 1985:1-1994:1. The first interval represents the whole sample period while the latter two represent subsample intervals. The subperiods are chosen because the bank lending rate was at times administered by the monetary authorities prior to 1985. For the whole period and the post-1984 period there is clear evidence that changes in the discount rate had substantial predictive ability for the spread: the exclusion restrictions are rejected at the 1 percent level; for the 1975:2-1984:4 interval the evidence is somewhat weaker as the p-values of the F-test rise to .05 and .08, respectively. Notice though that changes in the discount rate appeared to have no discernible non-neutral effects on the spread over the whole sample period or the 1975:2-1984:4 period. In marked contrast, the spread responded positively and with force over a two-year period to movements in the discount rate during the 1985:1-1994:1 interval when both the bank lending rate and the commercial bill rate were determined by market forces.

For the reserve asset ratio, the primary instrument in the operation of monetary policy between 1975 and 1984, we observe no consistent pattern linking changes in the instrument variable to contemporaneous or subsequent changes in the spread. In more recent times, the operation of monetary policy has centered chiefly on the announced targets for cash settlement balances. A tightening of monetary policy occurs when the target is lowered.[24] The last column reports the effect of changes in the cash settlement balances target on the spread. There is no statistical evidence of a linkage.

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[23] The bank lending rate series is available only on a quarterly basis. Hence the results reported in Table 3 are based on quarterly data.

[24] Notice that the expected sign on the coefficient of the t-test is negative in this case.

On the whole, these findings suggest that the important linkage between changes in monetary policy and the information variables which figure prominently in the bank lending view is not visible in the data. The composition of financial intermediation, measured by the ratio of bank loans to the combined total of bank loans and commercial bills, was not markedly changed by variations in the settings of the instruments of monetary policy. As regards the response pattern of the price variable, the spread, the picture is not much different. With only one exception, changes in the instruments of monetary policy did not have the assumed short-run lasting effect on the spread.

III.C. The Finance Mixes and Aggregate Economic Activity.

Although the finance mix variable and the spread do not exhibit a clear-cut systematic relationship to the monetary policy instruments, it is far from certain that there is no direct link between changes in the stance of monetary policy and aggregate real economic activity. The possibility still exists that changes in the finance mix or the spread affect the real sector of the economy in some systematic fashion.[25] This section reports the statistical findings of Granger causality tests and neutrality tests which tie changes in the finance mix variable to changes in a number of selected economic indicators for NZ. If the model of Section II is correct, we should expect the finance mix variable to be positively related to changes in the level of economic activity.

III.C.1. The KSW-Finance Mix:

The predictive content for future economic activity of changes in the ratio of bank loans to the combined total of commercial bills and bank loans, the finance mix variable proposed by KSW, is evaluated by means of a simple bivariate Granger causality test. The

[25] Monetary policy is executed at times by "moral suasion" rather than adjusting interest rates or other policy levers.

results of Table 4 give an indication of the explanatory power of Mix_{KSW} for a series of measures of aggregate economic activity over the 1979:1-1987:1 period. Of the nine NZ economic indicators shown in the table, only the Total Stocks to Sales ratio bears a clear-cut systematic relationship with the mix variable. The fact that the Total Stocks to Sales ratio and the finance mix are positively related is consistent with the notion that firms' inventories decline faster than their cash flows in the wake of a contractionary shock.[26] Of the three variables that are cointegrated with the finance mix only the error correction term in the bivariate regression of Production in the Manufacturing Sector is negative and statistically significant at the 5 percent level. Apparently, temporary deviations from the long-run relationship between the level of Production and the finance mix variable account for subsequent movements in Production in the Manufacturing Sector. It is of some interest to note that none of the selected measures of investment activity - Stocks of Finished Goods, Stocks of Materials or Additions to Fixed Assets - was responsive to changes in the finance mix. It seems difficult to reconcile this finding with the view that the ability of firms to finance inventories or capital spending weakens as bank credit becomes more scarce.

To see whether there exists any feedback between economic activity and the finance mix we also ran bivariate regressions with the finance mix variable serving as the dependent variable. The significance levels of these alternative F-tests and t-tests are given in parentheses in the respective column. Again, in most cases there is no evidence of a systematic relationship between economic activity and the finance mix variable. Notice

[26] One could argue, as Gertler and Gilchrist(1993) do, that this argument applies only to small firms. Larger firms may be able to carry stocks as their sales fall because they face less stringent borrowing constraints than small firms as monetary policy tightens. Indeed, they show that the stocks to sales ratio of small firms falls in the wake of a monetary tightening while that of large firms actually rises for a period.

though that in two cases, Sales and Other Income and Production, there is evidence of reverse and bidirectional causality, respectively.

Taken altogether, the findings of Table 4 do not lend much support to the view that changes in the finance mix precede changes in economic activity. Even if there is evidence of a link between the finance mix variable and economic activity, as in the case of Production, there is also feedback from economic activity to the finance mix variable. The uni-directional relationship between the volume of bank loans relative to the volume of commercial bills and the pace of economic activity - one of the cornerstones of the bank lending view - is clearly absent from the data.

III.C.2. The Alternative Finance Mixes.

In part A of this section the descriptive analysis of the composition of financial intermediation revealed that finance company loans were just as important a source of credit as commercial bills in New Zealand during the 1970s and 1980s. In this sub-section we construct two alternative definitions of the finance mix variable. The first alternative finance variable simply replaces the volume of commercial bills which appears in Mix_{KSW} with the total volume of finance company loans outstanding. This new finance mix variable represents the ratio of bank loans to the combined sum of bank loans and finance company loans and is labelled Mix_{FC}. The other alternative definition is more comprehensive than either Mix_{KSW} or Mix_{FC} and is labelled Mix_{TOTAL}. It represents the ratio of bank loans to the combined sum of bank loans, finance company loans, and commercial bills.

Once again bivariate Granger causality tests and neutrality tests were carried out to assess the impact of the alternative finance mixes on economic activity. [27] The results are

[27]The results of the cointegration tests appear in the appendix in Tables A4 and A5, respectively.

contained in Table 5. Several points are noteworthy. First, the Total Stocks to Sales ratio is sensitive to changes in the Mix_{TOTAL} but not to changes in the Mix_{FC} variable. This implies that relative to bank loans changes in the volume of dealers' commercial bills but not finance company loans had some material effect on the Stocks to Sales ratio. Second, irrespective of the definition of the finance mix variable, the same three cointegrating relationships prevail. It is apparent though that for Sales and Other Income and Bankruptcies the cointegrating relationship is tighter for both Mix_{FC} and Mix_{TOTAL} compared to Mix_{KSW}. The coefficients on the respective error correction terms are significant at the 5 percent level or below. Third, Stocks of Materials react to changes in both Mix_{FC} and Mix_{TOTAL}. However, the sign of the coefficient on the t-test is unexpectedly negative. Finally, evidence of bidirectional causality exists only for Production.[28]

A more powerful test of the importance of finance company loans relative to bank loans is made possible by drawing on quarterly data on aggregate economic activity from the database of the Reserve Bank's Model XII econometric model of the New Zealand economy. The sample period now extends from 1967:2 to 1987:1. Ten aggregate economic indicators, ranging from Private Durables Consumption to Capacity Utilisation, are considered. The results of the bivariate regressions of the indicators on the Mix_{FC} variable appear in Table 6.[29] Of the cointegrated variables, only Exports and Imports of Goods are weakly related to the Mix_{FC} variable over the 20-year period. [30] The remaining indicators show no lasting response to changes in the ratio of bank loans to the sum of bank loans and finance company loans.

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[28] The numbers in parentheses indicate the marginal significance levels of causality tests in which the mix variables served as the dependent variable.

[29] See the appendix for a summary of the unit root and cointegration tests.

[30] The relationship between Unemployment and Mix_{FC} is marked by reverse causality.

All in all, the findings reported in Table 5 and Table 6 fall far short of uncovering unambiguous proof of the existence of a tight uni-directional relationship between the finance mixes and the pace of economic activity. Neither the data drawn from the manufacturing and building sectors of the NZ economy nor the macroeconomic variables drawn from the Reserve Bank's database exhibit the systematic relationship to the finance mixes emphasised by the bank lending view. Perhaps most damaging for the bank lending view are the results of Table 6 which imply that changes in bank loans relative to finance company loans had no material consequences for aggregate economic activity over a 20 year-period.

III.D. The Interest Rate Spread and Economic Activity.

According to the model of Section II, the existence of a bank lending channel of monetary policy can also be studied by examining changes in the relative price of credit and the ensuing consequences for the pace of economic activity. As in part C of this section, we examine movements in a number of quarterly economic indicators from two different data sets to see whether these movements can be reconciled with the predictions of the bank lending view.

The findings based on the economic indicators measuring activity in the manufacturing and building sectors of the New Zealand economy are arranged in Table 7.[31] They show that changes in the relative cost of credit have neither predictive power for nor non-neutral effects on economic activity over the whole sample period which extends from 1979:1 to 1994:1. For the 1986:1-1994:1 interval, changes in the difference between the bank

[31] To preserve visual clarity, we omit the findings based on the test for reverse causality. These findings do not add much to the discussion. They are available upon request from the author.

lending rate and the commercial bill rate do not capture changes in the level of most economic indicators either.[32] Only two economic indicators, Additions to Fixed Assets and Stocks of Materials, respond mutely to changes in the spread. In both cases, the sum of the coefficients bears the expected sign and is statistically significant at the 10 percent level.

The results of the examination of the effect of changes in the spread on the indicators of economic activity drawn from the Reserve Bank's database are reported in Table 8. We find that all but two economic indicators do not move in lock-step with changes in the cost of bank relative to open-market credit during the 1975:2-1994:1 period. Only Total Stocks and Commercial Stocks appear to be somewhat sensitive to changes in the spread over the whole sample period. Prior to 1985, changes in the spread have a more pronounced non-neutral effect on economic activity. Six of the ten indicators respond to movements in the spread during this period. However, while statistically significant at the 10 percent level, the response of four indicators - Private Durables Consumption, Private Consumption, Exports of Goods, and Total Sales - is not consistent with the prediction of the bank lending view as indicated by the positive sign on the t-test of the sum of the coefficients. For the subperiod starting in 1986, changes in the spread have substantial predictive power for and a lasting effect on Imports of Goods. Both the F-test and t-test yield p-values at the 1 percent level of significance. The spread also seems to have a marginal non-neutral effect on changes in Registered Unemployment during the 1986:1994 interval. For the remaining indicators, however, the spread has neither predictive power nor a lasting impact.

On the whole, these results cast doubt on the proposition that variations in the

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[32] Notice that four lags of the rate of inflation now enter the VAR. The inclusion of the rate of inflation eliminates the predictive power of the spread for some economic indicators in a bivariate VAR. Unfortunately, including the rate of inflation reduces the number of degrees of freedom and rules out consideration of the subsample period before 1985.

difference between the bank lending rate and the commercial bill rate signal impending changes in real activity. The results reported add weight to the argument that changes in the observable relative price of credit - the simple spread - are " only one element among many dimensions that together constitute the relevant price as seen by both borrowers and lenders".[33]

IV. Conclusion.

Focusing primarily on the 1970s and 1980s, the examination of a possible linkage between conditions in financial markets and real activity in New Zealand has produced evidence which is not sympathetic to the view that a potent bank lending channel of monetary policy existed during this period. This assessment is based on the observation that changes in various indicators of monetary policy did not systematically alter either the composition or price of bank credit relative to non-bank credit as envisaged by the bank lending view. In addition, the empirical results reported in this paper show that the vast majority of the selected economic indicators were not responsive to changes in either the quantity-based or price-based indicators of credit conditions emphasised by the bank lending view.

The fact that the empirical evidence covering the pre-1985 period also fails to support the bank lending view may come as a surprise. A priori one would expect the lending channel of monetary policy to be far more important in a highly regulated financial environment characterised by stringent reserve requirements for trading banks. After all, this tool allows the monetary authorities to affect the size of the liabilities of the banking sector and the composition of banks' assets.[34]

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[33] Friedman and Kuttner (1993), p. 195.

[34] Of course, the real crux of the matter is to what extent the existence of reserve requirements impinged on the ability of trading banks to create loans. There is some doubt that

The evidence against the operation of a material bank lending channel in the transmission of monetary policy is based on aggregate balance sheet data of financial intermediaries. Further research could focus on related aspects of the bank lending view, such as the significance of off-balance sheet activities of banks. For instance, the case for the existence of a bank lending channel of monetary policy would be strengthened if changes in bank loans adjusted for the existence of loan commitments could be linked to changes in the pace of economic activity. A tightening in monetary policy should lead to a fall in bank loans not made under commitment but should leave loans made under commitment unaffected (Morgan(1993)).

Although we find essentially no support for the bank lending view in our examination of NZ data, we do not rule out the operation of a "broader credit channel" of monetary policy.[35] Downplaying the role of banks, this strand of the credit channel literature ties changes in aggregate spending to changes in the cost premium for external relative to internal finance. One particular issue which merits consideration in this context is the extent to which a monetary contraction prevents firms of low net worth from tapping external sources of credit. New insights into the monetary causes of the business cycle may also be garnered by studying the balance sheet conditions of individual firms.[36]

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changes in the reserve asset ratios were an effective instrument of monetary policy over the 1973-85 period. Recall that the KSW mix variable bears no systematic relationship to changes in the lagged reserve asset ratio over this period. But in view of the fact that the Reserve Bank also imposed explicit controls on the growth rate of bank loans at various points in time during the first sub-sample period, one would tend to think that the lending channel of monetary policy should have been stronger in the first sub-sample period relative to the subsequent period.

[35] Oliner and Rudebusch(1994).

[36] See Bernanke, Gertler, and Gilchrist(1993).

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Figure 1: Mix = Loans/(Loans + Dealers Commercial Bills)

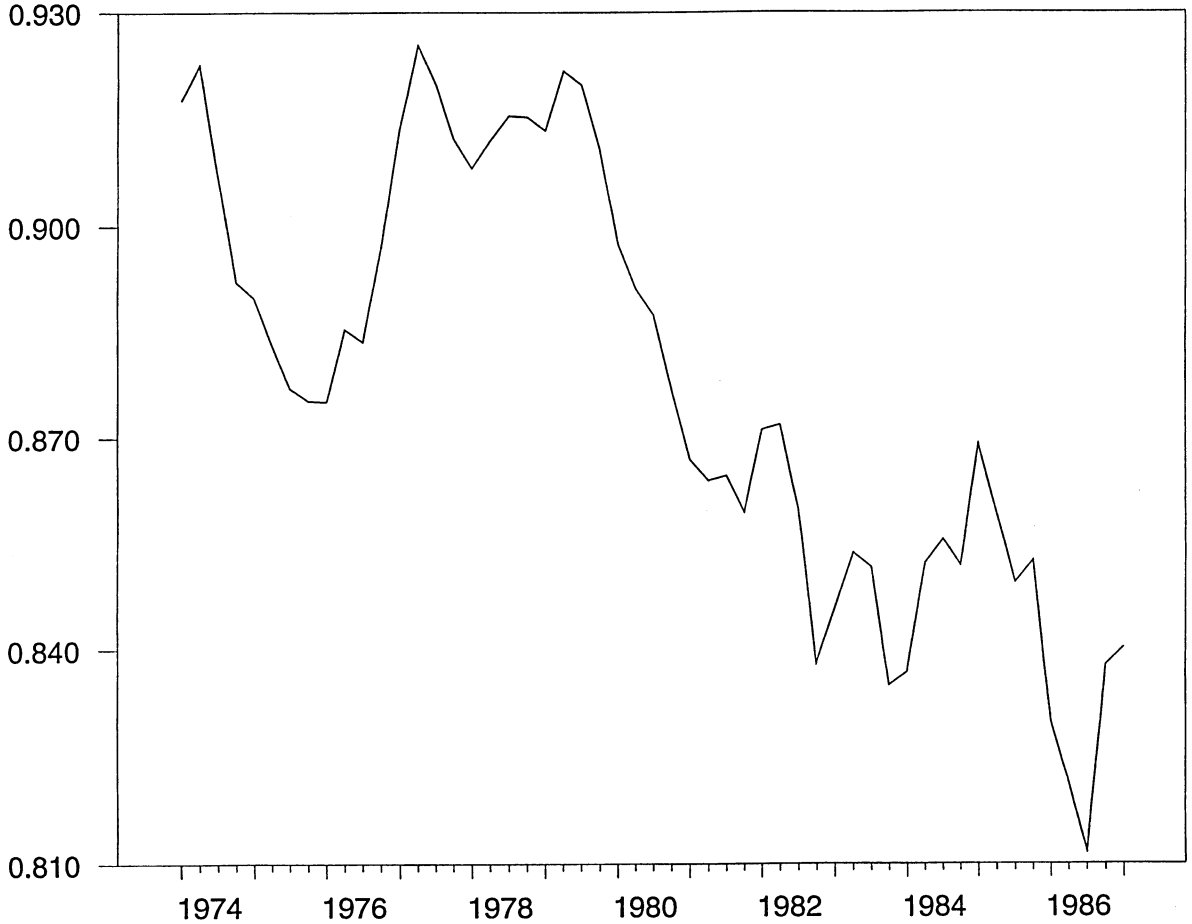

Figure 2: Mix = Loans/(Loans + FC Loans)

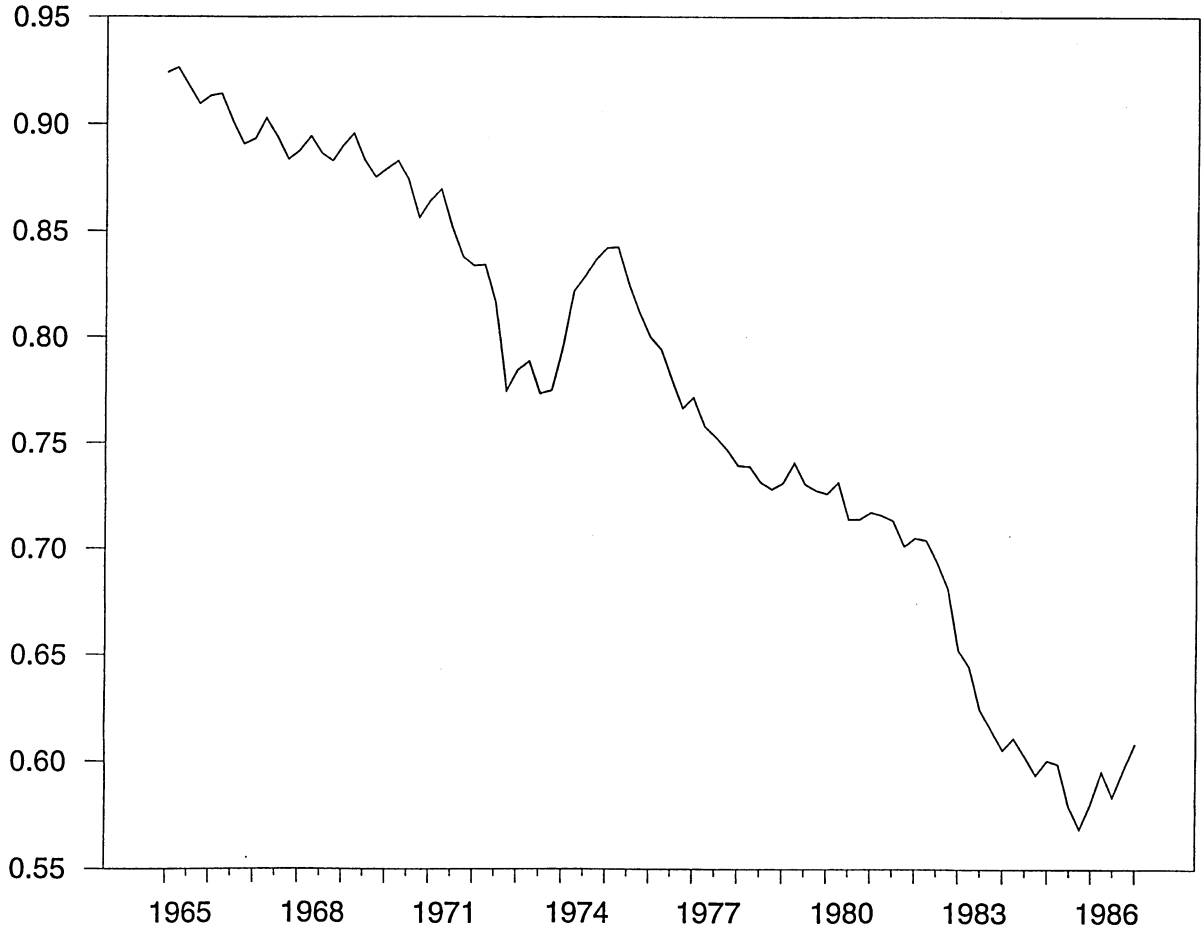

Figure 3: Mix=Loans/(Loans + FC Loans + Dealers' Commercial Bills)

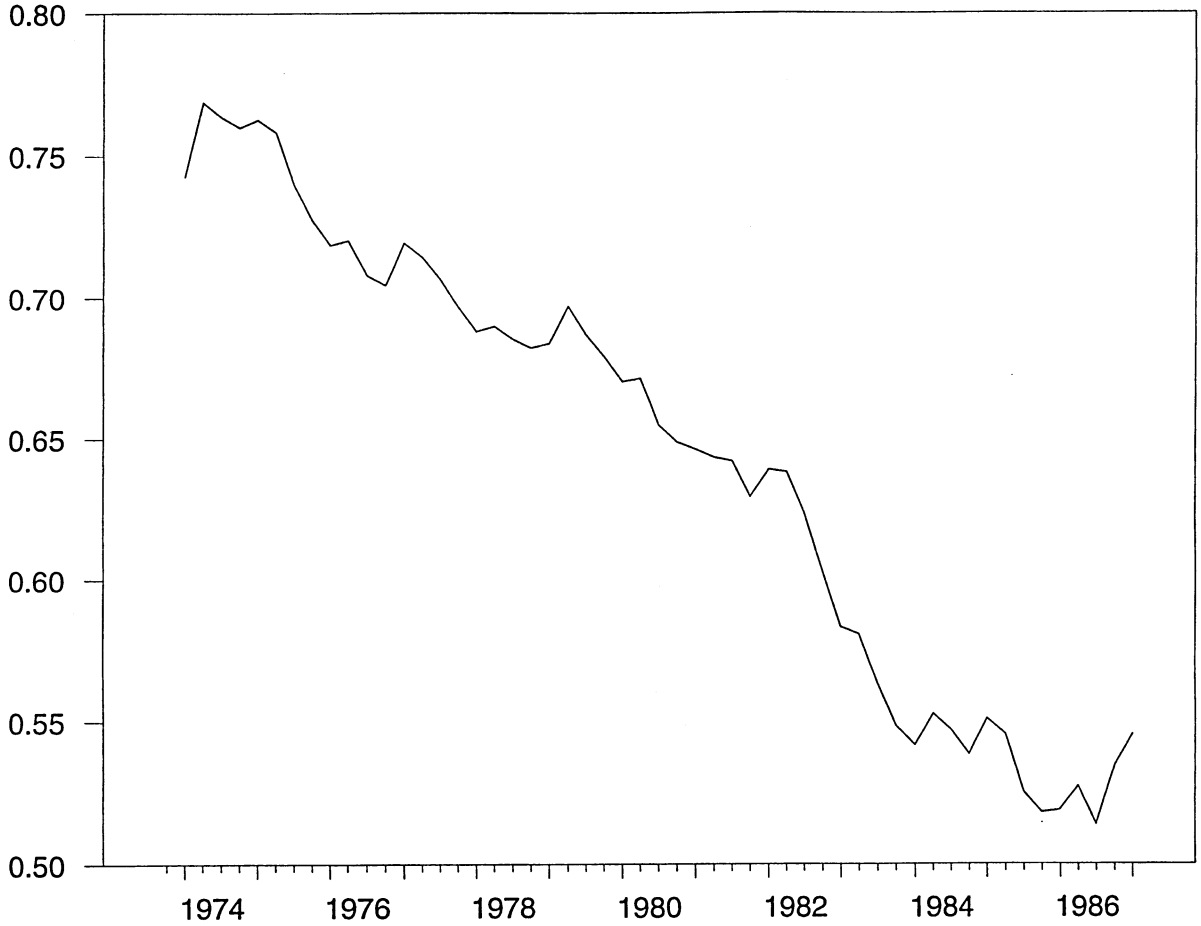

Figure 4: Spread = Bank Lending Rate - 90-day CB Rate

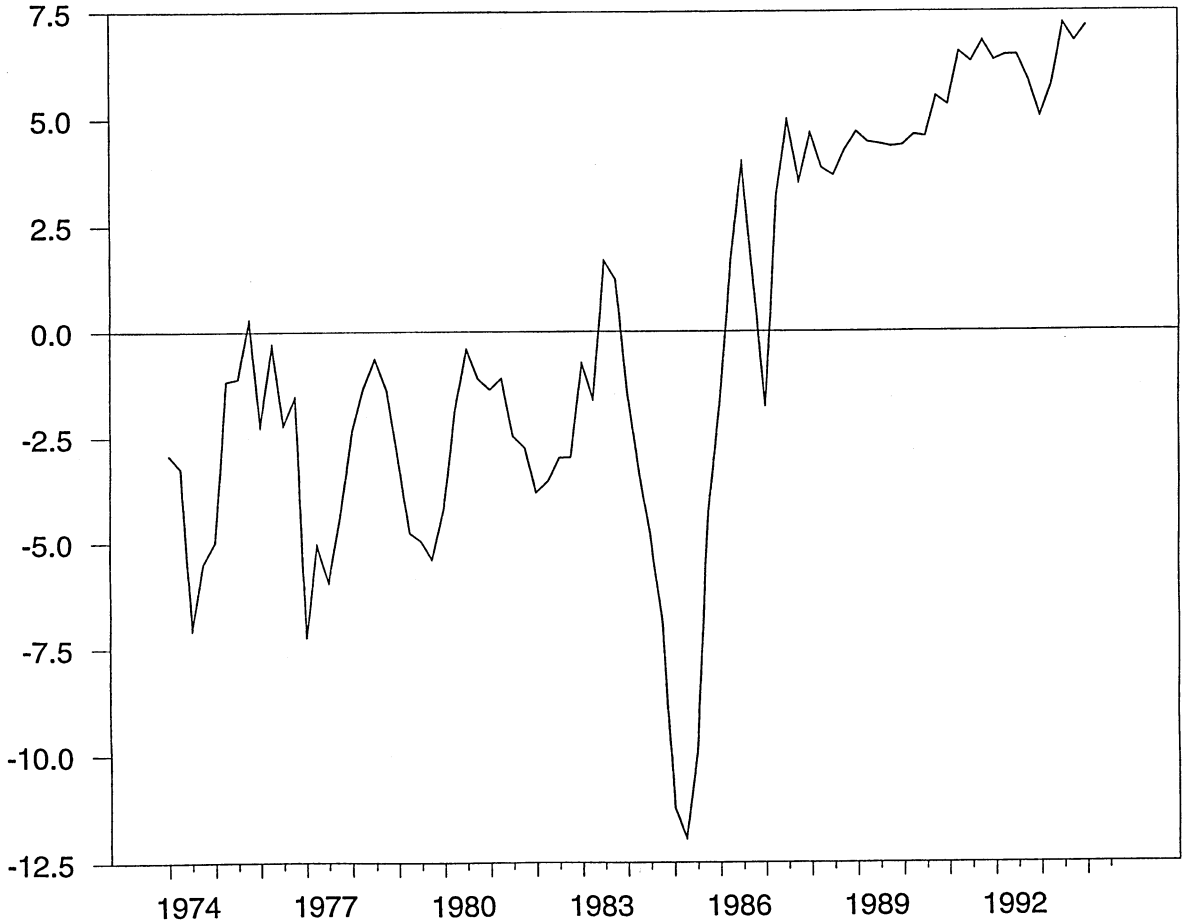

Table 1:
A Comparison of Nominal Magnitudes for Selected Years: Bank Loans, Finance Company Loans, and Dealers' Commercial Bills.

Year	Bank Loans	Finance Com. Loans	Dealers' Com. Bills
1965	472.8	38.0	--
1970	641.7	93.6	--
1975	1168.3	238.5	156.9
1980	2529.9	978.3	319.5
1985	4945.2	3487.6	822.3
1987	7360.5	4734.1	1397.3

Source: Author's own calculation based on data drawn from INFOS and various issues of the Reserve Bank of New Zealand Bulletin. The figures represent yearly averages calculated from monthly observations. All figures are expressed in millions of current NZ dollars. The three entries for 1987 represent the respective figure for the March quarter(i.e not for the whole year).

Table 2:
The Effect of Changes in the Discount Rate on the Finance Mix Variable
Mix $_{KSW}$ = Bank Loans / (Bank Loans + Dealers' Commercial Bills).
Monthly Data 1974:7 - 1984:12.

Instrument			
Lags / n	Discount Rate	Reserve Asset Ratio	Discount Rate(87:3)
6	.02/.22^{+}	.13/.03^{+}	.01/.80^{+}
12	.12/.96^{+}	.67/.13^{+}	.01/.69^{+}

Note:
a. The hypothesis that the discount rate contains a unit root cannot be rejected at the 10 percent level. In contrast, for the reserve asset ratio the null hypothesis can be rejected at the 10 percent level. In addition, the hypothesis that the finance mix variable and the discount rate are not cointegrated cannot be rejected at the 10 percent level.
b. The following equation was estimated:

$$\Delta Mix_t = \kappa_0 + \kappa_1 time + \sum_{j=1}^{n} \gamma_j \Delta Mix_{t-j} + \sum_{j=1}^{n} \theta_j \Delta I_{t-j} + z_t$$

where
ΔMix represents the change in the KSW Mix variable.
ΔI represents the change in the instrument.

c. The reserve asset ratio is defined as the share of demand deposits which had to be held in the form of deposits at the Reserve Bank, holdings of notes, and all forms of government securities. Similar empirical results are obtained for a weighted average of the reserve asset ratios applicable to demand and time deposits.

Table 3: The Effect of Changes in the Policy Instruments on the Spread: Quarterly Data.

		Instrument		
Sample Period	Lags / n	Discount Rate	Reserve Asset Ratio	Cash Settlement Balances Target #
1975:2-1994:1	4	.01/.60^{-}	------	------
1976:2-1994:1	8	.01/.44^{+}	------	------
1975:2-1984:4	4	.05/.51^{-}	.03/.31^{-}	------
1975:2-1984:4	8	.08/.71^{-}	.37/.24^{-}	------
1985:1-1994:1	4	.01/.15^{+}	-------	.57/.22^{-}
1985:1-1994:1	8	.01/.04^{+}	-------	.36/.24^{-}

Note:

a. The results are based on estimating the following equation:

$$\Delta \text{Spread}_t = \kappa_0 + \kappa_1 \text{time} + \sum_{j=1}^{n} \gamma_j \Delta \text{Spread}_{t-j} + \sum_{j=0}^{n} \theta_j \Delta I_{t-j} + z_t$$

where the Spread is defined as the difference between the Bank Lending Rate and the 90-day Commercial Bill Rate. The Bank Lending Rate is a quarterly weighted average of term loan interest rates and overdraft interest rates. I represents the Discount Rate , the Reserve Asset Ratio on Demand Deposits or the Target for Cash Settlement Balances.

b. For the whole sample period and the 1985:1-1994:1 subperiod we also included a dummy variable. D=1 for 1985:1-1985:3 and D=0 otherwise. The dummy was added to capture the effect of the abrupt drop in the spread caused by the financial sector reforms . In both regreessions the coefficient of the dummy variable is negative and statistically significant at the 5 percent level.

c. The contemporaneous value of the change in the instrument is included because market interest rates react swiftly to changes in the instrument. For a similar view, see Thornton(1994).

The regression results reported in this column are based on the 1987:2-1994:1 period. In view of the short sample period only 6 lagged(instead of 8) changes of the spread and the Cash Settlement Balances Target appear in the regression.

Table 4:
Quarterly Data. **Mix_{KSW} = Bank Loans/ (Bank Loans + Dealers' Com. Bills Outstanding)**
F-Test of the Explanatory Power of Mix_{KSW}.
t-Test of the Sum of the Coefficients of Mix_{KSW}.

Dependent Variable	Mix_{KSW}[a] Whole Period 79:1-87:1	u_{t-1}
Total Stocks to Sales Ratio	$.01/.01^{+}$ $(.12/.10^{-})$	
Sales and Other Income	$.28/.32^{-}$ $(.04/.01^{+})$	$.27^{-}$ $(.21^{-})$
Additions to Fixed Assets	$.12/.94^{+}$ $(.18/.24^{-})$	
Stocks of Finished Goods	$.20/.29^{+}$ $(.95/.84^{-})$	
Bankruptcies	$.41/.39^{+}$ $(.51/.18^{-})$	$.16^{-}$ $(.19^{-})$
Stock of Materials	$.13/.08^{+}$ $(.03/.38^{-})$	
Building Work Put in Place: Commercial Buildings	$.23/.72^{-}$ $(.37/.70^{+})$	
Building Work Put in Place:Factories	$.95/.87^{+}$ $(.07/.15^{+})$	
Production	$.21/.32^{+}$ $(.12/.01^{+})$	$.01^{-}$ $(.28^{-})$

[a] The sample period for Production is 78:3 87:1. For Bankruptcies it is 77:2 87:1.
Each variable is regressed on four lags of itself and four lags of the mix variable:

$$\Delta y_t = c + \sum_{j=1}^{4} \gamma_j \Delta y_{t-j} + \sum_{j=1}^{4} \delta_j \Delta Mix_{t-j} + u_t$$

Except for the Total Stocks to Sales Ratio all variables including the mix variables have been differenced. The bivariate regression includes the error correction term if a cointegration relationship exists between the mix variable and the economic indicator. All regressions except the one for Production also contain three seasonal dummies.
Note: The first entry in the second column of the table is the respective level of significance at which the null hypothesis of the coefficients of the four lags of the mix being zero can be rejected(F-test). The second entry represents the level of significance at which the null hypothesis that the coefficients of the mix **sum to zero** can be rejected(t-test). The superscript(+,-) indicates the sign of the sum.
The entry in the third colum is the marginal significance level at which the null hypothesis that the coefficient on the error correction term equals zero can be rejected.
All variables are in logs. All nominal variables have been deflated by the Producer Price Index. All variables except bankruptcies and building work put in place refer to the manufacturing sector of the New Zealand economy. All data series were taken from INFOS(See the data appendix for a description of the data and its sources).
The entries in parantheses represent the p-values of the F-test and t-test for the regression in which the mix variable serves as the **dependent** variable:

$$\Delta Mix_t = c + \sum_{j=1}^{4} \gamma_j \Delta y_{t-j} + \sum_{j=1}^{4} \delta_j \Delta Mix_{t-j} + u_t$$

Table 5: Alternative Definitions of the Finance Mix Variable(Quarterly Data).

Dependent Variable	Mix_{FC} 79:1 87:1		u_{t-1}	Mix_{TOTAL} 79:1 87:1		u_{t-1}
Total Stocks to Sales Ratio	$.42/.62^{+}$	$(.11/.25^{-})$		$.02/.02^{+}$	$(.08/.14^{-})$	
Sales and other Income	$.01/.09^{+}$	$(.25/.18^{+})$	$.01^{-}$ $(.25^{-})$	$.01/.47^{+}$	$(.27/.11^{+})$	$.05^{-}$ $(.35^{-})$
Additions to Fixed Assets	$.15/.10^{+}$	$(.34/.38^{-})$		$.68/.25^{+}$	$(.20/.21^{-})$	
Stock of Finished Goods	$.46/.38^{+}$	$(.86/.74^{-})$		$.28/.17^{+}$	$(.96/.58^{+})$	
Bankruptcies	$.21/.15^{-}$	$(.44/.26^{-})$	$.04^{-}$ $(.25^{-})$	$.06/.22^{+}$	$(.88/.39^{-})$	$.05^{-}$ $(.55^{-})$
Stock of Materials	$.02/.01^{-}$	$(.54/.18^{-})$		$.10/.08^{-}$	$(.15/.27^{-})$	
Building Work Put in Place: Commercial Buildings	$.83/.90^{+}$	$(.18/.08^{+})$		$.33/.74^{-}$	$(.12/.09^{+})$	
Building Work Put in Place: Factories	$.63/.59^{-}$	$(.92/.91^{-})$		$.98/.84^{-}$	$(.47/.27^{-})$	
Production	$.01/.68^{-}$	$(.01/.01^{+})$	$.01^{-}$ $(.01^{-})$	$.01/.31^{+}$	$(.01/.01^{+})$	$.01^{-}$ $(.01^{+})$

Note:
Mix_{FC} = Bank Loans/(Bank Loans + Finance Company Loans) Mix_{Total} = Bank Loans / (Bank Loans + Finance Company Loans + Dealers' Commercial Bills)
The dependent variable is regressed on four lags of itself and four lags of the mix variable:

$$\Delta y_t = c + \sum_{j=1}^{4} \gamma_j \Delta y_{t-j} + \sum_{j=1}^{4} \delta_j \Delta Mix_{t-j} + w_t$$

Except for the Total Stocks to Sales Ratio all variables including the mix variables have been differenced. The bivariate regression includes the error correction term u_{t-1} if a cointegration relationship exists between the mix variable and the economic indicator. With the exception of the regression in which Production serves as the dependent variable all regressions also contain three seasonal dummies.
The entries in parantheses represent the p-values of the F-test and t-test for the regression in which the mix variable serves as the **dependent** variable.

$$\Delta Mix_t = c + \sum_{j=1}^{4} \gamma_j \Delta y_{t-j} + \sum_{j=1}^{4} \delta_j \Delta Mix_{t-j} + v_t$$

Table 6:
Indicators of Aggregate Economic Activity.
Quarterly Data. **Mix_{FC} = Bank Loans/ (Bank Loans + Finance Company Loans)**
F-Test of the Explanatory Power of Mix_{FC}.
t-Test of the Sum of the Coefficients of Mix_{FC}.
1967:2 - 1987:1

Variable	Mix_{FC}	u_{t-1}
Private Durables Consumption	$.62/.32^{-}$ $(.50/.41^{+})$	
Private Consumption	$.83/.24^{-}$ $(.01/.19^{+})$	
Private Investment Dwellings	$.28/.88^{-}$ $(.13/.66^{+})$	
Total Stocks	$.04/.64^{+}$ $(.03/.61^{+})$	
Commercial Stocks	$.04/.44^{+}$ $(.02/.62^{+})$	
Exports of Goods	$.20/.13^{+}$ $(.48/.32^{+})$	$.06^{-}$ $(.16^{-})$
Imports of Goods	$.48/.78^{-}$ $(.05/.55^{+})$	$.10^{-}$ $(.79^{-})$
Total Sales	$.85/.48^{-}$ $(.04/.54^{+})$	
Registered Unemployment	$.17/.41^{+}$ $(.58/.64^{+})$	$.49^{-}$ $(.06^{-})$
Capacity Utilisation	$.71/.17^{-}$ $(.84/.14^{+})$	

Note:
The dependent variable is regressed on eight lags of itself and eight lags of the mix variable:

$$\Delta y_t = c + \sum_{j=1}^{8} \gamma_j \Delta y_{t-j} + \sum_{j=1}^{8} \delta_j \Delta Mix_{t-j} + w_t$$

Except for capacity utilisation all variables including the mix variables have been differenced. All regressions contain three seasonal dummies. The bivariate regression includes the error correction term u_{t-1} if a cointegration relationship exists between the mix variable and the economic indicator.
The entries in parantheses represent the p-values of the F-test and t-test for the regression in which the mix variable serves as the **dependent** variable.

$$\Delta Mix_t = c + \sum_{j=1}^{8} \gamma_j \Delta y_{t-j} + \sum_{j=1}^{8} \delta_j \Delta Mix_{t-j} + v_t$$

Table 7:
Quarterly Data. **Spread = Bank Lending Rate - 90-Day Commercial Bill Rate**
F-Test of the Explanatory Power of the Spread.
t-Test of the Sum of the Coefficients of the Spread.

Variable	ΔSpread 1979:1-1994:1	ΔSpread 1986:1-1994:1
Total Stocks to Sales Ratio	.73/.29^{-}	.92/.60^{-}
Sales and Other Income	.72/.36^{+}	.48/.34^{+}
Additions to Fixed Assets	.34/.14^{-}	.29/.09^{-}
Stocks of Finished Goods	.30/.43^{-}	.52/.51^{-}
Bankruptcies	.77/.47^{+}	.26/.20^{+}
Stock of Materials	.30/.14^{-}	.12/.08^{-}
Building Work Put in Place: Commercial Buildings	.47/.95^{+}	.98/.73^{-}
Building Work Put in Place: Factories	.57/.55^{-}	.84/.99^{-}
Production	.90/.51^{+}	.34/.41^{+}

Note:
The dependent variable is regressed on four lags of itself, four lags of the rate of inflation, and four lags of the change in the spread variable:

$$\Delta y_t = c + \sum_{j=1}^{4} \gamma_j \Delta y_{t-j} + \sum_{j=1}^{4} o_j \Delta \pi_{t-j} + \sum_{j=1}^{4} \delta_j \Delta \mathrm{Spread}_{t-j} + w_t$$

All regressions except the one for Production contain three seasonal dummies.

Table 8:
Indicators of Aggregate Economic Activity.
Quarterly Data. **Spread = Bank Lending Rate - 90-Day Commercial Bill Rate**
F-Test of the Explanatory Power of the Spread.
t-Test of the Sum of the Coefficients of the Spread.

Variable	ΔSpread 1975:2-1994:1	ΔSpread 1975:2-1984:4	ΔSpread 1986:1-1994:1
Private Durables Consumption	.85/.37^{+}	.46/.09^{+}	.44/.91^{+}
Private Consumption	.44/.24^{+}	.23/.06^{+}	.61/.39^{+}
Private Investment Dwellings	.20/.62^{+}	.14/.15^{+}	.76/.45^{-}
Total Stocks	.25/.05^{-}	.18/.04^{-}	.25/.68^{+}
Commercial Stocks	.39/.09^{-}	.33/.07^{-}	.64/.66^{+}
Exports of Goods	.14/.52^{+}	.06/.04^{+}	.67/.26^{+}
Imports of Goods	.22/.75^{-}	.14/.68^{+}	.01/.01^{-}
Total Sales	.79/.66^{+}	.31/.10^{+}	.44/.61^{+}
Registered Unemployment	.83/.92^{+}	.27/.32^{-}	.19/.07^{+}
Capacity Utilisation	.22/.93^{+}	.67/.32^{+}	.23/.32^{-}

Note:
The dependent variable is regressed on four lags of itself, four lags of the rate of inflation, and four lags of the change in the spread variable:

$$\Delta y_t = c + \sum_{j=1}^{4} \gamma_j \Delta y_{t-j} + \sum_{j=1}^{4} o_j \Delta \pi_{t-j} + \sum_{j=1}^{4} \delta_j \Delta Spread_{t-j} + w_t$$

Except for capacity utilisation all variables have been differenced. All regressions contain three seasonal dummies.

IsThere a Bank Lending Channel of Monetary Policy in New Zealand?

Appendix

19 November 1996

Appendix:

The appendix consists of three parts. In the first part additional regression results are reported(Tables 2A and 3A). In addition, the impulse responses of the monthly finance mix variable and the quarterly spread variable to changes in the policy instruments are shown(Figures A1-A6). The second part contains the tests for unit roots and cointegration(Tables A1 to A6) while the third part gives an overview of the data used in this study.

To test for asymmetry in the response of the finance mix variable to changes in the two policy instruments, we distinguished between positive and negative changes in the discount rate and the reserve asset ratio. As shown in Table 2A, the regression results do not point to the existence of an asymmetric response pattern. Over the 1975:2-1987:3 period the predictive ability of the discount rate derives from both positive and negative changes in the discount rate. A tightening(easing) of monetary policy, represented by a positive(negative) change in the reserve asset ratio, leaves the composition of the finance mix unaffected.

Table 3A reports the findings for the spread. Its most interesting finding is that the non-neutral effects on the spread between 1985:1 and 1994:1 resulted chiefly from positive changes in the discount rate. However, the asymmetric response to positive changes in the discount rate is not particularly strong. The pronounced negative effect of decreases in the reserve asset ratio on the spread is somewhat puzzling.

The impulse responses of the monthly finance mix variable to positive and negative changes in the two policy instruments are arrayed in Figures A1-A3. Again, we detect no clear-cut pattern in the response of the Mix_{KSW} variable to changes in the discount rate or the reserve asset ratio.[1]

Based on quarterly data, Figures A4 and A5 illustrate the response of the spread to changes in the discount rate.[2] Figure A4 shows that distinguishing between positive and negative changes in the spread is rather inconsequential for the behaviour of the spread over the 1975:2-1994:1 period. Figure A5, however, demonstrates that the spread reacted more forcefully to changes in the discount rate during the 1985:1-1994:1 period. The latter result is consistent with the regression results reported in the paper. Figure A6 shows that the spread did not move very much in response to changes in the reserve asset ratio between 1975:2 and 1984:4.

<u>Abbreviations Used:</u>
DMIX = first difference of Mix_{KSW}
DLCS=first difference of the spread
NEGDD = negative change in the discount rate
POSDD = positive change in discount rate
NEGRAR=negative change in the reserve asset ratio
POSRAR= positive change in the reserve asset ratio
DDISC= change in the discount rate
DARDD=change in the reserve asset ratio.

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[1] The impulse response function tracks movements in the finance mix over a 15-month period in the wake of a shock in the policy instrument. The confidence bands(2 standard deviations) are based on 500 draws in the Monte Carlo experiment.

[2] For the spread the range is 8 quarters for the whole period and 4 quarters for the subperiods.

Appendix

Table 2A: Distinguishing Between Positive and Negative Innovations.
Monthly Data.
Finance Mix Variable: Bank Loans / (Bank Loans + Dealers' Commercial Bills)

	Discount Rate		
Sample Period	Lags / n	Positive	Negative
1974:7-1984:12	6	.26/.28^{+}	.12/.68^{+}
1975:1-1984:12	12	.34/.87^{+}	.03/.88^{-}
	Discount Rate		
Sample Period	Lags / n	Positive	Negative
1974:7-1987:3	6	.09/.93^{+}	.05/.27^{+}
1975:1-1987:3	12	.05/.69^{-}	.03/.90^{-}
	Reserve Asset Ratio		
Sample Period	Lags / n	Positive	Negative
1974:7-1984:12	6	.01/.04^{+}	.47/.33^{-}
1975:1-1984:12	12	.52/.36^{+}	.54/.35^{+}

Note: The above results are based on the following equation:

$$\Delta Mix_t = \kappa_0 + \kappa_1 time + \sum_{j=1}^{n} \gamma_j \Delta Mix_{t-j} + \sum_{j=1}^{n} \psi_j \Delta^{+} I_{t-j} + \sum_{j=1}^{n} o_j \Delta^{-} I_{t-j} + z_t$$

where $\Delta^{+}I$ represents a positive innovation to the instrument
and $\Delta^{-}I$ represents a negative innovation to the instrument.

Appendix:

Table 3A: The Effect of Changes in the Policy Instruments on the Spread: Distinguishing Between Positive and Negative Changes. Quarterly Data.

		Instrument					
Sample Period	Lags n	Discount Rate		Reserve Asset Ratio		Cash Settlement Balances Target #	
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.
1975:2-1994:1	4	.01/.81^{-}	.01/.24^{-}	------	-------	------	-------
1976:2-1994:1	8	.08/.26^{+}	.01/.31^{-}	------	-------	------	-------
1975:2-1984:4	4	.52/.34^{-}	.80/.65^{-}	.04/.74^{-}	.18/.03^{-}	------	------
1985:1-1994:1	4	.01/.14^{+}	.01/.62^{-}	------	------	.93/.41^{+}	.67/.63^{-}

Note:

a. The results are based on estimating the following equation:

$$\Delta \text{Spread}_t = \kappa_0 + \kappa_1 \text{time} + \sum_{j=1}^{n} \gamma_j \Delta \text{Spread}_{t-j} + \sum_{j=0}^{n} \omega_j \Delta^{+} I_{t-j} + \sum_{j=0}^{n} \phi_j \Delta^{-} I_{t-j} + z_t$$

where the Spread is defined as the difference between the Bank Lending Rate and the 90-day Commercial Bill Rate. The Bank Lending Rate is a quarterly weighted average of term loan interest rates and overdraft interest rates. I represents either the Discount Rate, the Reserve Asset Ratio on Demand Deposits or the Target for Settlement Cash Balances.

b. For the whole sample period and the 1985:1-1994:1 subperiod we also included a dummy variable. D=1 for 1985:1-1985:3 and D=0 otherwise. The dummy was added to capture the effect of the abrupt drop in the spread caused by the financial sector reforms . In both regreessions the coefficient of the dummy variable is negative and statistically significant at the 5 percent level.

The regression results reported in this column are based on the 1987:1-1994:1 period.

Figure A1

Impulse Responses of the Mix 1975:2 1987:3

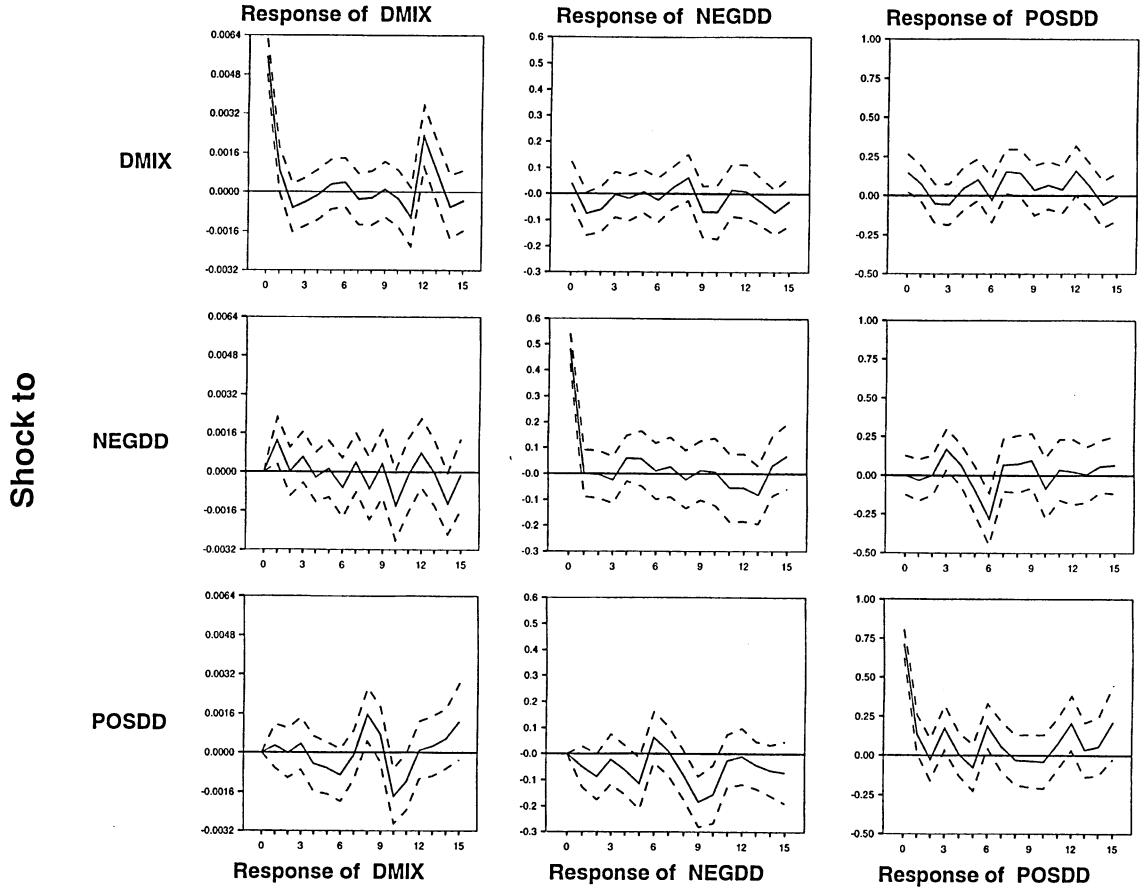

Figure A2

Impulse Responses of the Mix 1975:2 1984:12

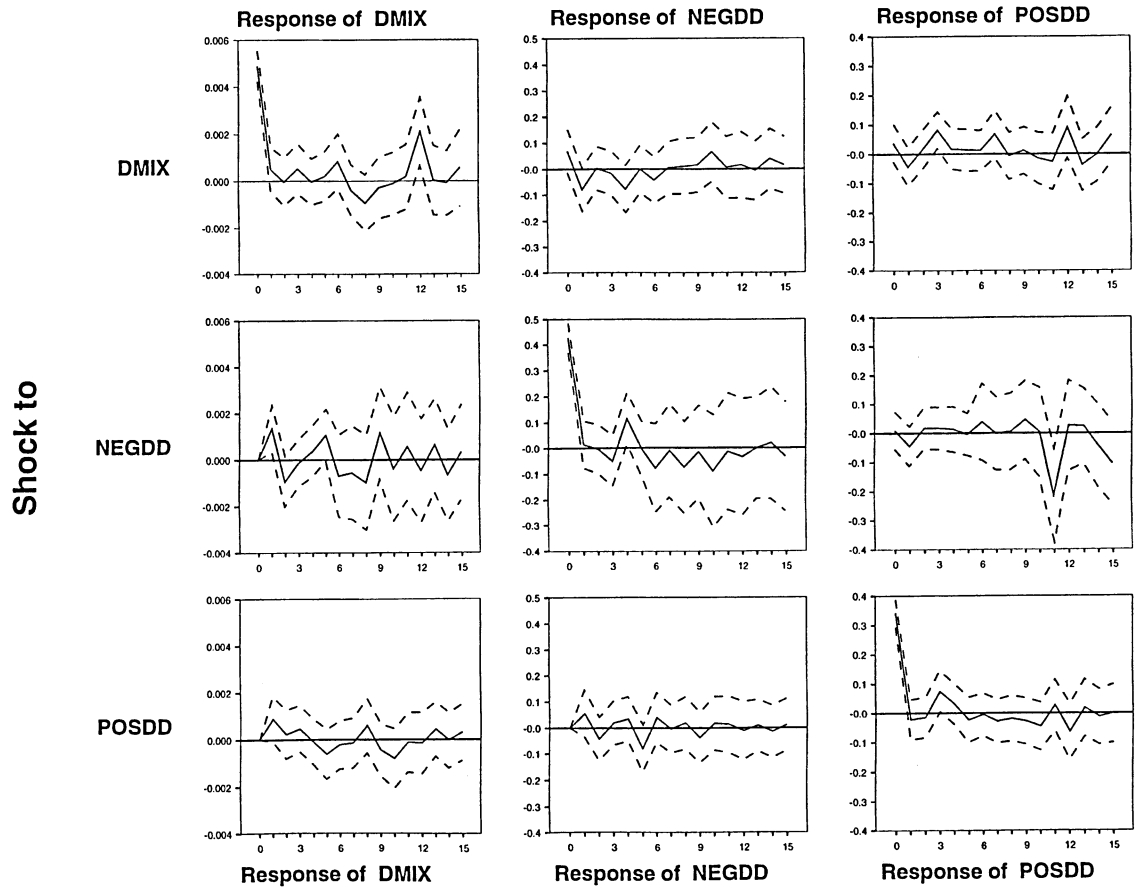

Figure A3

Impulse Responses of the Mix 1975:2-1984:12

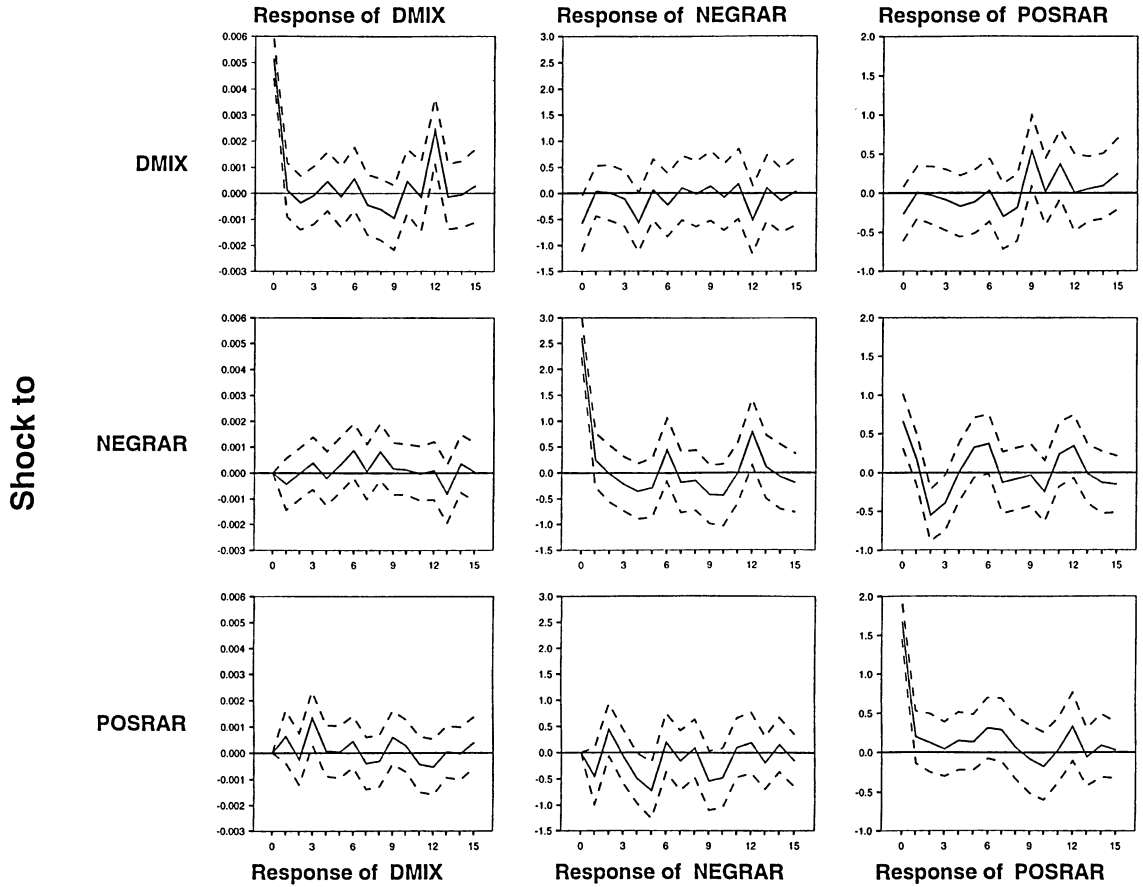

Figure A4

Impulse Responses of the Spread 1975:2-1994:1

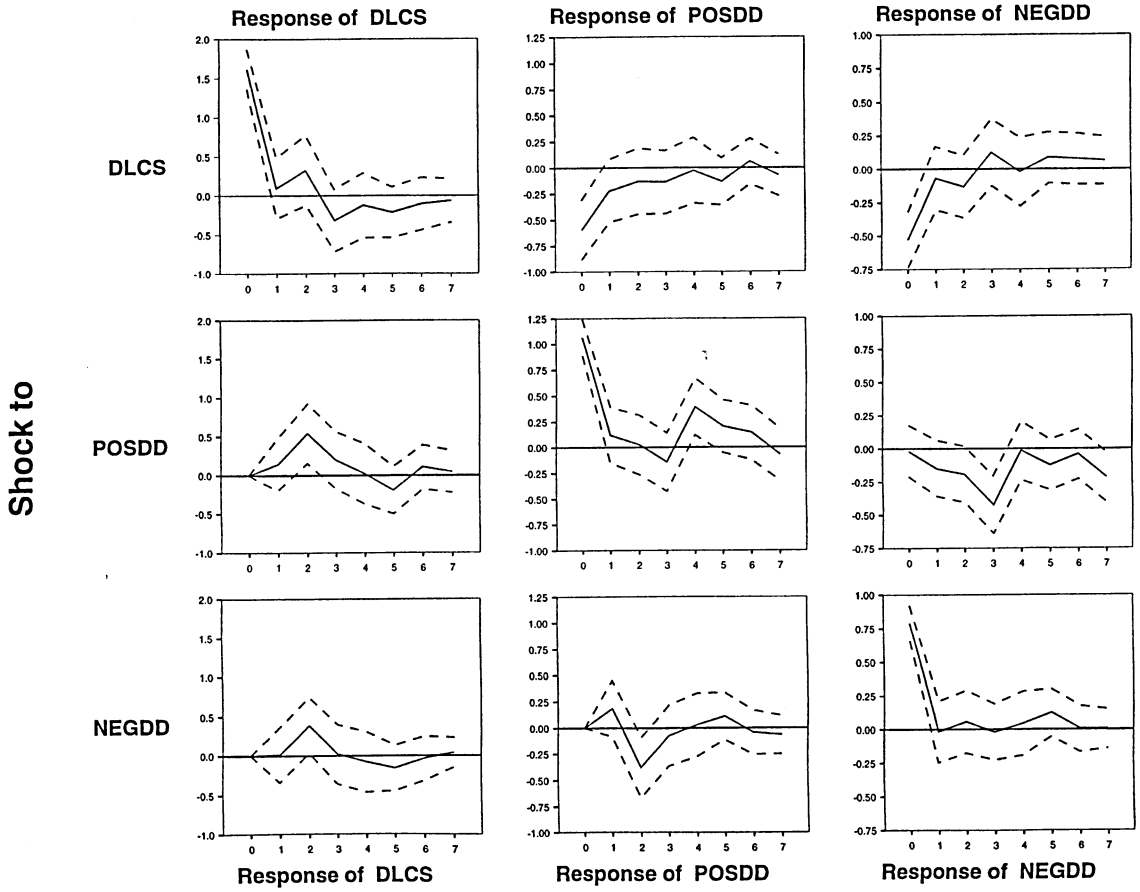

Figure A5

Impulse Responses of the Spread 1985:1-1994:1

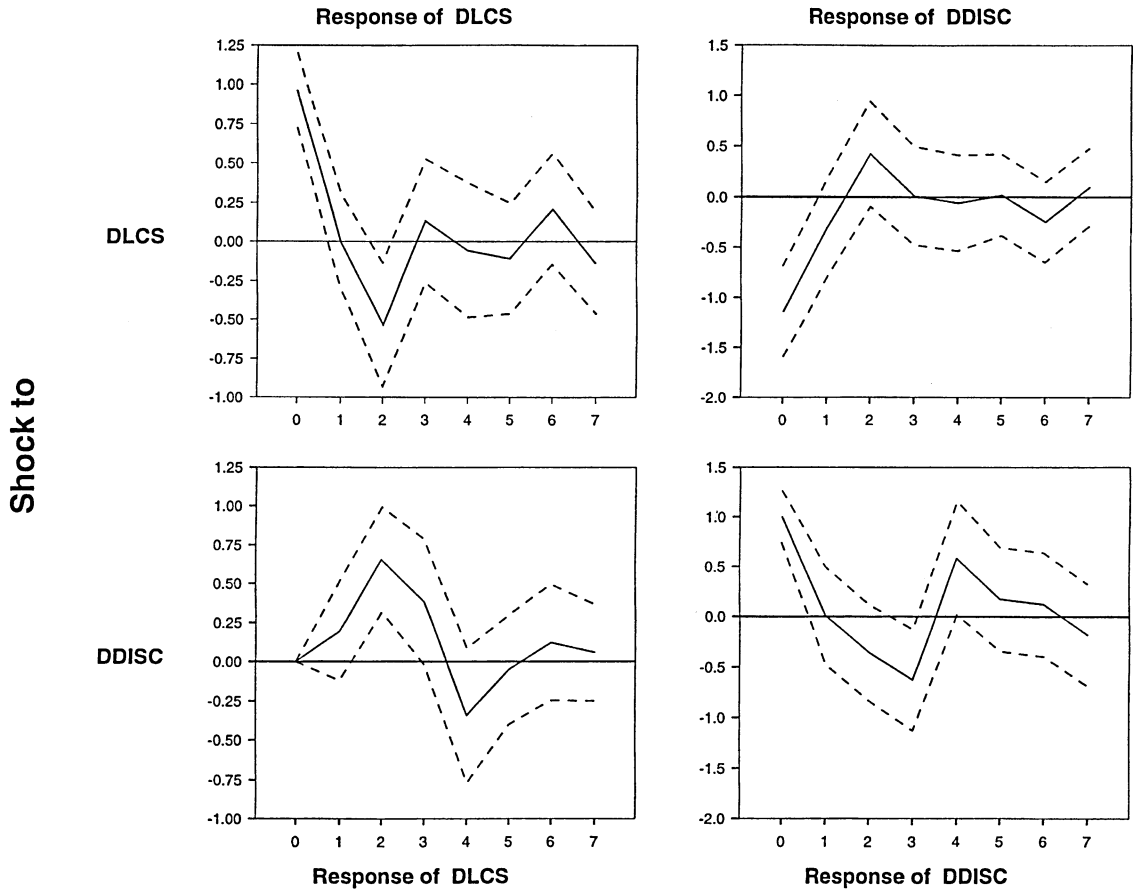

Figure A6

Impulse Responses of the Spread 1975:2-1984:4

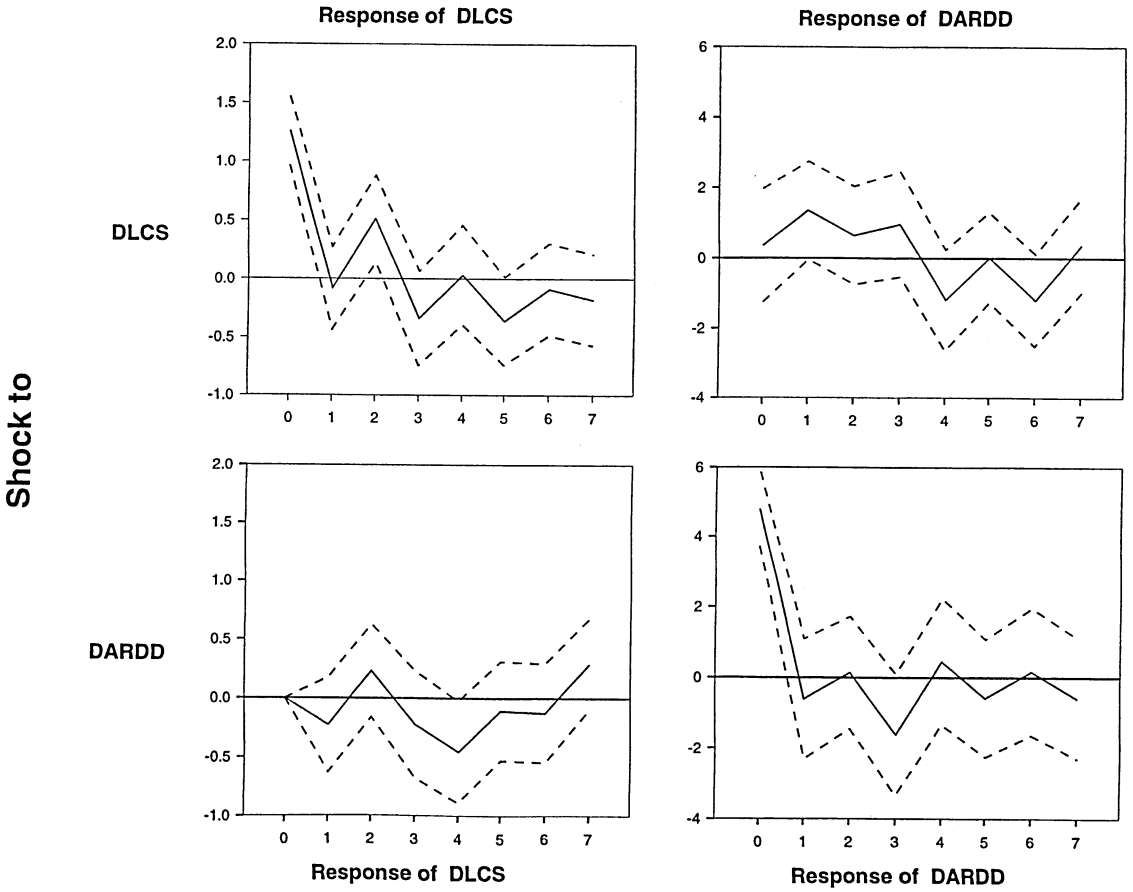

Table A1: Tests for Nonstationarity: Augmented Dickey-Fuller Tests: Quarterly Survey of Manufacturing Sector and Other Economic Indicators.

Variable (Lags)	Constant, Trend		Constant, No Trend		No Constant No Trend
(Asymptotic Critical Values at 10 percent level in Parentheses)	t-test **(-3.13)**	F-test **(4.03)**	t-test **(-2.57)**	F-test **(3.78)**	t-test **(-1.62)**
Total Stocks-Sales Ratio (8)	-3.26*	5.37*	-------	-------	--------
Sales and Other Income (8)	-1.05	1.65	.385	.953	1.34
Additions to Fixed Assets (2)	-1.54	.930	-1.42	1.18	-1.27
Stocks of Finished Goods (8)	-.877	1.43	-1.01	.655	.489
Bankruptcies (6)	-1.23	1.84	-1.35	2.27	1.45
Stock of Materials (2)	-2.03	2.55	-1.14	1.46	-1.41
Building Work Put in Place: Commercial Bldgs (8)	-2.56	2.19	-2.57	3.33	.038
Building Work Put in Place: Factories (7)	-1.78	1.07	-1.32	.900	-.320
Production (0)	-2.19	2.02	-1.64	1.96	1.06
Mix_{KSW} = loans/(loans+cb) (12)	-2.39	2.10	-1.09	.808	.370
Mix_{FC} = loans/(loans+fcl) (1)	-2.54	3.20	-.686	1.67	1.37
Mix_{Total} = $\frac{\text{loans}}{\text{(loans+fcl+cb)}}$ (6)	-1.52	3.71	.124	4.14*	2.66
Spread = bank lend. rate -cb rate (5)	-4.30*	9.77*	--------	--------	---------

Note: * reject at the 10 percent level.

a. All data is quarterly except Mix_{KSW} which is based on monthly observations.

For the following variables the sample period extends from 1977:2-1995:4:

Total Stocks to Sales Ratio, Sales and other Income, Additions to Fixed Assets, Stocks of Finished Goods, Stock of Materials, and Building Work Put in Place. For the remaining variables the sample periods are as follows:

Bankruptcies - 1976:1-1995:1

Production - 1977:1 - 1995:2

Mix_{FC} and Mix_{Total} - 1973:4-1987:1

Mix_{KSW} - 1973:12 - 1987:3(monthly data).

Spread - 1965:1 -1994:1(Bank lending rate(A) - cb rate; see data appendix for further details).

cb represents the volume of dealers' commercial bills outstanding. Loans and fcl represent loans extended by trading banks and finance companies, respectively.

b. All nominal variables have been deflated by the Producer Price Index. All variables are in logs. An asterisks implies a rejection of the null hypothesis that the data series contains a unit root.

c. We also tested for the presence of a unit root in the first difference of each variable. The hypothesis that the level of

the variable is I(2) could be rejected in each case.
d. In all cases but one the test for nonstationarity is based on the following equation:

$$\Delta y_t = a_0 + a_1 t + \gamma y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + e_t \qquad (1)$$

In examining the time series property of the spread variable over the 1965:1-1994:1 period, we included a dummy variable: D=1 for 1985:1-1985:3 and D=0 otherwise. The dummy was added to capture the effect of the abrupt drop in the spread caused by the floating of the New Zealand Dollar.

The form of the data-generating process is unknown which implies that in order to test whether a series is non-stationary or stationary we should begin with the most general model (equation (1)), including both a trend and a constant. The testing strategy was to conduct a t-test on the null hypothesis that $\gamma=0$ against the alternative hypothesis that $\gamma < 0$ (implying the series is stationary). If we could not reject the null hypothesis, we calculated an F-statistic that tested the appropriateness of including a trend term in the equation i.e. we tested the null that $\gamma=a_1=0$ against the alternative that $\gamma<0$, $a_1 \neq 0$. If we rejected the null we concluded that the trend is significant and that the series is stationary. If we could not reject the null we removed the trend term and re-estimated equation (1) without the trend term.

This same procedure of conducting a t-test and then an F-test was applied to equation(1) without the trend term. The constant was removed if we could not reject the null of $\gamma=a_0=0$.
Finally, we re-estimated equation (1) having removed both the trend and the constant and tested the null hypothesis of $\gamma=0$ against the alternative that $\gamma<0$.

This testing procedure produded a hierarchy of five separate statistics for testing for stationarity in each series. These test statistics are given in the five columns of the above table, and should be read from left to right.

Table A2: Tests for Nonstationarity: Augmented Dickey-Fuller Tests.
Indicators of Aggregate Economic Activity: 1965:1-1987:1. Quarterly Data.

Variable (Lags)	Constant, Trend		Constant, No Trend		No Constant No Trend
(Asymptotic Critical Values at 10 percent level in Parentheses)	t-test **(-3.13)**	F-test **(4.03)**	t-test **(-2.57)**	F-test **(3.78)**	t-test **(-1.62)**
Private Durables Consumption(9)	-2.00	1.74	-1.52	1.70	1.01
Private Consumption(8)	-1.91	2.03	-1.00	1.66	1.50
Private Investment Dwellings(8)	-2.50	2.11	-2.44	3.00	-.231
Total Stocks(8)	-1.84	2.39	-1.13	2.33	1.80
Commercial Stocks(8)	-1.51	1.43	-1.60	1.89	1.05
Exports of Goods(8)	-2.51	4.75*	-.774	3.96*	2.68
Imports of Goods(4)	-2.96	3.27	-1.18	1.18	.939
Total Sales(5)	-1.75	2.47	-.784	2.41	2.04
Registered Unemployment(7)	-2.41	4.10*	-1.92	4.33*	.619
Capacity Utilisation(5)	-2.84	2.82	-2.86*	4.16*	------

Note:
* denotes significance at the 10 percent level.
Where applicable, the series is expressed in real terms. The data were drawn from the database of the Reserve Bank of New Zealand. For more detailed information about the time series data consult the data appendix.
See also the notes to Table A1 for more details on the testing procedure.

Table A3:
Quarterly Data.
Cointegrating Regression ADF Test: Mix_{KSW}
1977:4 1987:1[a]

Variable	p	t-statistic	Cointegrated
Total Stocks to Sales	na	na	na
Sales and other Income	5	-1.27	no
Additions to Fixed Assets	1	-2.08	no
Stock of Finished Goods	3	-1.49	no
Bankruptcies	1	-3.37*	yes
Stock of Materials	1	-2.74	no
Building Work Put in Place: Commercial Buildings	3	-.337	no
Building Work Put in Place: Factories	1	-2.36	no
Production	4	-3.00*	yes

Note:
[a] Except for Bankruptcies for which the sample period extends from 1976:2 to 1987:1 and Production for which the sample period runs from 1977:2 to 1987:1.

The test of cointegration is based on the residuals of the regression of each of the nine economic indicators on the mix variable. Let the cointegration equation be given by

$$y_t = \alpha + \beta\, Mix_{KSW_t} + u_t$$

A cointegration relationship between the economic indicator and the mix variable exists if the null hypothesis of the non-stationarity of the OLS residuals can be rejected. More formally,

$$H_o : \gamma = 0$$
$$H_A : \gamma < 0$$

is tested based on the cointegrating Augmented Dickey -Fuller test:

$$\Delta u_t = \gamma u_{t-1} + \sum_{j=1}^{p} \beta_j \Delta u_{t-j} + \epsilon_t$$

p denotes the number of lagged differences of the variable used in the ADF test equation. An asterisks marks the rejection of the null hypothesis at the 10 percent level that the variable in question and the mix variable are not cointegrated. The critical value at the 10 percent level is -2.84.

Table A4:
Quarterly Data.
Cointegrating Regression ADF Test: Mix_{FC}
1977:4 - 1987:1[a]

Variable	p	t-statistic	Cointegrated
Total Stocks to Sales	na	na	na
Sales and other Income	4	-4.81*	yes
Additions to Fixed Assets	1	-1.28	no
Stock of Finished Goods	2	-2.23	no
Bankruptcies	0	-4.26	yes
Stock of Materials	1	-2.31	no
Building Work Put in Place: Commercial Buildings	6	-1.30	no
Building Work Put in Place: Factories	1	-2.06	no
Production	4	-4.77*	yes

Note:
[a] Except for Bankruptcies for which the sample period extends from 1976:2 to 1987:1 and Production for which the sample period runs from 1977:2 to 1987:1.

The test of cointegration is based on the residuals of the regression of each of the nine economic indicators on the mix variable. Let the cointegration equation be given by

$$y_t = \alpha + \beta Mix_{FC_t} + u_t$$

A cointegration relationship between the economic indicator and the mix variable exists if the null hypothesis of the non-stationarity of the OLS residuals can be rejected. More formally,

$$H_o : \gamma = 0$$
$$H_A : \gamma < 0$$

is tested based on the cointegrating Augmented Dickey -Fuller test:

$$\Delta u_t = \gamma u_{t-1} + \sum_{j=1}^{p} \beta_j \Delta u_{t-j} + \epsilon_t$$

p denotes the number of lagged differences of the variable used in the ADF test equation. An asterisks marks the rejection of the null hypothesis at the 10 percent level that the variable in question and the mix variable are not cointegrated. The critical value at the 10 percent level is -2.84.

Table A5:
Quarterly Data.
Cointegrating Regression ADF Test: Mix_{TOTAL}.
1977:4-1987:1[a]

Variable	p	t-statistic	Cointegrated
Total Stocks to Sales	na	na	na
Sales and other Income	4	-4.18*	yes
Additions to Fixed Assets	1	-1.40	no
Stock of Finished Goods	4	-1.81	no
Bankruptcies	1	-3.32*	yes
Stock of Materials	2	-2.05	no
Building Work Put in Place: Commercial Buildings	6	-1.16	no
Building Work Put in Place: Factories	1	-2.05	no
Production	4	-5.00*	yes

Note:
[a] Except for Bankruptcies for which the sample period extends from 1976:2 to 1987:1 and Production for which the sample period runs from 1977:2 to 1987:1.

The test of cointegration is based on the residuals of the regression of each of the nine economic indicators on the mix variable. Let the cointegration equation be given by

$$y_t = \alpha + \beta\, Mix_{TOTAL_t} + u_t$$

A cointegration relationship between the economic indicator and the mix variable exists if the null hypothesis of the non-stationarity of the OLS residuals can be rejected. More formally,

$$H_o : \gamma = 0$$
$$H_A : \gamma < 0$$

is tested based on the cointegrating Augmented Dickey -Fuller test:

$$\Delta u_t = \gamma u_{t-1} + \sum_{j=1}^{p} \beta_j \Delta u_{t-j} + \epsilon_t$$

p denotes the number of lagged differences of the variable used in the ADF test equation. An asterisks marks the rejection of the null hypothesis at the 10 percent level that the variable in question and the mix variable are not cointegrated. The critical value at the 10 percent level is -2.84.

Table A6:
Indicators of Aggregate Economic Activity.
Cointegrating Regression ADF Test: Mix_{FC}
1965:1 - 1987:1

Variable	p	t-statistic	Cointegrated?
Private Durables Consumption	9	-2.07	no
Private Consumption	9	-2.16	no
Private Investment Dwellings	8	-2.53	no
Total Stocks	8	-2.24	no
Commercial Stocks	8	-1.90	no
Exports of Goods	9	-4.75*	yes
Imports of Goods	4	-3.04*	yes
Total Sales	7	-1.90	no
Registered Unemployment	7	-3.07*	yes
Capacity Utilisation	-----	----------	----------

Note:
See previous tables for description of testing procedure.
An asterisks marks the rejection of the null hypothesis at the 10 percent level that the variable in question and the mix variable are not cointegrated.

Data Appendix:

Description of Economic Time Series.

Series	Attribute	Source	Frequency	Period
Bank Loans	Advances & Discounts, nominal	INFOS	monthly	1960:1-1987:3
Finance Company Loans	nominal	INFOS	quarterly	1965:1-1987:1
Commercial Bills	Total Bills Outstanding, nominal	INFOS	monthly	1973:12-1987:3
Commercial Bills	Dealers' Bills Outstanding, nominal	INFOS	monthly	1981:6-1987:3
Commercial Bill Rate	Prime 90-Day Commercial Bills Maximum Rate[1]	INFOS	monthly	1977:1-1987:3
Commercial Bill Rate	Prime 90-Day Commercial Bills	MPNZFS	quarterly	1974:1-1976:4
Commercial Bill Rate	90-Day Commercial Bills	Reuters	daily	1987-1994(Feb.)
Bank Lending Rate(A)	Weighted Average of term loan interest rates and overdraft rates	Reserve Bank	quarterly	1965:1-1994:1
Discount Rate		IFS	monthly	1973:1-1995:12
Reserve Asset Ratio	Demand Deposits	INFOS	monthly	1973:6-1985:1
Cash Settlement Target		Reserve Bank	monthly	1986:3-1995:12
Discount Margin		"	"	"
Total Stocks to Sales Ratio	Manufacturing, Index	INFOS	quarterly	1977:2 1995:4
Sales and Other Income	" nominal	"	"	"
Stocks of Finished Goods	" "	"	"	"
Additions to Fixed Assets	" "	"	"	"
Stocks of Materials	" "	"	"	"
Producers' Price Index	Index	"	"	1977:4-1995:4
Bankruptcies	Total Number	"	"	1976:1-1995:2
Production	Manufacturing,SA Index	"	"	1977:1-1995:2
Building Work Put in Place: Factories	Nominal	"	"	1965:1-1995:4
Building Work Put in Place: Commercial Buildings	Nominal	"	"	1965:1-1995:4

[1] When forming a quarterly time series of the commercial bill rate, we had to rely on different sources. We decided to use the 90 Maximum Rate(instead of the Minimum Rate or the average of the two) retrieved from INFOS as it shared a much closer relationship with the earlier series drawn from MPNZFS.

[2] Data on dealers' commercial bills becomes available only in June 1981. Trading banks were not allowed to operate in the commercial bills market before April 1978. To get a plausible estimate of the volume of dealers' bills prior to June 1981, we multiplied the total volume of commercial bills outstanding by .8, the share(80%) of all commercial bills accounted for by dealers' bills in 1981. It must be emphasised that the distinction between dealers' commercial bills and bank bills became relevant in the post-1981 period when the share of bank bills in the volume of commercial bills rose significantly. Before 1981 the commerical bill market was dominated by commercial bills

dealers. In an earlier version of the paper, we used the total volume of commercial bills outstanding. There appears to be a sturdier long-run relationship between economic activity and the Mix_{KSW} and Mix_{TOTAL} as the error correction term is significant at the 1 percent level in several cases. However, these results are marred by the lack of distinction between bank and non-bank credit(as dealers' commercial bills and bank bills are lumped together) and can therefore be hardly interpreted as evidence in favour of the bank lending view. This point was brought to my attention by a referee.

Abreviations Used:
INFOS=INFOS Database.
MPNZFS= Monetary Policy and the New Zealand Financial System, 2nd Edition.
SA = Seasonally Adjusted.
IFS=International Financial Statistics.

Data Drawn from the Reserve Bank Econometric Model of the New Zealand Economy: Model XII.

Series	Attribute	Frequency	Period
Real Private Consumption	CPX	Quarterly	1965:1-1994:1
Real Household Consumption Durables	CPDX	"	1965:1-1994:1
Real Private Dwellings Investment	IPDX	"	1965:1-1994:1
Real Stock Level	VX	"	1965:1-1993:2
Real Stock Level, Commercial	VCX	"	1965:1-1993:2
Real Exports of Goods	XGX	"	1965:1-1994:1
Real Imports of Goods	MGX	"	1965:1-1994:1
Real Final Sales	SX	"	1965:1-1992:3
Consumers' Price Index	PC	"	1965:1-1994:1
Capacity Utilisation	QCU	"	1965:1-1994:1
Registered Unemeployment	RUE	"	1965:1-1992:4

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