A MODEL OF THE NEW ZEALAND MONETARY SECTOR

R. S. DEANE
M. A. LUMSDEN

Reserve Bank of New Zealand
Wellington

Research Paper No. 2 **December 1971**

Copies of Research Papers are obtainable free of charge on application to the Economic Department, Reserve Bank of New Zealand, Box 2498, Wellington.

CONTENTS

PREFACE

Any econometric model must reflect, at least in part, the particular interests or biases of those responsible for its construction. This is certainly true in the case of the quarterly model currently being formulated in the Research Section of the Economic Department of the Reserve Bank of New Zealand. In the model a special effort has been made to obtain a reasonably detailed coverage of the monetary sector and to investigate the role of financial variables in determining expenditures. Although it is recognised that the theoretical controversies are by no means settled in this area, monetary variables appear as significant explanatory factors in a range of expenditure relationships. This is clear, for example, in Research Paper No. 1 which describes the model as a whole.

It is thus appropriate that the second Research Paper should deal with the monetary sector in some depth. Although this sector is defined for present purposes as including the trading banks and the savings banks, it is hoped that at a later stage the analysis will be extended to cover other financial intermediaries such as insurance companies and finance houses. This would help explain more fully within the overall model the private sector's holdings of financial assets and the various flows of credit both to government and private borrowers. Thanks to the efforts of the Reserve Bank over the past decade the range of quarterly financial data is now very good. We are endeavouring at present to prepare detailed quarterly statistics for the government sector, including the financing of the deficit before borrowing. Once this is complete it should be possible to integrate fully the government, financial and foreign sectors within a satisfactory macroeconomic framework. But this will be the subject of later Research Papers.

Other members of the Economic Department have generously assisted us with the research underlying this paper. We are delighted to be able to acknowledge our debt of gratitude to them while at the same time absolving them and the Bank from any responsibility in respect of the views we express. The equation estimation and model simulation have been carried out on the Bank's Burroughs 2500 computer. In view of the latter's maximum program capacity of 50K bytes, Mr. A. B. Sturm has served us remarkably well in constructing a most efficient Database system which has coped with all our data storage, manipulation, transformation, regression and simulation problems.

R. S. Deane
M. A. Lumsden

A MODEL OF THE NEW ZEALAND MONETARY SECTOR

This paper outlines work undertaken to develop a quarterly econometric model of the New Zealand monetary sector. For present purposes this sector is defined as the domestic banking system in a broad sense, including both trading banks and savings banks. Between them, these institutions account for the vast bulk of private sector liquid assets issued by deposit-accepting financial institutions in New Zealand. This point is illustrated by the following analysis of the Reserve Bank's "money supply and selected liquid assets" series as at the end of March 1970:

	$ million	% of Total
Deposits held by:		
Trading banks ...	798.2	27.9
Savings banks ...	1,681.0	58.7
Finance companies ...	100.6	3.5
Stock and station agents ...	66.6	2.3
Money market ...	48.2	1.7
Notes and coin ...	168.7	5.9
Total ...	2,863.3	100.0

In summary, the model aims to explain changes in the community's holdings of a range of financial assets and liabilities. In particular, the model contains behavioural equations for currency, trading banks' demand and fixed term deposits, savings banks' current and investment account deposits, and bank advances. Other variables are also explained endogenously, such as the trading banks' holdings of notes, net cash and government securities, and savings banks' cash and fixed deposit balances, central government and local authority security holdings and mortgage lending to the private sector.

A. THE STRUCTURE OF THE MODEL

In most respects the structure of the model is orthodox in the sense that it adopts summarised versions of the domestic balance sheets for both trading banks and savings banks as its basic framework. Within this context the model attempts to explain the major items by a number of behavioural equations, empirical relationships and identities. The two balance sheets are set out in detail in the following table along with (a) the symbols used to represent the assets and liabilities of each institution, and (b) sample data for March 1970 to give some idea of the order of magnitude of the various individual items. The major behavioural equations in most cases rest on the modified stock adjustment model, as explained in the next section.

(1) *Trading Banks*

The results, tabulated in detail later in the paper, include equations for each of the major categories of private sector deposits held by the two groups of institutions (i.e. demand and fixed deposits). Government deposits at the trading banks, and Treasury deposits, are treated as exogenous to the present model. Treasury deposits in particular vary according to quite arbitrary decisions made at the close of the Government's financial year in March. Essentially they represent book-keeping entries of little economic significance. Deposits in another special category—wool retention accounts(1)—were made for a limited number of years in response to substantial tax inducements offered to woolgrowers and accordingly can also be treated as exogenous. The trading banks' deposit equations thus explain (a) demand deposits, excluding those of Government and Treasury, and (b) fixed deposits excluding wool retention accounts.

On the assets side of the trading banks' balance sheet, behavioural equations are derived for the banks' holdings of notes and their lending to the private sector by way of advances. An alternative version of the former equation is offered for notes and coin combined although this formulation is not suitable for inclusion in the model due to the need to estimate note holdings as a separate item in the statutory minimum requirements identity. In this case coin is treated as an exogenous item, it being both small and readily predictable. Alternative treatments are also offered for bank advances; equations having been estimated with and without the inclusion of lending to meat freezing companies and woolbuyers. For reasons outlined later, the aggregative form is preferred for the present model. Of the remaining items, lending to local bodies by way of purchases of securities and net other assets are estimated exogenously. Neither category is of particular importance from the monetary economist's point of view.

Penal borrowing is determined by the monetary authorities. Under the formula system which has been in operation since October 1969, this can be treated as a contra entry in the banks' balance sheet, as implied by the relevant identity in the model. In earlier years, the total amount of penal borrowing was determined along similar lines—depending mainly on the excess of actual non-priority bank lending over the corresponding ceilings set by Government—although its manner of distribution between banks was different. The system worked on the simple principle of increasing the reserve ratios (the percentage of deposits which must be held as cash frozen at the Reserve Bank) until the banks were forced to borrow from the central bank an amount approximately equivalent to the officially desired penal borrowing. Statutory minimum requirements are still imposed by the reserve ratio system, with a special deduction for note holdings, but since October 1969, penal borrowing has been additional to rather than inclusive within this identity. Thus banks' total cash comprises the sum of penal borrowing and statutory minimum requirements plus free cash. Net cash becomes the difference between free cash and non-penal borrowing from the Reserve Bank.

Although these identities are spelt out in detail later in the paper, the model is not designed to provide estimates of all the various components of banks' cash as just mentioned. Instead, it treats the aggregate of government security holdings and net free cash as the major balance sheet residual. This formulation of the model reflects a certain view of how the banking system operates in New Zealand. Essentially it is assumed that, subject to certain important institutional and policy constraints (including, of course, officially controlled interest rates), market forces play the major role in determining the level of trading banks' deposits and advances. During

(1) These averaged $10.4 million, $8.3 million, $3.9 million and $0.7 million in the years 1964 to 1967 respectively.

most of the past decade the banks have readily accepted all deposits offered at the ruling interest rates (zero in the case of demand deposits) while lending with equal willingness as much as the authorities would allow, and often more, by way of the overdraft system. In this context trading banks' cash, excluding holdings of notes and coin which simply depend on day-to-day requirements of customers, becomes a residual in the genuine sense of the word. For example, it is accepted as normal for the banks to operate on a true negative cash basis for large portions of each year, assisted by a central bank which has in the past invariably provided lending facilities on a virtually automatic basis (if at a certain price). In other words, except on certain pre-specified occasions (e.g. when the large March tax flow to Government occurs) the banks have not been forced to dispose of securities to meet their liquidity problems. With a minimum liquid assets ratio system currently under consideration, this position could well change in the future.

In the first half of the model's estimation period, 1960-65, the banks were not allowed to expand their holdings of government securities, a ruling which was a hangover from capital market restrictions imposed during the second world war. In the second half of the period, until 1969, security holdings expanded in line with a rigid formula linking such growth to increases in fixed deposits. Thus securities were swapped for cash in line with official rulings. It has only been since June 1969 that banks have been granted reasonable freedom to deal in securities. This should explain the decision to treat net cash and securities as a single residual item, at least for the present. The most logical alternative (rejected in this case) would be to treat government securities as exogenous. It is intended that forecasts will be generated on the basis described above until a new system for determining required holdings of liquid assets is introduced. In the meantime the division of the residual aggregate between cash and securities should not be too difficult, given information about statutory reserve cash, penal borrowing requirements and knowledge of likely individual bank positions.

The model is concerned only with the domestic assets and liabilities of the banking system. Hence it provides no direct estimates of the trading banks' net overseas assets. However, when the monetary sector is incorporated in a larger model of the whole economy it should be possible to determine official net overseas assets (Reserve Bank plus trading banks) from the appropriate foreign sector identity. In summary:

$$\triangle ANZ = CR - CP + XB$$

where $\triangle ANZ$ is the change in New Zealand's official overseas assets
- CR is current overseas exchange receipts
- CP is current payments abroad
- XB is the net capital balance on an overseas exchange transactions basis (incorporating I.M.F. transactions for the purpose of this identity).

(2) *Savings banks*

The approach adopted towards the savings banks is necessarily somewhat different from that just described for the trading banks. One major similarity exists in that behavioural equations are determined for deposits in both current accounts and investment accounts.[2] There is also a simple equation explaining savings banks' own cash and fixed deposit balances. This incorporates minimum statutory cash requirements implicitly rather than explicitly, for reasons explained later. Lending to local bodies is similarly treated as endogenous although political and policy factors have in the past been of some importance in this area. Unfortunately these influences can not be quantified.

Government policy has an impact on savings banks in two main ways: first, through official control of deposit interest rates and, secondly, through the imposition of government security investment ratios which require specified proportions of deposit balances to be diverted to the Government sector. Accordingly, the model contains a simple empirical relationship expressing required holdings of government securities as the product of deposits and a weighted average security ratio for all savings banks. The latter allows for different ratios as between different institutional groups and, where applicable, different types of deposits. The excess of actual security holdings over required minimum holdings, which may be either positive or negative, is then explained by an orthodox behavioural equation. Lending to the private sector, on the other hand, is treated as the residual in the balance sheet (other net assets, a small item, being exogenous). The assumption here is that as private and trustee savings banks expand they will in the first instance meet their own liquidity and other asset requirements, then take up government securities to more or less the required level, and finally use all remaining funds for lending through their most profitable outlet, the private sector. Given an estimate of the change in local body securities, the remainder will comprise commercial and other private mortgages. On the basis of the New Zealand experience of the past decade, the assumption seems quite realistic. It should be noted that the Government-owned Post Office Savings Bank is not permitted to indulge in private sector lending activities.

It should be clear then that the model involves estimating the demand for a number of financial assets and liabilities in a series of markets: cash (including both currency and cash balances), demand deposits, term deposits, bank advances and mortgages, and central and local government securities. In a normal market situation it would also be necessary to develop supply functions. However, in New Zealand, many interest rates are subject to official regulation. Of the major interest rates incorporated explicity in the present model—the rates on government securities, trading banks' fixed deposits, savings banks' investment accounts, bank overdrafts—none were free rates in any meaningful sense of the word during the estimation period.[3] Accordingly, supply equations are dropped from the model and

(2) The latter category including National Savings Accounts.

(3) Towards the end of the period, in June 1969, some easing occurred in the controls over trading banks' term deposit rates when the banks were allowed to compete actively and freely for so-called large deposits (in excess of $25,000). Subsequently in October 1970 the latter restriction was removed for deposits accepted for terms greater than two years.

THE NEW ZEALAND MONETARY SECTOR *

TRADING BANKS

	Symbol	*Sample Data as at 31-3-70 $m.*
LIABILITIES		
Demand deposits, excluding Government	DDT	608.3
Fixed deposits, excluding wool retention	DFT	230.8
Government deposits	DGT	12.3
Treasury deposits	DTT	30.0
Wool retention accounts	DWT	0.0
Total Deposits	DT	881.4
Penal borrowing from Reserve Bank	LTRP	13.9
Other borrowing from Reserve Bank	LTRO	31.4
Total Selected Domestic Liabilities	TDL	926.7
ASSETS		
Notes	NOT	29.3
Coin	COT	4.1
Notes and Coin	NCT	33.4
Statutory minimum requirement at Reserve Bank	DRTM	17.7
Penal borrowing requirement at Reserve Bank	DRTP	13.9
Free cash	DRTF	0.0
Total Balances at Reserve Bank	DRT	31.6
Notes, Coin and Balances at Reserve Bank	NCDT	65.0
Advances, ** excluding meat and wool	LPTI	548.6
Advances, meat companies and woolbuyers	LMWT	137.2
Total Advances **	LPT	685.8
Local authority securities	LLT	1.5
Government securities	GT	72.6
Total Selected Domestic Assets	TDA	824.9
Net Other Assets	AOT	101.8

SAVINGS BANKS

LIABILITIES		
Demand deposits	DDS	1,125.1
Fixed deposits	DFS	555.9
Total Deposits	DS	1,681.0
ASSETS		
Cash and fixed deposits at trading banks	DTS	48.4
Private sector lending	LPS	155.2
Government securities	GS	1,458.1
Local authority securities	LLS	45.5
Net Other Assets	AOS	—26.2
	= DS	1,681.0

* As defined for the present model.
** Including discounts and term loans.

interest rates are assumed to be exogenously determined by Government.[4] The implication of this assumption is, of course, that banks will accept any volume of deposits at the going rate; a position which is in fact very close to reality. One cautionary comment should be added: given the recently extended freedom in respect of trading bank fixed deposits, some revision of the approach may be necessary in the future.

B. THEORETICAL CONSIDERATIONS

The model uses the modified stock adjustment theory of portfolio behaviour as the basis for most of the behavioural equations. The formulation of this approach to empirical monetary relationships in econometric models is attributable mainly to de Leeuw (3), (4), (5), and Goldfeld (7), (8), although in recent years the theory has been employed quite extensively by other writers, such as Evans and Klein (6), Teigen (17), Silber (16), Helliwell et al (9), and Norton et al (11), (13). Under this approach it is generally argued that the desired stock (A_t^*) of any asset in time period t depends on:

(a) The asset holder's wealth (W_t);

(b) The actual and/or expected yield on that asset (ra_t, $\dot{ra}_t$); and

(c) The actual and/or expected yield on alternative assets $(\bar{r}_t, \dot{\bar{r}}_t)$[5], so that

$$A_t^* = f\ (W_t,\ ra_t,\ \dot{ra}_t,\ \bar{r}_t,\ \dot{\bar{r}}_t) \qquad (1)$$

Equation (1) represents an implicit assumption that asset holders have in mind an equilibrium distribution of their wealth which, if attained, would represent a position of desired balance in portfolio holdings. Portfolio diversification is assumed to occur for a number of reasons, such as the varying degrees of liquidity as between assets, uncertainties about the future, and the need to meet certain legal requirements. The transactions cost incurred in buying and selling assets is expected to result in a delay in adjusting actual asset holdings to the desired levels. Hence it is assumed that actual (quarterly) changes in the stock of an asset A_t will be a constant proportion, g, of the difference between the desired stock at the end of the quarter and the actual stock at the beginning of the period. This means that:

$$\triangle A_t = g\ (A_t^* - A_{t-1}) \qquad (2)$$

The adjustment coefficient, g, will lie between 0 and 1. If in fact $g = 1$ then the actual stock is adjusted to the desired stock entirely within the relevant time period. However, it is possible that this stock adjustment mechanism may be modified by various short-term influences which could cause either some modification to the desired holding of an asset or a temporary alteration to the rate of adjustment towards equilibrium. Thus, if:

(a) The vector of short-term constraints or "shocks" is denoted $\overline{SH}_t$,

(b) The interest rate expectation variables are dropped (for reasons explained later),

(c) The random error term U_t is added, and

(d) Equation (1) above is substituted in equation (2), the basic theoretical formulation employed in this paper is obtained:

$$\triangle A_t = f\ (W_t,\ ra_t,\ \bar{r}_t,\ \overline{SH}_t,\ A_{t-1},\ U_t) \qquad (3)$$

The signs on the coefficients of the variables in this functional relationship are expected to be positive in the case of wealth and the interest rate on the asset in question (the own rate, as it is sometimes called) and negative for the interest rates on competing assets and, of course, the lagged stock variable. The appropriate sign for the constraint variable will depend on the circumstances. In the present model, for example, an important constraint appears to be the flow of taxation receipts to Government. These would be expected to be positively related to the community's need for bank advances and negatively correlated with their demand for current and time deposits.

Equation (3) represents what is often termed the linear form of the stock adjustment model. An alternative specification is the ratio form where all the stock and flow variables in the equation are deflated by some measure of the asset holder's wealth. In this instance (3) becomes:[6]

$$\frac{A_t}{W_t} - \frac{A_{t-1}}{W_{t-1}} = f\ (ra_t,\ \bar{r}_t,\ \frac{\overline{SH}_t}{W_t},\ \frac{A_{t-1}}{W_{t-1}},\ U_t) \qquad (4)$$

C. MEASUREMENT PROBLEMS

Inevitably some serious problems arise in terms of measurement of the relevant variables. The most severe data limitation in New Zealand is the complete lack of official quarterly national income accounts.[7] If the analysis is to be restricted to officially published data,

(4) The average interest rate on new mortgage registrations, which is a market-determined rate to a large extent, plays only a minor role in the monetary model. It helps explain the savings banks' holdings of government securities in excess of the required minimum. While this rate, JM, is treated as exogenous in the present instance for the sake of simplicity, it is explained endogenously as part of the mortgage market in the model of the whole economy (see Deane (1)).

(5) The bar over a symbol indicates that the symbol represents a vector of relevant variables.

(6) For elaboration of this approach see de Leeuw (3), (4), Goldfeld (7), (8), and Silber (16).

(7) Although the New Zealand Institute of Economic Research prepares quarterly unofficial estimates of national income, it is felt that the reliability of these is too much in doubt for such estimates to form a useful basis for econometric work. In some cases the Institute's estimates are little better than intelligent guesses, and no more than this would be claimed for them.

the closest available approximation in the sense of a general activity variable of reasonably wide coverage is the quarterly retail trade turnover series. On the income side, the only private income series available is that for salary and wage earners; an officially produced series which, incidentally, is quite widely used but not published. This leaves open some unfortunately wide statistical gaps. For instance, there is no official coverage of income received by companies, farmers and the professional and self-employed categories, while in the expenditure area there are no adequate estimates of private gross capital formation. Accordingly, in a study such as this, liberal use must be made of proxy variables, not all of which provide adequately long-term data. Many of the important series are available only from around 1960; a factor which effectively limits the length of the estimation period.

The question of whether or not the analysis should be restricted to the use of official data only is a difficult one in the New Zealand context. The advantages of employing information collected and collated by the Department of Statistics (or some other official agency) are fairly obvious. In fact, in normal circumstances there would be some presumption in favour of not going far beyond such sources for basic statistical series. But, given the absence of satisfactory quarterly indicators of aggregate economic activity, the New Zealand situation is rather abnormal by comparison with most other Western countries. The econometric model-builder thus has no alternative but to endeavour to construct a proxy series approaching gross national product if a model is to have any meaningful and theoretically acceptable structure. This is the approach which has been forced upon the Research Section of the Reserve Bank in order to provide an adequate framework on which to build a model. The resultant quarterly aggregate expenditure series, Y, which is described in detail by Lumsden and Deane (10), basically comprises the sum of various expenditures in the following sectors: retail, services, automotive, government, building and construction, plant and equipment, trade stocks (i.e. non-farm stocks), and exports less imports. On a March year basis, the series closely correlates with the official estimates of gross national product. An earlier version of this aggregate expenditure series has been used successfully in a 63 equation model of the New Zealand economy (1) and a revised and extended version of Y is also used in this paper.

The endogenous monetary variables are generally drawn from the Reserve Bank's quarterly compilation entitled "Money Supply and Selected Liquid Assets of the Public". However, it should be observed that the data do not always correspond with the comparable published versions due usually to minor modifications which are required for the balance sheet approach which is adopted here. For example, deposits of non-bank financial institutions are excluded from trading banks' deposits under the Reserve Bank's money supply definition; in the case of the model these deposits are added back to give the relevant bank liability aggregate.

Given the absence of any official quarterly estimates of either wealth or national income, two proxy variables are initially tested in this role: retail trade turnover and, where it seems relevant, net salary and wage income (private plus government sectors). In each case various weighted averages of recent past values of these variables were constructed in a crude endeavour to approximate more closely the somewhat elusive wealth concept. This approach is along similar lines to other work already mentioned. The wealth of financial institutions is taken as the sum of their deposits, this aggregate being treated as effectively representing total liabilities. The data shortcomings in respect of wealth, and wealth proxies, discouraged extensive testing of the ratio form of the typical equation discussed earlier. Nevertheless, it can be recorded that deflation by a permanent retail trade turnover variable (with weights similar to those originally employed by Friedman) generally fails to yield results significantly better than those presented in this paper. The same applies to permanent net salary and wage income. For these reasons, the simpler linear form is preferred.

Although official data are employed throughout the detailed equation testing procedures, in order to illustrate the nature of the results which can be achieved with proxies of this type, the preferred behavioural equations of the monetary model are re-estimated at a later stage in the paper by substituting the new aggregate expenditure series, Y, for the official general activity variables (either retail turnover or net salary and wage income, as appropriate). This demonstrates the way in which the monetary sector can be conveniently incorporated in an economy-wide model with the desired feedback relationships. For example, the use of the official proxies such as retail turnover will fail to capture adequately the impact of a change in either of the two major exogenous variables in the overall model, government expenditure and export receipts. The aggregate expenditure series, on the other hand, includes each of these variables, thus facilitating a direct influence on the monetary magnitudes. If the monetary variables in turn have some influence on the expenditure side of the model, as appears to be the case (see Deane (1)), the nature of the circular flow is clear. The results from both approaches—using official and unofficial data—are compared towards the end of the paper.

A variety of interest rate variables are tested in the equations with the limits again being imposed by data availability. The nominal own rate on currency and trading banks' demand deposits in New Zealand is zero.[8] Throughout the estimation period the rate on savings banks' current deposits remained at 3 percent, making it impossible to test the private sector's reaction to a change in this rate. Thus the paper concentrates on three principal rates of return on financial assets: the yield on short-term government securities; the interest rate on short-term non-carded trading banks' fixed deposits; and the savings banks' investment account interest rate. Carded rates are fixed by agreement be-

---

(8) The cost of holding bank deposits in terms of bank fees, etc., is effectively ignored under this approach.

tween banks for small deposits while non-carded rates reflect a greater element of competition for deposits of larger amounts. Hence the latter rates are employed in the model although no official published series is available in this area. Following other writers, such as Teigen (17), interest rates are introduced multiplicatively with the general activity variable in some relationships where this significantly improves the equation and its overall fit. This procedure allows more adequately for the differential effects of changes in rates over time as holdings of financial assets and liabilities grow in response to economic growth and increased affluence generally. For the bank advances equation two borrowing rates are tried: the actual average overdraft interest rate (available only at six-monthly intervals but interpolated to obtain quarterly estimates) and the official maximum average rate (which is varied from time to time at the discretion of the monetary authorities).

No attempt is made at this stage to enter the difficult area of estimating variables to account for changes in expectations as far as future levels of interest rates are concerned. Although these expectations are usually measured empirically by weighted moving averages of past actual interest rates, there is unfortunately no guarantee that variables constructed in this manner genuinely reflect what they are intended to represent. It is hoped that some attention will be devoted to this area in the future. Another obvious deficiency of the monetary model, and one that is unavoidably common to all work in this field, is the use of nominal interest rates in place of the theoretically ideal real rates.

The major short-term constraint variable employed in the model is the flow of taxation receipts to Government from the corporate sector and other persons (i.e. persons other than salary and wage earners who pay tax on a regular P.A.Y.E., pay-as-you-earn, basis). Under the New Zealand income tax system the financial sector experiences a strong seasonal build up in liquidity for much of the financial year. There is some flow of payments in September but this is far outweighed by the massive March tax flow when the bulk of non-salary and wage income tax payments take place. At a later stage, when work is completed on the construction of a full quarterly series for the Government's accounts, it is hoped to test a more adequate type of "impact" variable in this context, along the lines of the domestic official borrowing concept used by Norton, et al (13).

Two final points warrant mention in this section. First, the adjustment coefficient mentioned in the earlier discussion of the underlying theory should be interpreted with some care, given the preceding list of data deficiencies. Nevertheless, the speeds of adjustment implied by the coefficients on the lagged stock in most of the equations are not implausible nor generally greatly out of line with those found in comparable research elsewhere. Secondly, the use of current price data rather than constant price data is justified on grounds similar to those of other studies; simply, that the lack of appropriate price deflators, particularly for monetary data, precludes any alternative course of action.

D. INSTITUTIONAL FACTORS

The decade of the 1960's marked a number of significant changes in policy attitudes towards the New Zealand monetary sector leading, among other things, to several substantial changes in the institutional structure. In developing an econometric model based on time series data, such changes can create a variety of statistical hazards. These problems are reflected in the model in several ways. For example, some use is made of what are loosely termed institutional dummy variables to account for large and at times arbitrary shifts between different classes of financial assets. Considerable care has been exercised with the construction and use of these variables to ensure they only account for changes genuinely not attributable to other explanatory variables at the time of an institutional upheaval. In one case, that of trading banks' term deposits, a reasonable result could only be obtained by eliminating completely the first half of the standard estimation period. For some other equations the usual underlying theoretical basis, as provided by the stock adjustment model, has been varied to yield more plausible results. Savings banks' deposits are a good example of this. The flow of these deposits has been affected markedly by institutional changes during the period.

To assist the interpretation of the results in this paper, the following summary of major structural changes in the financial system during the 1960's may be useful:

1. The short-term money market was given official blessing in 1962, when five dealers were approved by the Reserve Bank subject to certain conditions.
2. In the early sixties the number of trustee savings banks expanded from a total of six to thirteen, thus giving a much wider geographical coverage of the country.
3. Private savings banks, all subsidiaries of the trading banks, were established in late 1964 and enjoyed exceptionally rapid growth during most of the model's estimation period at the expense of, among others, the Post Office Savings Bank.
4. The term loan system for trading banks was introduced in 1963.
5. In 1965, the banks were encouraged to compete more actively for fixed deposits when the officially controlled interest rates were moved up to a more realistic level and the banks were allowed, effectively for the first time since 1941, to expand their holdings of government securities according to a formula laid down by the authorities.
6. Also in 1965 the banks were authorised to take up shareholdings in the rapidly expanding field of hire-purchase finance companies.
7. In 1967 capital issues control was imposed on finance companies, this being replaced in 1969 by a variable government stock ratio requirement.
8. A series of "voluntary" arrangements for the diversion of substantial funds to the Government sector were introduced and utilised during the mid-sixties (with one such arrangement, that with insurance companies, still in operation). The commitment to

government security ratios as a means of financing the Government's deficit before borrowing and ostensibly also to regulate non-bank intermediaries was amply confirmed by the 1970 Budget when those financial institutions not already subject to such ratios were brought within the official net, in most cases by direct legislative action.

9. An attempt was made in June 1969 to rejuvenate the ailing Post Office Savings Bank through the introduction of new savings schemes.

10. In an endeavour to improve further the competitive position of the trading banks, the 1969 Budget and October 1970 mini-Budget granted complete freedom for the banks to compete for fixed deposits in excess of $25,000 (1969) and for terms of two years or more, regardless of amount (1970). An incentive to move in this direction was provided by permitting the banks to become fully invested, meaning that instead of holding large idle balances during the seasonal liquidity build-up, the banks are now able to invest much of this spare cash in official securities, thus earning additional income to meet the higher interest rates on fixed deposits.

11. Treasury Bills, very short-term negotiable government stock, were introduced in 1969.

12. Over the ten years, the ceilings system for bank advances has been gradually modified to cope with problems such as insistent requests for inclusion of new categories of borrowers in the priority group and growing inequities as between individual banks in the distribution of penal borrowing. Ironically enough the priority aggregate has increased so rapidly that provision for a form of mild restraint in this area was at one stage recently considered necessary by the authorities.

Two major unifying themes emerge from this summary of changes in the financial system. The first has been the desire of the monetary authorities to extend their influence beyond the traditional confines of the trading bank sector. This they have chosen to do largely by way of direct controls, especially government security investment ratios, supplemented by some variations in interest rates. Obviously Government retains strong doubts about the role of the market system in this context. The second underlying factor has been the authorities' need to create new financial assets during the period under consideration. The most important causal element here has undoubtedly been the need to maintain the flow of funds from the "captive" institutions to the Government. Political pressure from the financial institutions probably constituted a secondary influence.

Thus, the bias of monetary policy during the past decade has been towards the regulation of bank advances by direct controls supplemented by the extension of government security investment ratios over an increasingly wide range of non-bank financial intermediaries. Savings banks, money market dealers, finance companies, stock and station agents, building societies, life insurance companies and private superannuation funds all come within the official legislative or persuasive framework. In addition, the monetary authorities have continued to control a range of important interest rates, albeit in a relatively passive manner at least until the last year or two. Hence the policy variables incorporated in the model are of several types: a dummy variable, described later, to account for official efforts to achieve direct control over the level of trading bank lending; an amalgamated ratio variable to represent mandatory requirements in respect of the savings banks' holdings of government securities; trading banks' reserve cash ratios; and a variety of interest rates subject to the authorities' control, either directly (savings banks' deposit and investment account rates; trading banks' advances and fixed deposit rates, the latter at least until mid-1969) or indirectly (government security yields, which are dependent largely on movements in new issue rates as the open market in these bonds is very thin).

Generally speaking, the paper takes for granted a knowledge of the manner in which monetary policy operates in New Zealand. But there is one point which should perhaps be spelt out in relation to the channels through which policy is applied. On the basis of an assessment of current and likely future trends in economic activity, including the balance of payments, the authorities endeavour to establish ceilings for bank lending which seem to them to be reasonably consistent with the Government's economic objectives. Neither the methodology employed in setting "appropriate" ceilings, nor the ceilings themselves, are available in published form. However, there are two main categories of lending targets: priority export orientated sectors (top-tier) and all other non-priority groups lumped together (bottom-tier). Policy attention has until very recently been restricted almost entirely to the latter category. Accordingly, if actual bottom-tier advances exceed their corresponding ceiling, a penalty is imposed usually by means of enforced penal borrowing, the amount being related to the offending excess. Prior to September, 1969, compliance with the penal requirements was ensured by means of the reserve ratio system. In other words, ratios were raised to levels which forced the banks "into the red" by the necessary amount. Apart from this, of course, there were many reserve ratio changes during the period designed to cope simply with the strong seasonal fluctuations experienced in banks' liquidity in New Zealand. Hence the predominant policy variable from the model's point of view is the predetermined amount of penal borrowing, not the variations in statutory reserve ratios (although these are of course incorporated in the appropriate identity).

The point is further emphasised by the formula system employed since late 1969 to determine penal requirements. This borrowing is now additional to rather than included within statutory minimum cash requirements as set by ratio levels (the latter now remaining at 8 percent of demand deposits and 3 percent of time deposits for all "normal" circumstances). Unfortunately there is no adequate published or unpublished series available to represent penalty borrowing over the past ten years. It is for this reason that a dummy variable is constructed to represent official policy towards bank advances.

E. DATA AND NOTATION

The ordinary single stage least squares estimates in the paper are generally based on quarterly seasonally unadjusted current price data for the period 1960(2) to 1970(1), a total of 40 observations. Where the estimation period varies from the standard, it is expressly noted. The time period is determined primarily by data availability. In particular, the Reserve Bank's "money supply and selected liquid assets" series (14), (15), from which much of the monetary data is drawn, is only available on a quarterly basis from 1960(1). Some of the statistics are not available in official publications including notably parts of the monetary data, especially prior to 1965, the taxation figures, and the series for salary and wage income. Monetary stocks are measured as at the last balance day in the quarter. With the New Zealand financial system being subject to very large seasonal swings in liquidity this type of point measurement inevitably poses some dating problems. For example, trading bank deposits and advances can differ substantially over the space of a few days, especially in March, and hence some random errors must inevitably arise from the mere fact that the last balance day (last Wednesday) in a quarter can vary in actual date from year to year. Nevertheless, the use of, say, weekly average data for the last month in a quarter may well cause more problems than it would solve once the monetary model is incorporated in a larger economy-wide model. An example of this situation would be the need to reconcile the monetary, government and overseas exchange transactions sectors.

The accompanying notation, listed in alphabetical order, is used in the equations. Not all the variables listed are employed in the model (the preferred equations, and accompanying identities, are set out in a later section). Variables endogenous to the present model are denoted by an asterisk (bracketed where implicitly endogenous) while those endogenous to the quarterly model of the whole economy, of which the monetary sector is one part, are indicated by a double asterisk.

	Symbol	*Description*
**	ANZ	New Zealand's official overseas reserves, $m.
	AOS	Net other assets of savings banks, $m.
	AOT	Net other assets of trading banks, $m.
	COT	Coin held by trading banks, $m.
**	CP	Total current payments, OET, $m.
	CR	Total current receipts, OET, $m.
*	CUR	Currency (notes and coins) in the hands of the public, $m.
*	DDS	Demand deposits of savings banks, $m.
*	DDT	Demand deposits of trading banks, $m.
*	DFS	Fixed (investment) deposits of savings banks (including National Savings Accounts), $m.
*	DFT	Fixed deposit of trading banks excluding wool retention deposits, $m.
	DGT	Government deposits at trading banks, $m.
	DRT	Trading banks' total deposits at Reserve Bank (including borrowing), $m. (DRTM + DRTP + DRTF).
	DRTF	Free cash of trading banks, $m.
*	DRTM	Statutory minimum requirements of trading banks, $m.
(*)	DRTN	Net cash position of trading banks, $m. (DRTF — LTRO).
	DRTP	Penal borrowing requirements of trading banks, $m.
(*)	DS	Total deposits of savings banks, $m.
(*)	DT	Total deposits of trading banks, $m.
*	DTS	Savings banks' cash and deposits at trading banks, $m.
	DTT	Treasury deposits at trading banks, $m.
	DWT	Wool retention deposits at trading banks, $m.
*	GS	Government securities held by savings banks, $m.
*	GSR	Required minimum government security holdings of savings banks, $m.
(*)	GT	Government securities held by the trading banks, $m.
	JGS	Yield on short-term government securities, %.
**	JM	Average interest rate on new mortgage registrations, %.
	JSI	Interest rate on savings banks' investment accounts, %.
	JTF	Interest rate on trading banks' fixed deposits (non-carded rates, short end), %.
	JTL	Average trading bank overdraft interest rate, %.
	JTLM	Maximum official average trading bank overdraft interest rate, %.
**	KT	Total trade stocks, including primary produce processing, $m.
*	LLS	Local authority securities held by savings banks, $m.
	LLT	Local authority securities held by trading banks, $m.
(*)	LMWT	Advances by trading banks to meat freezing companies and woolbuyers (some estimation prior to 1965), $m.
*	LPS	Lending to the private sector by savings banks (excluding LLS), $m.
*	LPT	Advances, discounts and term loans to the private sector by trading banks (excluding LLT), $m.

	Symbol	*Description*
(*)	LPT1	Trading bank lending to the private sector excluding meat freezing companies and woolbuyers, \$m. (LPT — LMWT).
	LTR	Trading bank borrowing from Reserve Bank, \$m.
	LTRO	Trading bank borrowing, other than penal borrowing from Reserve Bank, \$m.
*	LTRP	Trading bank penal borrowing from the Reserve Bank, \$m. (= DRTP).
(*)	NCT	Notes and coins held by trading banks, \$m. (NOT + COT).
	NCDT	Notes, coins and deposits at Reserve Bank of trading banks, \$m. (NCT + DRT).
*	NOT	Notes held by trading banks, \$m.
	NSG	Savings banks' weighted average required government security ratio, fraction.
	NTD	Trading banks' reserve ratio for demand deposits, fraction.
	NTF	Trading banks' reserve ratio for fixed deposits, fraction.
	OET	Overseas exchange transactions basis.
*	REST	Trading banks' balance sheet residual (sum of holdings of government securities and net free cash), \$m.
**	RT	Total retail trade turnover, \$m.
**	RTP	Permanent total retail trade turnover, \$m, defined as follows: $RTP = 0.139 \sum_{i=0}^{11} .9^i RT_{t-i}$
	S_i	Seasonal dummy; = 1 in quarter i, = 0 elsewhere.
(*)	TDA	Total selected domestc assets of the trading banks, \$m.
(*)	TDL	Total selected domestic liabilities of the trading banks, \$m.
**	TY	Total income tax paid to public account, net of refunds, \$m.
**	TYCG	Income tax paid, companies (subsisting plus provisional), gross, i.e. excluding refunds, \$m.
**	TYOG	Income tax paid, other persons gross; i.e. excluding refunds, \$m.
	TYOR	Income tax refunds, other persons, \$m.
	TYSR	Income tax refunds, salary and wage earners, \$m.
	XB	Capital account balances, OET, \$m.
	XPB	Private capital balances, OET, \$m.
**	YSN	Salary and wage income, net of income tax, \$m.
**	YSNP	Permanent net salary and wage income, \$m. Defined as follows: $YSNP = 0.176 \sum_{i=0}^{7} .9^i \; YSN_{t-i}$
**	Y	Aggregate expenditure series, \$m. (For details, see Lumsden and Deane (10).)
	ZA	Dummy variable to represent official monetary policy in respect of trading bank advances. Assumes the following values: 0 = policy, passive or permissive; 1 = policy, caution; 2 = policy, firm restraint; and 3 = policy, severe restraint. (See text for full explanation).
	ZDC1	Dummy variable to account for dishoarding of currency during the decimal currency change-over period. Takes the value 1 in 1967(2).
	ZDC3	As for ZDC1, except takes the value 1 from 1967(3) to 1969(1).
	ZE	Dummy variable to account for Easter falling at the end of March. Takes the value 1 in the March quarters of 1961, 1964 and 1970.
	ZIS1	Dummy variable to account for the period prior to the introduction of the private savings banks; takes the value 1 up to and including 1964(3).
	ZIS2	Dummy variable to account for the influence of the opening of the private savings banks; takes the values 1, 1, 1, 0.7, 0.3 in successive quarters, commencing in 1964(4).
	ZIS3	Dummy variable to account for a statistical discrepancy in the data for savings banks' cash; takes the value 1 in 1962(4).
	ZJS1	Dummy variable to account for the immediate impact of a change in the savings banks' investment account interest rate; takes the value 1 in 1962(4) and 1966(3).

In the results, a number of abbreviations are used for the statistical tests:

R^2	Coefficient of determination
S.E.E.	Standard error of the estimate
D.W.	Durbin-Watson statistic.

T-values are provided in brackets below the corresponding coefficients. The symbol $\triangle$ preceding a symbol indicates the change in that variable. Lags are denoted by subscripts where relevant, e.g. ZA_{-2} is ZA lagged two quarters. An asterisk in either the equations or the identities indicates multiplication of the relevant variables.

F. RESULTS

The results are discussed in the following order: currency; trading banks' demand deposits, fixed deposits; savings banks' total deposits, investment account deposits, demand deposits; trading banks' advances, holdings of notes and coin; savings banks' cash, holdings of government securities and holdings of local authority securities. The major statistical estimates are set out in a series of tables while graphs applicable to the preferred equations for some of the more important variables are provided to help illustrate the nature of the results. After the discussion of the results a summary of the model is set out, including identities as well as the set of preferred behavioural equations.

(1) *Currency*

A selection of equations explaining the change in the non-bank public's holdings of currency is presented in Table 1. The equations can legitimately be interpreted as demand equations since the supply of currency is always adjusted by the banking system to meet the needs of the community.

The equations include two special dummy variables, ZDC1 and ZE. The former accounts for a substantial reduction in currency which occurred in the June quarter of 1967 (just prior to the decimal currency changeover) and which could not be explained by the other independent variables. ZE allows for the fact that some March quarters end during or immediately prior to the Easter holiday. When this occurs the end of quarter figures for currency in circulation are substantially inflated. Hence this variable can be regarded as simply a balance day adjustment factor. The significance of the seasonal dummy variables illustrates the nature of the strong seasonal movements in the currency series.

Estimates 1.1 to 1.4 compare four variables chosen as likely national income proxies: retail turnover and net salary and wage income, each on a current and permanent basis alternatively. In a statistical sense there is little difference between the results obtained with each of these variables. The decimal currency and Easter dummies are both significant, as is the lagged stock of currency which has the anticipated negative coefficient. The best overall fit is obtained with YSNP although in equation 1.4 the lagged stock variable attracts a rather low T-value.

The savings banks' investment account interest rate, JSI, yields the expected negative coefficient in equations 1.6 and 1.7, suggesting at least superficially that the community attempts to economise on their holdings of currency (itself assumed to have a zero rate of return, which is true in nominal terms if not in a real sense) in response to a rise in interest rates on an alternative relatively liquid financial asset. However, JSI is not significant at the 5 percent level (which is the criterion normally adopted in this paper). Unfortunately it would be meaningless to test the interest rate on savings banks' ordinary current account deposits, as this has remained unchanged during the past decade. Other rates tried—JGS and JTF—yielded poor results, entering with positive and statistically insignificant coefficients.

Some improvement in the fit of the equations is obtained by making the ZE variable multiplicative on income, as in equations 1.8 and 1.9. In the latter case the coefficient on YSNP is somewhat lower (although remaining significant) and lagged currency's coefficient rather higher (and statistically more significant) than in estimate 1.4. Hence 1.9 is the preferred equation; the estimates and residuals obtained from it are presented in graph 1.

Two points of some interest emerge. First, the low coefficients on retail turnover and income are probably attributable to the very slow rate of growth in holdings of currency between 1960 and 1970. This in turn would appear to reflect the increase in the general public's usage of cheque facilities. Secondly, the coefficient on the lagged stock of currency in equation 1.9 implies an average lag in adjusting actual holdings to desired holdings of about 3 quarters.

(2) *Trading Banks' Demand Deposits*

Again, the equations in Table 2 can be viewed as demand functions in the sense that the banks are assumed to be willing to accept all offers of deposits at the going (zero) interest rate. All the equations suggest the importance of interest rates on alternative financial assets in explaining changes in bank demand deposits. In particular, the non-carded rate on trading banks' fixed deposits and the yield on short-term government securities give satisfactory results although it needs to be borne in mind that these rates may well be serving as proxies for returns on competing assets other than simply fixed deposits and official bonds. Clearly there has been some substitution between demand deposits and other financial assets during the period under consideration.

On a priori grounds retail trade turnover is judged to be a more relevant national income proxy variable than the net salary and wage income series favoured in the currency and savings banks' deposit equations. There appears to be little to distinguish between the performance of RT and RTP (the permanent concept), except that in the case of RT the three seasonal dummy variables explain less of the variation in the dependent variable than with RTP (e.g. compare the coefficients on S_4).

Two major constraint variables are tested in the equations. As suggested by the coefficients on the seasonals in estimates 2.1 and 2.2, the tax flow into the Public Account is considered an important influence on the level of demand deposits. This is confirmed by equations 2.3 to 2.6 which illustrate (a) the interaction between the seasonal dummy variables and total net tax receipts (2.3); (b) the effect of dropping S_2 and S_4 in

THE PUBLIC

(

No.	Constant	S_1	S_2	S_3	CUR_{-1}	RT	RTP
1.1	47.6068	—35.0453 (12.8975)	—21.1088 (12.8936)	—18.3645 (11.4097)	—0.2407 (2.1342)	0.0161 (1.8615)	
1.2	44.3582	—36.4347 (13.0368)	—21.8081 (14.0795)	—19.1084 (12.7166)	—0.2181 (1.9116)		0.0191 (2.0444)
1.3	45.0706	—35.9298 (13.2897)	—21.4270 (13.7934)	—18.7425 (12.4128)	—0.2224 (1.9913)		
1.4*	38.0779	—36.3079 (13.4188)	—21.3892 (13.5059)	—18.4753 (12.0603)	—0.1924 (1.7397)		
1.5*	39.7378	—35.6067 (13.2879)	—20.8875 (12.8995)	—17.9832 (11.4446)	—0.2014 (1.8180)		
1.6	59.3568	—34.6060 (11.3530)	—21.1943 (13.4541)	—18.5068 (12.0738)	—0.2707 (2.2014)		
1.7	59.1374	—35.5174 (12.0060)	—21.8891 (14.0920)	19.1619 (12.7264)	—0.2643 (2.1308)		0.0411 (1.6548)
1.8	57.4850	—34.8107 (14.4281)	—21.5657 (15.4262)	—19.0587 (14.0118)	—0.2927 (2.8726)		
1.9*	51.3283	—35.0003 (14.3417)	—21.3854 (14.8424)	—18.6583 (13.3822)	—0.2652 (2.5977)		

* Estimation period 1961(1) - 1970(1); 37 observations.
** Multiplicative on the "general activity" variable present in the equation (e.g. in 1.8 this variable is ZE1 * YSN).

TABL
TRADING BANK
(Δ DDT

No.	Constant	S_2	S_3	S_4	DDT_{-1}	RT	RTP
2.1	259.8280	30.5100 (4.7937)	—9.4816 (—1.8449)	34.3743 (3.0789)	—0.4919 (4.2311)	0.3611 (3.4453)	
2.2	263.2862	36.2456 (6.3050)	—6.9767 (1.3662)	55.8129 (7.5684)	—0.4580 (4.1340)		0.3600 (3.4538)
2.3	259.9969	23.1328 (1.2885)	15.6374 (1.0482)	26.6236 (1.2725)	—0.4827 (4.0366)	0.3655 (3.4278)	
2.4	286.7181		33.7622 (6.9308)		—0.5078 (5.4232)	0.4163 (5.8782)	
2.5	292.1783		—34.6688 (7.0803)		—0.5098 (5.5943)	0.3988 (5.6028)	
2.6	282.4006		—36.3589 (7.9106)	19.1439 (3.5495)	—0.4392 (3.9326)		0.3729 (3.6146)
2.7	297.9052		—35.9369 (8.1221)		—0.4716 (5.6179)	0.3755 (5.7547)	
2.8	279.1774		—38.1612 (8.7967)	19.1423 (3.8158)	—0.3847 (3.6217)		0.3178 (3.2249)
2.9	152.0481		—34.9987 (7.5183)		—0.4812 (5.6650)	0.7621 (7.2938)	

* Multiplicative on RT.

BLE 1
OLDING OF CURRENCY
JR DEPENDENT)

YSN	YSNP	JSI	ZDC1	ZE1	R^2	S.E.E.	D.W.
			—11.4645	14.4139	.954	3.359	2.26
			(3.1906)	(6.1697)			
			—11.6600	14.4812	.955	3.326	2.28
			(3.2705)	(6.2600)			
0.0156			—11.7915	14.4373	.956	3.292	2.30
(2.2189)			(3.3377)	(6.3054)			
	0.0226		—11.6704	14.3568	.958	3.219	2.26
	(2.7735)		(3.3692)	(6.4139)			
0.0197			—11.7855	14.4360	.958	3.245	2.20
(2.6630)			(3.3683)	(6.3963)			
0.0287		—3.1862	—11.3638	14.2835	.957	3.298	2.33
(1.8469)		(0.9461)	(3.1855)	(6.2125)			
		—3.9127	—11.1115	14.3462	.956	3.331	2.32
		(0.9564)	(3.0731)	(6.1818)			
0.0096			—11.5671	0.0383**	.964	2.963	2.34
(1.5076)			(3.6381)	(7.5215)			
	0.0149		—11.5018	0.0385**	.966	2.928	2.39
	(1.9992)		(3.6501)	(7.4655)			

2
DEMAND DEPOSITS
DEPENDENT)

JGS	JTF	TY	TYCG + TYOG	XPB	R^2	S.E.E.	D.W.
—17.5374	—13.7412				.931	10.653	2.15
(2.2563)	(2.2899)						
—22.8714	—12.6741				.931	10.646	2.20
(2.9440)	(2.2182)						
—17.2808	—13.2980	—0.0296			.931	10.790	2.16
(2.1891)	(2.1585)	(0.4403)					
—17.6558	—13.6112	—0.1094			.928	10.741	2.14
(2.2849)	(2.6217)	(4.6390)					
—18.0054	—14.0780		—0.1173		.930	10.592	2.11
(2.3692)	(2.7689)		(4.8030)				
—22.5755	—11.7855		—0.1439		.932	10.585	2.13
(2.9182)	(2.0706)		(6.3698)				
—23.1585	—12.3911		—0.1405	1.5306	.944	9.629	2.08
(3.2400)	(2.6584)		(5.9320)	(2.8154)			
—26.4023	— 8.7708		—0.1647	1.3875	.943	9.846	2.11
(3.5855)	(1.6136)		(7.2662)	(2.4470)			
— 0.0554*	— 0.0358*		—0.1372	1.5354	.940	9.951	2.09
(2.8500)	(2.9632)		(5.4416)	(2.6432)			

favour of TY (2.4); and (c) the superiority of (TYCG + TYOG) over the aggregate version, TY (compare 2.4 with 2.5 and 2.6). The former tax variable represents gross taxation paid by the corporate and "other persons" sectors, thus excluding, among other things (such as tax refunds), salary and wage earners' payments which are made on a P.A.Y.E., pay-as-you-earn, basis. The second constraint variable, private net overseas capital inflow, is included in equations 2.7 and 2.8. Although other overseas exchange transactions concepts were tried in this context, XPB was the only one which brought any improvement. The coefficient on XPB is a little larger than perhaps may be expected but it is quite significant and generally improves the basic equation (compare the T-values and S.E.E. between 2.5 and 2.7).

Equation 2.7 is the preferred estimate (see graph 2). It suggests that changes in trading banks' demand deposits are determined primarily by a general activity variable, retail turnover, interest rates on competing assets, and the lagged stock of demand deposits with an implied adjustment period of just over one quarter. Additionally, changes in holdings of these deposits are constrained by the size of the September and March tax flows and the impact of overseas capital flows measured in cash terms. Finally in this section, it can be noted that incorporating interest rates multiplicatively on RT rather than in linear fashion gives an inferior result (2.9 compared with the preferred estimate, 2.7).

(3) *Trading Banks' Fixed Deposits*

As observed earlier in the section on institutional matters, there was little encouragement for the banks to expand their holdings of interest-bearing term deposits prior to 1965. However, from mid-1965 to mid-1969, considerable growth occurred in fixed deposits under a formula system linking increases in these liabilities to an expansion in trading banks' holdings of government securities, this constituting the first meaningful rise in these holdings since the war. Fixed deposit interest rates, traditionally subject to regulation by the monetary

TRADING BANK FIXED
ESTIMATION PERIO]

No.	Constant	S_1	S_2	S_3	S_4	DFT_{-1}	RT
3.1	—254.5623	34.1634	23.4395	42.0198		—0.8733	0.8136
		(2.4602)	(2.7195)	(3.9876)		(5.5152)	(4.7662)
3.2*	— 18.3958	—14.7454	— 0.7872	3.6066		—0.0279	0.0913
		(1.9854)	(0.1280)	(0.5061)		(0.3511)	(0.9486)
3.3	—243.6167	36.0748	25.7511	44.6881		—0.8382	0.8585
		(2.6553)	(3.1712)	(4.4755)		(5.5263)	(5.3279)
3.4	—115.3789	—17.0052	— 9.6814			—0.8194	
		(2.6767)	(1.9233)			(4.2116)	
3.5	—115.6973	—17.3075	— 9.7709			—0.7618	
		(2.6819)	(1.9097)			(3.9695)	
3.6	—261.4304		23.6883	36.8253		—0.9129	0.8414
			(2.5397)	(3.9616)		(4.9790)	(4.3069)
3.7	—110.2188		— 9.9490	2.2666		—0.7773	
			(1.6719)	(0.4352)		(3.7577)	
3.8	—210.7572	31.1170	20.9333	38.4896		—0.8825	0.6655
		(2.5276)	(2.7074)	(4.0518)		(6.4681)	(3.1807)
3.9	—239.5127		—10.8237			—0.8608	
			(2.2667)			(4.4455)	
3.10	— 37.8120		—141.9811	—103.3174	—159.9281	—0.6397	0.6083
			(1.1516)	(0.9896)	(1.3474)	(2.3714)	(2.3702)
3.11	—165.4192		—18.9733		— 39.3408	—0.8607	0.6457
			(3.9232)		(4.2528)	(5.9994)	(3.0505)

* Estimation period 1960(2) – 1970(3): i.e. 42 observations.

** Multiplicative on the general activity variable or wealth variable present, i.e. in equation 3.8 this variable is e.g. JGS * authorities, also increased during this period and, in fact, since June 1969 the banks themselves have enjoyed considerable freedom in determining their own rates. Accordingly, the equations in table 3 are estimated for the period 1965(3) to 1970(3), a total of 21 observations. The justification for using the shorter time period is supported by a comparison of estimates 3.1 and 3.2. The latter equation, which covers a 42 observation period (1960(2) to 1970(3)), gives results which are quite implausible relative to what would be expected on the grounds of normal portfolio behaviour and in the light of the results for the shorter but more relevant time span.

Equations 3.1 and 3.3 reveal the importance again of retail trade turnover, interest rates and the lagged stock of the financial asset in question, term deposits, as explanatory variables. As anticipated, JTF (the own rate) has a positive coefficient, while the negative coefficient on JGS indicates that trading bank fixed deposits represent close substitutes for other competing financial assets. As in the case of demand deposits, JGS is probably acting as a proxy for a vector of yields on alternative assets and should be interpreted in this light with some care. The results are more satisfactory using individual rather than differential interest rates, as shown in equations 3.3 and 3.5. Furthermore, estimates 3.4 and 3.5 show that RTP is inferior to RT, although it still provides reasonable results.

Some difficulties were encountered in testing the flow of taxation payments (TYOG + TYCG) as a constraint variable in the equations. The March quarter seasonal has to be dropped because of the high correlation between it and the tax variable. Equations 3.6 and 3.7 show that the tax variable behaves as expected when RTP is used, but "perversely" when RT is included. The addition of S_4 to estimate 3.6 helps to solve this problem, as illustrated by equation 3.10, but the tax variable still does not have sufficient statistical significance to warrant its retention as an explanatory variable.

TABLE 3
DEPOSITS (△ DFT DEPENDENT)
1965(3) - 1970(3) : 21 OBS

RTP	JGS	JTF	JGS-JTF	TYOG + TYCG	R^2	S.E.E.	D.W.
	—27.4623	37.1526			.898	7.668	2.31
	(3.2174)	(2.4739)					
	— 1.0888	—0.0122			.460	11.575	2.28
	(— 0.1498)	(0.0020)					
			—26.4118		.892	7.598	2.07
			(3.1546)				
0.9591	—53.6858	30.1132			.844	9.114	2.10
(3.4034)	(4.4195)	(1.5988)					
0.6994			—48.5212		.828	9.264	2.34
(3.7029)			(4.1898)				
	—27.9464	37.2964		0.1198	.892	7.863	2.39
	(— 3.1826)	(2.4218)		(2.2624)			
0.9105	—51.7566	30.2666		—0.0614	.849	9.311	2.09
(3.0821)	(4.0659)	(1.5725)		(2.4713)			
	— 0.0607**	0.0958**			.921	6.749	2.32
	(3.8957)	(3.2907)					
1.2598	— 0.1346**	0.0830**		—0.0570	.868	8.389	2.04
(2.8699)	(4.6190)	(1.9847)		(2.5645)			
	—25.0755	37.1960		—0.4710	.907	7.627	2.05
	(2.8559)	(2.4899)		(1.0668)			
	— 0.0600**	0.0954**		—0.0326	.922	6.705	2.31
	(3.8593)	(3.2953)		(1.4039)			

RT while in equation 3.9 it is JGS * RTP.

An appreciable improvement to the fit of the equations can be achieved by introducing the interest rate variables multiplicatively on RT (compare estimate 3.8 with 3.1). This result is not surprising given the very rapid rate of growth in fixed deposits (since 1965); a rate which, incidentally, was much higher than that achieved by currency and trading bank demand deposits. This latter fact could help explain why multiplicative interest rates are relatively more successful in the case of term deposits. The preferred estimate, number 3.8, is illustrated in graph 3. The result implies a very fast adjustment rate which may not be unrealistic, at least under the rather unusual circumstances which prevailed during the estimation period (note the high coefficient on DFT_{-1}).

(4) *Savings Banks' Total Deposits*

In developing equations to explain changes in holdings of savings banks' deposits several major problems emerged. One of these, the introduction during the estimation period of new institutions, has already been mentioned. Close inspection of the movements in small savings before and during the period of institutional upheaval suggests that this change of itself led to a significant rise in savings' deposits. This is not surprising given considerations such as the greatly expanded geographical coverage of the trustee savings banks and the opening of private savings banks as subsidiaries of the five trading banks. These intermediaries offer substantial non-interest rate benefits to their deposit holders (not available, it may be added, from the traditional collector of New Zealand's small savings, the Post Office Savings Bank). These include in both cases the availability of mortgage finance, a not unimportant factor in a country where there appears to have been an excess demand for private dwellings throughout most of the model's estimation period (1960-1970), this being related of course to a major constraint in the form of a shortage of mortgage finance (relative to the demand

TABLE 4

SAVINGS BANKS' TOTAL DEPOSITS

No.	Constant	S_2	S_3	S_4	DS_{-1}	$\triangle DS_{-1}$	RT	YSN
4.1	45.6715	—44.4507	—24.5197	—45.3811			0.0443	
		(5.0058)	(5.1489)	(4.5886)			(2.0283)	
4.2	49.0497	—44.7349	—24.7877	—44.4519				0.0329
		(4.9660)	(5.1440)	(4.5541)				(1.9407)
4.3	46.6622	—43.5410	—24.1502	—42.5936				
		(4.8962)	(5.0615)	(4.4912)				
4.4**	47.4105	—46.3295	—26.6278	—46.5629				
		(5.1365)	(5.4546)	(4.8299)				
4.5	1.7350	—39.9236	—20.9663	—46.7290	—0.0484		0.2013	
		(3.9925)	(3.9253)	(4.0068)	(1.3992)		(1.5196)	
4.6	37.5741	—42.7327	—22.6221	—41.4239			0.0228	
		(4.2943)	(4.2755)	(3.6974)			(0.6295)	
4.7	51.6900	—41.3357	—22.0861	—39.1263			—0.0614	
		(4.1464)	(4.1897)	(3.4576)			(0.5613)	
4.8***	44.6922	—44.5184	—25.9690	—48.3322		—0.3485	0.0405	
		(4.7535)	(5.0883)	(4.4706)		(2.5713)	(1.1738)	
4.9	28.3894	—47.2177	—25.7789	—49.7508			0.1667	
		(5.1687)	(5.2274)	(4.9068)			(3.8442)	
4.10**	29.3737	—49.8651	—28.3907	—50.1533				
		(4.3123)	(5.5550)	(4.9753)				
4.11**	43.0883	—47.2492	—26.8128	—49.9328			0.0574	
		(5.3160)	(5.5954)	(4.9935)			(2.5207)	

† This variable is JGS — JSI.
* Multiplicative on general activity.
** Estimation period 1961 (1) to 1970(1); 37 observations.
*** Estimation period 1960(3) to 1970(1); 39 observations.

for it). Furthermore, the private savings banks offer the advantage of all banking needs being met by one institution, with the trading banks offering not only savings facilities and mortgage finance but also cheque accounts and loans by way of the overdraft system. Moral persuasion has probably also helped to ensure a positive correlation between the granting of requests for short-term personal overdraft limits and the growth of new savings accounts with the private savings banks.

In order to cope with institutional changes of this type on an empirical level two dummy variables were constructed. The first, ZIS1, takes the value 1 up to and including 1964(3) and zero thereafter, thus splitting the estimation years into two parts approximately equivalent to the periods before and after the major institutional changes took place. The precise date of change is admittedly blurred by the gradual establishment over a year or two of new trustee banks but corresponds more closely to the setting up of the private savings banks. The latter appeared to exert a rather more substantial influence on the data than the new and smaller trustee banks (excluding the existing ones from consideration in this context). This type of variable would be expected to assume a negative coefficient reflecting the generally lower level of deposits prior to the major expansion in the number of savings banks. Alternatively, the problem can be handled by a variable designed to detect only the short-term impact of the change. This is the role of ZIS2 which takes positive declining values for five quarters after the major change took place. The two variables were constructed essentially to cope with differences which emerged between the two types of savings deposits considered in this paper.

The second major problem is related to the first, in the sense that institutional variations over the past decade have led to a position where New Zealand now has three different types of savings banks. While the claims offered by the three groups do not appear on the surface to be greatly differentiated, the range of "fringe benefits" associated with deposits at the various institu-

(Δ DS DEPENDENT)

RTP	YSNP	JGS	JSI	ZJSI	ZIS2	TYOG	TYOR + TYSR	R^2	S.E.E.	D.W.
		—7.2635†		0.0286*	21.2770	—0.3791	0.8205	.841	5.117	2.87
		(2.7215)		(2.6744)	(6.8917)	(3.7656)	(1.9511)			
		—7.8665†		0.0315*	21.1503	—0.3848	0.8684	.842	5.103	2.93
		(3.1069)		(2.7313)	(6.8954)	(3.7292)	(2.1046)			
0.0427		—7.9876†		0.0318*	21.4653	—0.3765	0.7902	.839	5.146	2.85
'1.8276)		(3.0484)		(2.7023)	(6.8480)	(3.6497)	(1.8040)			
	0.0435	—7.8342†		0.0272*	22.3124	—0.4080	0.8873	.850	5.064	3.08
	(2.2869)	(3.3284)		(2.9912)	(7.1154)	(3.9396)	(2.0781)			
		—4.4022	12.9179		20.2974	—0.2950	1.1302	.817	5.585	2.83
		(1.1967)	(2.0872)		(5.7180)	(2.5199)	(2.3800)			
		—7.0593	10.0157		21.0743	—0.3524	1.0195	.805	5.674	2.90
		(2.2056)	(1.6908)		(5.9172)	(3.1639)	(2.1433)			
		—0.0221*	0.0396*		22.1015	—0.3356	1.1213	.808	5.633	2.81
		(2.3777)	(2.0888)		(6.1289)	(3.0096)	(2.4404)			
		—10.1723	14.6742		26.2945	—0.4241	0.3320	.834	5.270	2.42
		(3.1745)	(2.5335)		(6.7216)	(3.9415)	(0.6445)			
		—0.0178*		0.0326*	20.9093	—0.3968	0.9726	.828	5.320	2.68
		(2.1495)		(2.9221)	(6.2323)	(3.8086)	(2.2084)			
	0.1916	—0.0229*		0.0371*	22.1731	—0.4413	1.0360	.836	5.299	2.82
	(4.2587)	(2.7869)		(3.3191)	(6.5721)	(4.0785)	(2.3255)			
		—6.6010[1]		0.0313*	22.0463	—0.4084	0.8831	.854	4.985	3.12
		(2.5080)		(2.9870)	(7.2414)	(4.1001)	(2.1424)			

tions does seem to be of some significance. But this is an area where measurement is exceedingly difficult and accordingly disaggregation by institution is not pursued in the model. Instead, equations are developed for total deposits on the one hand and for demand (current account) deposits and investment accounts (including National Savings) on the other hand. Although at first sight the latter classification appears a realistic one, in that demand and investment deposits are distinguished by substantially different interest rates (3 and 4.5 percent respectively), there is the complication that an investment account can be broken before its minimum period of one year has expired at an interest sacrifice which gives a yield (2.5 percent) only marginally below that of an ordinary deposit. Thus investment accounts can legitimately be regarded as very close to demand deposits in terms of liquidity. This explains why the aggregate equation is developed and compared with the normally preferred disaggregated approach.

The development of the equations in this section was complicated further by the poor results obtained from the orthodox stock adjustment model. This problem, which has also been experienced in other countries (see for example Norton (12)), is not so surprising given the very large size of the stock of savings deposits relative to the corresponding flow in any one quarter and the fact that many accounts, covering substantial absolute balances, exhibit little activity at least in the short periods being considered here. This degree of passiveness in holdings of small savings suggests that quarterly flows represent, in effect, the "tip of an iceberg". The use of the flow adjustment model, where the lagged change in holdings of the financial asset is employed as an alternative to the lagged stock of the same asset, did not produce satisfactory results either, so most of the equations presented in Tables 4 to 6 exclude these variables. In other words, it is postulated that changes in savings banks' deposits depend primarily on some mea-

CHANGE IN SAVINGS BANKS'

No.	Constant	S_1	S_2	S_3	DFS_{-1}	RT	YSN	RTP
5.1	— 4.3666	24.0332	7.8484	14.1020		0.0877		
		(3.2055)	(3.4412)	(3.1128)		(2.5931)		
5.2	— 1.5814	23.2282	7.0625	13.2123			0.0815	
		(3.1397)	(3.5141)	(3.0272)			(2.5771)	
5.3	— 1.8013	22.5512	6.7288	12.7259				0.0978
		(3.1393)	(3.5044)	(3.0256)				(2.4525)
5.4**	— 1.1278	23.2056	7.5128	13.1329				
		(3.0748)	(3.6715)	(2.9803)				
5.5	—29.1669	25.9874	9.9498	16.9831		0.1218		
		(3.4891)	(4.0279)	(3.6922)		(2.8156)		
5.6	—18.0731	23.7425	7.1477	14.3888			0.0860	
		(3.0810)	(3.3853)	(3.1338)			(2.1481)	
5.7	—14.0048	25.1426	9.6444	16.4596		0.0830		
		(3.3891)	(3.9872)	(3.6155)		(2.6650)		
5.8	— 3.7587	23.3390	7.0066	14.1280			0.0514	
		(3.0230)	(3.3262)	(3.0777)			(1.9068)	
5.9	—21.1420	25.2671	9.3777	15.9677		0.1250		
		(3.3919)	(3.7290)	(3.4165)		(2.8937)		
5.10	—13.5486	24.2955	8.9837	14.9568	—0.0142	0.1056		
		(3.1949)	(2.8597)	(3.0788)	(0.5328)	(2.1979)		
5.11	—37.5049	10.8715	9.6764	9.7984	—0.0574	0.1340		
		(2.9252)	(2.9869)	(2.8315)	(2.7440)	(2.4863)		
5.12	—20.7173	22.4915	7.7426	15.1013		0.0772		
		(2.5066)	(2.5970)	(2.6700)		(0.8050)		

* Multiplicative on the general activity variable present in the equation.
** Estimation period 1961(1) to 1970(1); 37 observations.

sure of income (or a "general activity" proxy), relative interest rates, and constraint variables such as tax payments and tax refunds. In addition, there is an adjustment, as already discussed, for institutional change factors.

Turning to the aggregate equations shown in Table 4, it can be observed that all the estimates include tax payments by persons other than salary and wage earners, TYOG, the tax refunds variable (TYOR + TYSR), and the institutional dummy, ZIS2. The coefficient on refunds is quite large, indicating that a relatively high proportion of these refunds find their way initially into savings banks' deposits. The presence of ZIS2 as a significant variable in the equations implies that the opening of new savings banks in 1964-65 led to a sharp increase in small savings beyond what would normally have been expected at that time. Equations 4.1 to 4.4 compare the performance of RT and YSN, each on a current and permanent basis, as national income proxies. In each of these estimates an interest rate differential variable is employed, (JGS — JSI) (i.e. the difference between the yield on short-term government securities and the interest rate on investment accounts), as well as a dummy variable, ZJSI, to take additional account of the short-term impact of a change in JSI, an event which is a somewhat rare occurrence.

When the own and competing interest rates are incorporated separately and in linear form, as in equation 4.6, JSI generally interacts with the general activity proxy with the result that the coefficients on each of these variables attract rather high standard errors. Adding the lagged stock of deposits to estimate 4.6 gives equation 4.5 which clearly has some unsatisfactory features, such as low T-values on several variables.

Despite this, equation 4.5 is an example of the most satisfactory type of formulation obtained using the stock adjustment model. Equation 4.7 illustrates the multicollinearity problem present when JGS and JSI are entered separately but multiplicatively on RT (the latter

TABLE 5
INVESTMENT DEPOSITS (△ DFS)

YSNP	JGS	JTF	JSI	ZJSI	TYOG	TYOR + TYSR	ZIS1	R^2	S.E.E.	D.W.
	—0.0133*			0.0283*	—0.2081	0.9859	—11.3700	.856	3.929	2.19
	(2.4258)			(3.4364)	(2.6947)	(3.0308)	(4.2148)			
	—0.0137*			0.0270*	—0.2079	1.0455	—11.7486	.859	3.891	2.21
	(2.6846)			(3.5520)	(2.6552)	(3.3169)	(4.4913)			
	—0.0159*			0.0312*	—0.2075	0.9867	—11.8543	.858	3.903	2.17
	(2.6938)			(3.4991)	(2.6629)	(2.9584)	(4.5907)			
0.0892	—0.0150*			0.0294*	—0.2116	0.9884	—11.9298	.852	3.968	2.24
'2.3607)	(2.6641)			(3.4945)	(2.6115)	(2.9631)	(4.6542)			
		—0.0107*		0.0265*	—0.2027	0.8537	—10.4080	.859	3.889	2.19
		(2.5741)		(3.2683)	(2.6477)	(2.6762)	(3.8761)			
		—0.0089*		0.0246*	—0.2100	0.9936	—11.4180	.847	4.045	2.15
		(2.1041)		(3.1195)	(2.5801)	(3.0451)	(4.1624)			
		—4.4412		0.0270*	—0.1936	0.9332	—11.8151	.859	3.885	2.21
		(2.5884)		(3.3312)	(2.5194)	(2.9223)	(4.4117)			
		—3.7854		0.0291*	—0.2002	0.8752	—13.2143	.845	4.077	2.01
		(2.0504)		(3.1497)	(2.4571)	(2.5058)	(4.9124)			
	—0.0072*	—0.0076*		0.0277*	—0.2018	0.9237	—10.7764	.864	3.875	2.26
	(1.3595)	(1.1062)		(3.3977)	(2.6460)	(2.8506)	(3.9974)			
	—0.0105*			0.0268*	—0.1929	0.9972	—10.6330	.857	3.977	2.19
	(1.3786)			(3.0468)	(2.3187)	(3.0225)	(3.4738)			
						1.3981	— 8.3542	.795	4.535	2.23
						(4.0982)	(2.5737)			
		—0.0106*	—0.0052*		—0.1797	1.0775	—11.1355	.809	4.518	2.22
		(2.1692)	(0.3827)		(2.0154)	(2.9290)	(3.5217)			

variable having an inappropriate sign). The use of the flow adjustment model in equation 4.8, where $\triangle DS_{-1}$ is added to estimate 4.6, also gives poor results. The exclusion of JSI and its replacement by ZJSI in estimates 4.9 and 4.10 helps overcome the collinearity problem noted in 4.7 and leads to both higher coefficients and higher T-values for RT and YSNP. In fact, the tests showed that JSI can only be included in these equations in differential form (i.e. JGS — JSI) if the general activity variable is to remain statistically significant. For the latter condition to be upheld, ZJSI must also be present. The interest rate on another competing financial asset, trading bank fixed deposits (JTF), was tried in place of and in combination with JGS but gave inferior although not unsatisfactory results.

The choice of a preferred equation among this set is not clear cut. In the case of the trading bank equations it will be recalled that retail trade turnover appeared to represent the most appropriate official proxy "general activity" variable. However, for the savings banks' sector, net salary and wage income seems on a priori grounds to be a suitable proxy, perhaps being conceptually more acceptable than the consumption variable. This is based on the supposition that the vast bulk of savings account deposits are held by salary and wage earners whereas the corporate and general commercial (non-salary and wage earning) sector holds a considerable volume, in both absolute and relative terms, of trading bank deposits (and advances). By law, companies cannot hold savings bank deposits. For these reasons, and to maintain consistency with the disaggregated equations, estimate 4.4 using YSNP is selected as the preferred formulation. Apart from yielding a slightly better statistical fit, YSNP is preferred over YSN in that it allows more adequately for lags in the adjustment process; a consideration of some relevance bearing in mind the exclusion of the statistically insignificant lagged stock variable.

Generally speaking disaggregation is preferred to an aggregate approach where there is some possibility of different behavioural characteristics appearing among the components of the aggregate. This seems to be the case in the present instance where the disaggregated equations provide more detailed information on the impact of various explanatory factors—income, interest rates, tax flows—without any loss in terms of the proportionate explanation being obtained (R^2). Furthermore, the Durbin-Watson statistics are more satisfactory in Tables 5 and 6 than in Table 4. In comparing these tables it should be noted that normalisation of the seasonal dummy variables on different quarters is a matter of statistical convenience; it has no effect on either the fit of the equations or the coefficients and standard errors of the non-seasonal explanatory variables.

(5) *Savings Banks' Fixed Deposits*

As with the aggregate equations, neither the stock adjustment model nor the flow adjustments version give

TABLE 6

SAVINGS BANK DEMAND DEPOSITS

No.	Constant	S_1	S_2	S_3	DDS_{-1}	$\triangle DDS_{-1}$	RT	YSN
6.1	18.6318	24.8030	—8.0408	7.9296			0.0600	
		(3.6434)	(4.3656)	(1.9603)			(2.0304)	
6.2	17.2198	25.3009	—7.6501	8.3953				0.0568
		(3.6769)	(4.3004)	(2.0846)				(2.0079)
6.3	17.7566	25.7856	—7.4627	8.7141				
		(3.8972)	(4.3385)	(2.2649)				
6.4**	15.6696	27.0928	—7.2231	8.9677				
		(3.9252)	(3.9728)	(2.2348)				
6.5**	—7.9473	26.9427	—7.6139	9.2446				
		(4.0043)	(4.2556)	(2.3612)				
6.6**	15.1635	27.1998	—7.3045	8.9826				0.0570
		(3.8451)	(3.8934)	(2.1631)				(2.0096)
6.7	36.1504	25.8162	—7.1144	9.2328				0.0229
		(3.8786)	(4.0416)	(2.3321)				(0.8883)
6.8	7.1815	25.7810	—6.7327	9.5048	—0.0449			
		(3.8466)	(3.6783)	(2.4241)	(1.3879)			
6.9**	—6.2813	27.3795	—5.9792	8.2823		—0.1669		
		(4.0614)	(2.4721)	(2.0551)		(1.0043)		
6.10**	7.7102	24.2468	—7.9516	7.7394				
		(3.3455)	(4.2451)	(1.8275)				

* Multiplicative on the wealth or general activity variable present in that equation e.g. in equation 6.1 the interest rate vari

** Estimation period 1961(1) to 1970(1); 37 observations.

satisfactory results (see, for example, estimate 5.10). A partial exception to this generalisation occurs where all interest rates and the tax payments variable are dropped (equation 5.11), but this hardly seems sustainable in the light of the alternative results and the relatively poorer fit. In the case of the flow adjustment model the lagged change in deposits attracted an implausible negative coefficient. Thus the major explanatory variables emerge as the general activity proxy (estimates 5.1 to 5.4 compare the available alternatives), tax payments (TYOG), tax refunds (with a perhaps surprisingly high coefficient), the institutional change dummy variable, ZIS1, and interest rates. As for the latter the own rate JSI performs poorly, interacting with the income proxy and contributing little to the fit of the equations. On the other hand the dummy variable ZJSI, designed to detect the short-term impact of the very occasional change in the investment deposit interest rate, gives quite satisfactory results (compare estimates 5.5 and 5.12). This variable is defined as 1 in the quarter immediately following a change in JSI and zero elsewhere. Both ZJSI and the competing interest rates (JGS and JTF) are usually entered multiplicatively on the general activity variable (equations 5.1 to 5.6) although linear comparisons are provided in equations 5.7 and 5.8. There seems to be little to choose between these various results. The estimates obtained from the preferred equation 5.4 are illustrated in graph 4.

(6) *Savings Banks' Demand Deposits*

In common with the problems experienced with total and fixed deposits, the stock and flow adjustment models each yield unsatisfactory results when employed to explain changes in savings banks' demand or current account deposits.[9] The point is illustrated by estimates 6.8 and 6.9 in Table 6. The lagged change in DDS attracts an inappropriate sign while the lagged stock variable lacks statistical significance and has a coefficient which implies an unrealistically long average adjustment period. Thus the major explanatory variables become retail trade turnover or, alternatively, net salary and wage income (between which there is little to choose on empirical grounds, as shown by equations 6.1 to 6.4); competing interest rates JGS and JTF (entered multiplicatively rather than in linear form for reasons which are shown in estimate 6.7 where, in particular, the income variable has a relatively small coefficient and low T-value); tax payments by persons other than salary and wage earners and an institutional dummy variable as described earlier, ZIS2. The seasonal dummy variables are also clearly important.

[9] This category includes the whole range of deposits withdrawable on demand and attracting the ordinary account 3 percent interest rate: ordinary, home lay-by, special purpose, thrift club, and school savings accounts.

(△ DDS DEPENDENT)

RTP	YSNP	JTF	JGS	JSI	TYOG	ZIS2	R^2	S.E.E.	D.W.
			—0.0159*		—0.2208	10.8967	.822	3.683	2.25
			(2.8220)		(3.2535)	(4.6910)			
			—0.0143*		—0.2209	10.9242	.819	3.714	2.22
			(2.6844)		(3.1418)	(4.6518)			
0.0620			—0.0162*		—0.2233	10.9107	:820	3.702	2.21
(1.8737)			(2.6568)		(3.2559)	(4.7004)			
	0.0560		—0.0136*		—0.2351	11.3785	.829	3.717	2.24
	(1.8213)		(2.3895)		(3.3046)	(4.8104)			
	0.1484	—0.0118*	—0.0122*		—0.2368	8.7972	.844	3.623	2.54
	(2.2680)	(1.5887)	(2.1772)		(3.4144)	(3.1190)			
			—0.0135*		—0.2378	11.3664	.829	3.724	2.26
			(2.4841)		(3.3207)	(4.7606)			
		—2.9334	—5.1402		—0.2198	9.1192	.836	3.582	2.40
		(1.4021)	(2.4311)		(3.2433)	(3.5735)			
0.2357		—0.0077*	—0.0168*		—0.2216	10.7755	.837	3.639	2.34
(2.2082)		(1.3001)	(2.6276)		(3.2151)	(3.8376)			
	0.1661	—0.0122*	—0.0159*		—0.2335	10.1414	.849	3.623	2.31
	(2.4511)	(1.6396)	(2.3732)		(3.3634)	(3.2488)			
	—0.0194	—0.0104*		0.0155*	—0.2065	11.8155	.827	3.815	2.16
	(0.1597)	(1.2556)		(1.2399)	(2.7335)	(3.8580)			

le is JGS * RT.

In explaining changes in demand deposits it would be expected that the investment account interest rate, which increased twice during the estimation period, would help explain any shift from demand to fixed deposits within the savings bank system. However, JSI performs perversely in these equations, yielding a positive and statistically insignificant coefficient while at the same time interacting with the general activity variable, causing the latter to become insignificant in a statistical sense and/or leading to a negative coefficient on this variable. Equation 6.10 is a typical result.

The estimates obtained from the preferred equation, 6.5, are illustrated in graph 5. The inclusion of JTF as well as JGS generally improves the fit of these equations and YSNP appears to give results superior to those yielded by the use of its alternatives. This is perhaps not surprising given the generally moderately small quarter-to-quarter changes in savings banks' demand deposits and the fact that these facilities would be widely used by salary and wage earners.

(7) *Trading Banks' Advances*

The explanation of changes in bank advances is of particular interest in New Zealand, given the way in which monetary policy has for such a long period concentrated upon control of this variable. As pointed out earlier in the section which discussed the nature of this policy, it is not easy to choose any single variable or set of variables which conveniently represent the influence of the actions taken by the monetary authorities. Bearing in mind the manner in which the cash reserve ratio policy has been employed over the years, neither the cash base nor the ratios themselves seem suitable for use in this context. But if it is hypothesised that advances are determined by the level of economic activity generally, subject to a constraint in the form of official policy directives, then it is necessary to find some way in which to represent the wishes of the authorities.

In the absence of any alternative measure, a dummy variable (ZA) was constructed to take account of this factor. A comprehensive review was carried out of policy changes over the period from 1955 to 1970 as recorded in official policy statements, minutes of meetings between the parties involved, memoranda and correspondence on official files and other relevant documents, such as bank annual reports. On the basis of fairly comprehensive information obtained from these sources, an attempt was made to classify policy in respect of bank advances according to a prespecified scale. Accordingly the dummy variable is assigned the value zero when policy is judged essentially passive or permissive, the value one represents a cautionary attitude, two implies firm restraint and three means very severe restraint.(10) The approach is not

(10) The values assigned to ZA by quarters are as follows:

1955	**1956**	**1957**	**1958**	**1959**	**1960**	**1961**
1122,	2222,	2222,	3332,	2211,	1112,	3333,
1962	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**
3222,	1111,	1111,	1222,	2222,	2332,	2112,
1969	**1970**	**1971**				
2222,	2222,	2222.				

TABLE 7

TRADING BANK ADVANCES, DISCOUNTS

No.	Constant	S_2	S_3	S_4	LPT_{-1}	RT	JTL
7.1	214.5544				—0.1854 (2.3076)	0.3120 (3.5826)	—47.4256 (1.9509)
7.2	160.4381				—0.2600 (3.6729)	0.2669 (3.0518)	
7.3	26.5259				—0.2055 (2.7795)	0.1589 (2.1763)	
7.4	31.2214				—0.2245 (3.3554)	0.1770 (2.6369)	
7.5	31.2034				—0.2616 (3.8073)	0.2071 (2.9671)	
7.6	38.6472				—0.2762 (4.1805)	0.2170 (3.2286)	
7.7	18.8770	13.7107 (0.4523)	12.3884 (0.4964)	17.0064 (0.4948)	—0.2061 (1.6487)	0.1462 (1.0646)	
7.8	12.7782				—0.2293 (3.4497)	0.2361 (3.5351)	
7.9	—27.2270				—0.2190 (2.6857)	0.7457 (1.6421)	— 0.08135* (1.1964)
7.10	125.3199				—0.2346 (2.8175)	0.2659 (2.9863)	—22.4200 (0.8073)

* Multiplicative on RT.

unlike that adopted by Norton in the United Kingdom (11) and Australia (13). Its crudeness is readily admitted. In particular, it fails to take into account adequately the distinction between top-tier priority (export sector) advances and bottom-tier non-priority (other) advances. The problems here are substantial as the system has varied significantly over the ten-year estimation period. Furthermore, top/bottom-tier statistics are not available in a consistent form for the full period. Because the maximum average interest rate on overdrafts is controlled by the Reserve Bank the normal supply equation is dropped from the model, in line with the treatment for other variables. In other words, it is assumed that the banks will meet the demand for advances at the officially determined rate subject to any supply constraint which the authorities may be able to impose through the persuasive power of the penal borrowing system (the latter was explained earlier).

An alternative way in which advances could be determined would be to adopt a two-stage procedure under which, first, advances would be a function of total credit limits and any other seasonal and cyclical variables required to account for such factors as changes in limit utilisation and, secondly, credit limits would be dependent on general activity, interest rates, etc. Unfortunately, serious statistical classification and policy-induced breaks in the total credit limits series prevent adequate testing of this approach over a reasonable time period. Hence this method is not pursued at present.

Given the absence of any official quarterly national income accounts the selection of a general activity proxy variable is not clear cut. Retail trade turnover is preferred in Table 7 on the basis that it seems to offer the closest approximation, having a quite wide coverage of final expenditures. Later, it is shown that a broader aggregate expenditure variable is probably a more suitable proxy. In the meantime it seemed appropriate also to test two other concepts in this role: first, current overseas payments, on the grounds that bank advances are used extensively to meet such payments and, secondly, changes in trade stocks (as held by retailers, wholesalers and manufacturers) since these are also often financed by bank credit. Because of multicollinearity problems the three variables, RT, CP and $\triangle$ KT, could only be entered in regressions individually rather than collectively.

The equations in Part 1 of Table 7 suggest that changes in total bank advances[11] are dependent on retail trade turnover (in its proxy role), the previous level of advances, tax payments by companies and persons other than salary and wage earners, and either the interest rate on overdrafts or the policy dummy variable. The latter two variables interact when in-

[11] Bank advances are defined as including all overdrafts, discounts, term loans, export finance, and meat hygiene loans.

ᐧART 1
AND LOANS ($\triangle$ LPT DEPENDENT)

JTLM	ZA_{-1}	ZA_{-2}	ZA_{-3}	ZA_{-4}	TYOG + TYCG	R^2	S.E.E.	D.W.
					0.4045 (14.8296)	.887	16.81	2.13
–28.1651 (1.1513)					0.3896 (14.7744)	.879	17.37	1.95
	—8.6327 (2.1003)				0.3872 (15.7588)	.889	16.68	1.97
		—10.1249 (2.7674)			0.3851 (16.3792)	.897	16.03	2.12
			—6.7090 (1.8084)		0.3840 (15.4692)	.885	16.92	2.16
				—8.9760 (2.5221)	0.3811 (15.9830)	.894	16.28	1.99
		—10.5444 (2.6015)			0.4426 (3.7041)	.898	16.70	2.15
		— 0.02904* (2.7768)			0.3852 (16.3929)	.897	16.02	2.12
					0.3956 (14.1416)	.880	17.35	1.96
				—7.0908 (1.6887)	0.3918 (14.2917)	.897	16.294	2.08

cluded together, as shown by the sample estimate 7.10.[12] The actual overdraft interest rate entered in linear form is preferred over either the official maximum average rate or JTL entered multiplicatively on RT (compare equations 7.2 and 7.9 respectively with 7.1). The positive coefficient on gross tax payments implies that a reasonable proportion of these flows is probably met through the use of bank credit. Equation 7.7 shows that seasonal dummy variables are not required, as evidenced by the low T-values on the seasonals and their interaction with other variables.

A poor result is obtained if the policy dummy variable is entered without any lag. On the other hand, it is not easy to interpret the differences between the results in equations 7.3 to 7.6 where ZA is entered with lags ranging from one to four quarters. The dummy is statistically most significant in equation 7.4 where it has a two quarter lag; this estimate also happens to give the lowest overall standard error. Certainly, from a practical point of view, a lag in the effectiveness of policy spread over at least three to six months would seem quite plausible. The results suggest the need for a more sophisticated statistical approach to the lag question; a matter which will hopefully be the subject of further study. Equation 7.4 is chosen as the preferred estimate and its residual pattern is shown in graph 6.

(12) This is probably due to the fact that the more sizeable increases in JTL have usually been associated with periods of relatively firm restraint over bank credit.

TABLE
(Δ LPT

No.	Constant	LPT_{-1}	CP	Δ KT	JTL
7.11	51.6449	—0.3810	0.6130		—6.4905
		(4.6115)	(5.4647)		(0.3873)
7.12	146.7870	—0.3847	0.6719		
		(6.0171)	(5.6999)		
7.13	26.9580	—0.3766	0.5657		
		(4.7097)	(4.1132)		
7.14	29.4763	—0.3859	0.5763		
		(5.7025)	(4.8320)		
7.15	25.3974	—0.4010	0.6074		
		(6.2966)	(5.5259)		
7.17*	—114.8810	—0.1552		0.4411	27.6956
		(1.9553)		(2.4141)	(1.3021)
7.18*	12.8926	—0.0514		0.3245	
		(1.1902)		(1.8126)	
7.19*	16.9899	—0.0679		0.3426	
		(1.5418)		(1.8327)	

* Estimation period 1961(2) - 1970(1).

TABLE
TRADING BANKS HOLDINGS OF

No.	Constant	S_1	S_2	S_3	NOT_{-1}	(DDT + [illegible] + DGT
8.1	20.2323	—26.6847	—18.5526	—18.4282	—0.5649	0.0250
		(5.8438)	(8.5734)	(7.8251)	(3.1043)	(1.3933
8.2	15.0061	—19.3508	—19.7980	—17.3720	—0.5275	0.0287
		(3.8398)	(9.6592)	(7.8700)	(3.1333)	(1.7305
8.3	0.6637	—18.9250	—19.5315	—17.1011	—0.6172	0.0357
		(3.7535)	(9.4851)	(7.7174)	(3.2956)	(2.0094
8.4	16.7051	—16.1093	—18.5893	—16.9778	—0.7558	0.0356
		(3.4827)	(9.9230)	(8.5908)	(4.5008)	(2.3754
8.5	11.6756	—12.4035	—17.7915	—16.2904	—0.8756	0.0482
		(3.0223)	(10.9636)	(9.5466)	(5.9171)	(3.6102
8.6	10.0973	—12.4258	—17.7017	—16.1849	—0.8712	0.0502
		(3.1253)	(11.2027)	(9.7383)	(6.0805)	(3.8383

* Multiplicative on (DDT + DFT + DGT)

The results obtained when RT is replaced by CP and △ KT are illustrated in Part 2 of Table 7. Although the equations incorporating current payments give quite good statistical fits, the interest rate and policy dummy variables yield rather implausible results.(13) On a priori grounds retail turnover is probably preferred over current payments. Problems also exist when the change in trade stocks is used as the general activity proxy. In particular in this case, the lagged stock of advances attracts a very small coefficient with a rather low T-value when the policy dummy variable is employed. Furthermore, the interest rate, JTL, attracts an inappropriate positive sign.

Finally on the question of bank advances, it should be observed that a set of results similar to those in Table 7 was obtained by using as the dependent variable the change in advances excluding two highly seasonal export orientated categories: advances to meat freezing companies and woolbuyers. Both of these groups belong to the preferential top-tier classification. But they were excluded also for the additional reason that their advances may be more closely related to export production, sales and stocks, and other overseas factors, than to domestic activity as represented by retail turnover.

(13) A possible explanation of this initially rather surprising result is that current payments are strongly influenced by import licensing controls which have usually been tightened and eased at much the same time as monetary policy has been altered in the same direction.

' PART 2
)EPENDENT)

JTLM	ZA_{-1}	ZA_{-2}	ZA_{-4}	TYOG + TYCG	R^2	S.E.E.	D.W.
				0.3778 (16.4533)	.917	14.43	2.44
–24.6764 (1.3984)				0.3814 (17.9211)	.921	14.08	2.61
		—2.0617 (0.5140)		0.3758 (17.5989)	.917	14.41	2.40
			—2.3674 (0.7005)	0.3750 (17.7523)	.918	14.36	2.41
				0.3744 (17.8653)	.916	14.26	2.40
				0.3033 (7.7248)	.890	16.77	2.15
	—9.8064 (2.4769)			0.3373 (9.1866)	.903	15.74	2.54
		—7.7677 (1.8927)		0.3335 (8.7466)	.896	16.31	2.40

8
NOTES (△ NOT DEPENDENT)

'T	△LPT	JGS	ZDC3	ZE	R^2	S.E.E.	D.W.
					.918	4.519	1.97
	—0.0860 (2.6470)				.932	4.166	2.02
	—0.0703 (1.9826)	2.6702 (1.0817)			.935	4.155	1.93
	—0.0694 (2.3502)		5.4906 (3.0570)		.948	3.722	2.04
	—0.0516 (1.9990)		5.0784 (3.2867)	—8.3744 (3.5338)	.963	3.193	2.20
	—0.0498 (1.9792)		4.9386 (3.2800)	—0.0121* (3.8663)	.965	3.106	2.24

However, the statistical results were inferior to those obtained for total advances and equation 7 A.1 at the bottom of the page is recorded mainly as a matter of interest rather than as a generally preferred formulation.

This sort of result implies, of course, that changes in advances to meat companies and woolbuyers are strongly correlated with domestic activity. Without carrying any implication about cause and effect equation 7 B.1 at the bottom of the page illustrates the strength of the empirical relationship (in the stock adjustment form).

8. *Trading Banks' Holdings of Notes and Coin*

The selection of equations in Table 8 shows that changes in the trading bank system's holdings of notes can be explained largely by the level of total deposits, the lagged stock of such notes and seasonal factors. In addition the change in bank advances is used in this instance as a short-term constraint on the banks' portfolio behaviour. Two dummy variables cope with (a) dating problems which arise as a result of the Easter holiday period occasionally falling near the end of the March quarter rather than during the first half of April, as is more usual, and (b) the decimal currency changeover period in 1967 when the trading banks held more notes than normal for some quarters following the changeover. The preferred equation is 8.6 in which the Easter dummy is multiplicative on deposits, thus allowing for a changing impact of this factor over time. The estimated coefficient on the lagged stock of notes implies a rapid rate of adjustment, as would be expected. Although, as noted earlier, it is necessary to treat coin as a separate item in the model, an equation similar to that for notes can be established for notes and coin combined. (See equation 8 A.1 below).

9. *Savings Banks' Cash*

Both trustee and private savings banks have a statutory obligation to maintain cash balances (or other officially approved highly liquid assets) equivalent to 5 percent of the first \$20 million of deposits and 2.5 percent of any deposits held in excess of that amount. This requirement remained unchanged throughout the model's estimation period. But it does not apply to the Post Office Savings Bank, which also happens to be by far the largest of the three groups of institutions.[14] Hence it is not possible to construct a meaningful weighted average cash ratio for the savings bank system as a whole. Given that the deposit equations are in aggregate form, i.e. do not distinguish between the different types of savings banks, there seem to be two alternatives for the treatment of savings banks' cash (including, it should be noted, fixed deposits held at the trading banks). First, the item could be treated as exogenous and estimated independently of the model. Secondly, an orthodox behavioural equation could be prepared explaining changes in cash in terms of total deposits held, thus ignoring the minimum cash ratios in an explicit sense but, of course, including them implicitly in the coefficient on deposits. After close examination of the position of individual private and trustee savings banks, most of which hold cash in excess of the minimum requirements, and bearing in mind the need for a different treatment of the Post Office Savings Bank, it was decided that the second alternative was sufficiently realistic to be acceptable. However, if in the future the cash ratios are varied the approach would need to be reviewed. Not unexpectedly equation 9.1 at the bottom of the page provides a reasonable explanation of changes in the cash variable, implying a rapid rate of adjustment which would presumably be consistent with the size of savings banks' cash flows and the relative predictability, at least in the short term, of their overall asset/liability positions.

---

[14] 55 percent of total savings banks deposits at the end of March 1970 were held with the Post Office Savings Bank.

$$\triangle LPT1 = \underset{(1.82)}{0.1768}\,RT - \underset{(2.25)}{8.4719}\,ZA_{-2} - \underset{(2.31)}{0.2991}\,LPT1_{-1} + \underset{(10.27)}{0.2738}\,(TYOG + TYCG) + \underset{(1.69)}{13.1500}\,S_2 + \underset{(7.66)}{50.7210}\,S_3 + 35.1436$$

R^2 0.849 S.E.E. 15.791 D.W. 2.12 (Equation 7 A.1)

$$\triangle LMWT = \underset{(3.90)}{0.2013}\,RT - \underset{(4.00)}{0.6533}\,LMWT_{-1} - \underset{(4.01)}{25.7095}\,S_1 - \underset{(11.48)}{61.7919}\,S_2 - \underset{(6.98)}{43.9589}\,S_3 + 4.1924$$

R^2 0.944 S.E.E. 7.763 D.W. 1.81 (Equation 7 B.1)

$$\triangle NCT = \underset{(4.05)}{0.05490}\,(DDT + DFT + DGT) - \underset{(2.13)}{0.05499}\,\triangle LPT - \underset{(6.39)}{0.8863}\,NCT_{-1} - \underset{(3.74)}{0.01203}\,(ZE * DDT + DFT + DGT) + \underset{(3.77)}{6.0035}\,ZDC3 - \underset{(2.83)}{11.4134}\,S_1 - \underset{(10.92)}{17.7572}\,S_2 - \underset{(9.26)}{15.7834}\,S_3 + 9.8763$$

R^2 0.963 S.E.E. 3.21 D.W. 2.19 (Equation 8 A.1)

$$\triangle DTS = \underset{(4.93)}{0.03423}\,(DDS + DFS) - \underset{(4.94)}{0.74902}\,DTS_{-1} - \underset{(5.88)}{13.71759}\,S_1 - \underset{(7.32)}{9.24119}\,S_2 - \underset{(10.54)}{14.74684}\,S_3 - 9.83010$$

R^2 .936 S.E.E. 2.59 D.W. 1.99 (Equation 9.1)

10. *Savings Banks' Holdings of Government Securities*

In New Zealand savings banks have traditionally been a major source of new funds for the Government. For example, the Post Office Savings Bank has always been obliged to invest effectively 100 percent of its deposits in central government securities; a requirement which has no doubt been a major causal factor behind its relative decline within the financial system. The creation of new financial assets peculiar to the Post Office Savings Bank, such as bonus bonds, and other special provisions,[15] have only partially alleviated this problem. On the other hand, although the trustee and private savings banks enjoy the privilege of being able to lend to the private sector, they must first invest substantial proportions of their funds in official securities. For instance, at present the minimum government security investment ratios are (a) 57 percent for all trustee savings banks' deposits and (b) 70 and 100 percent of ordinary deposits and investment accounts respectively for the trading banks' savings banks' subsidiaries, i.e. the private savings banks. To cope adequately with these different ratios for different institutions and different classes of deposits, and to allow for policy changes in the ratios over time, a weighted average government security investment ratio was constructed (NSG). Thus actual holdings of government securities by the savings banks, GS, are determined by a two-stage procedure whereby, first, required minimum holdings, GSR, are equivalent to the product of aggregate deposits and the ratio variable and, secondly, the excess of actual over required holdings (which may be a deficiency in some periods) is determined by a behavioural relationship.

[15] One special provision of some significance can be cited: the P.O.S.B. is permitted to pay interest on deposits up to a maximum of $20,000 whereas the trustee and private savings banks have a comparable maximum of only $6,100 and $6,000 respectively.

The explanatory variables in this equation are assumed to be:

(a) An interest rate differential (the difference between the yield on short-term government securities and the average mortgage interest rate reflecting the choice between holding securities in excess of statutory requirements and investing in private mortgages;

(b) The ratio of the change in NSG to the previous level of NSG (the negative coefficient implying that as the security ratio requirements increase the excess holdings of securities decline, and vice versa, in the short term); and

(c) The previous level of excess security holdings, to allow for lags in the adjustment process.

On the basis of data for the past decade equation 10.1 below is obtained.

11. *Savings Banks' Holdings of Local Authority Securities*

Because quarterly changes in savings banks' holdings of local authority securities are very small relative to the level of such holdings, the equation is estimated in this instance with the dependent variable in level rather than first difference form. Unfortunately no data are available on local authority security yields and hence the own rate cannot be taken into account at present. Essentially then, LLS is assumed to depend on the amount of deposits held by the savings banks, the interest rate on the major alternative private sector claim (the mortgage interest rate having the anticipated negative coefficient) and the previous holdings of local authority securities. (See equation 11.1 at the bottom of the page).

$$(GS - GSR) = \underset{(2.65)}{4.0914} (JGS - JM) - \underset{(2.97)}{1288.20} \frac{\Delta NSG}{NSG_{-1}} + \underset{(3.13)}{0.3544} (GS - GSR)_{-1} - \underset{(4.27)}{9.6829} S_1 + \underset{(2.31)}{5.1284} S_3 + 6.1618$$

R^2 0.664 S.E.E. 5.74 D.W. 2.37 (Equation 10.1)

The relevant identity is GSR = NSG * (DDS + DFS)

$$LLS = \underset{(2.54)}{0.0061} (DDS + DFS) - \underset{(2.03)}{0.9438} JM + \underset{(12.66)}{0.8828} LLS_{-1} - \underset{(3.59)}{0.4897} S_1 + 2.4489$$

R^2 0.998 S.E.E. 0.365 D.W. 1.62

(Equation 11.1)

G. A SUMMARY OF THE MODEL

The following set of identities and preferred estimates constitutes the 15 equation model discussed in this paper. There are 10 behavioural relationships and 5 identities. The estimation period is 1960(2) to 1970(1) unless otherwise stated.

(1) ***Currency***

$$\Delta CUR = \underset{(2.00)}{0.0149}\ YSNP - \underset{(2.60)}{0.2652}\ CUR_{-1} - \underset{(3.65)}{11.5018}\ ZDC1 + \underset{(7.47)}{0.0385}\ (ZE * YSNP) - \underset{(14.34)}{35.0003}\ S_1 - \underset{(14.84)}{21.3854}\ S_2 - \underset{(13.38)}{18.6583}\ S_3 + 51.3283$$

R^2 .966 S.E.E. 2.928 D.W. 2.39

(Equation 1.9)

(2) ***Trading Banks' Demand Deposits***

$$\Delta DDT = \underset{(5.75)}{0.3755}\ RT - \underset{(5.62)}{0.4716}\ DDT_{-1} - \underset{(3.24)}{23.1585}\ JGS - \underset{(2.66)}{12.3911}\ JTF - \underset{(5.93)}{0.1405}\ (TYCG + TYOG) + \underset{(2.82)}{1.5306}\ XPB - \underset{(8.12)}{35.9369}\ S_3 + 297.9052$$

R^2 .944 S.E.E. 9.629 D.W. 2.08

(Equation 2.7)

(3) ***Trading Banks' Fixed Deposits***

$$\Delta DFT = \underset{(3.18)}{0.6655}\ RT - \underset{(6.47)}{0.8825}\ DFT_{-1} - \underset{(3.90)}{0.0607}\ (JGS * RT) + \underset{(3.29)}{0.0958}\ (JTF * RT) + \underset{(2.53)}{31.1170}\ S_1 + \underset{(2.71)}{20.9333}\ S_2 + \underset{(4.05)}{38.4896}\ S_3 - 210.7572$$

R^2 .921 S.E.E. 6.749 D.W. 2.32

(Period 1965(3) to 1970(3); 21 observations).

(Equation 3.8)

(4) ***Trading Banks' Advances (including Discounts and Term Loans)***

$$\Delta LPT = \underset{(2.64)}{0.1770}\ RT - \underset{(3.36)}{0.2245}\ LPT_{-1} - \underset{(2.77)}{10.1249}\ ZA_{-2} + \underset{(16.38)}{0.3851}\ (TYOG + TYCG) + 31.2214$$

R^2 .897 S.E.E. 16.92 D.W. 2.16

(Equation 7.4)

(5) ***Trading Banks' Holdings of Notes***

$$\Delta NOT = \underset{(3.84)}{0.0502}\ (DDT + DFT + DGT) - \underset{(6.08)}{0.8712}\ NOT_{-1} - \underset{(1.98)}{0.0498}\ \Delta LPT + \underset{(3.28)}{4.9386}\ ZDC3 - \underset{(3.87)}{0.0121}\ (ZE2 * (DDT + DFT + DGT)) - \underset{(3.13)}{12.4258}\ S_1 - \underset{(11.20)}{17.7017}\ S_2 - \underset{(9.74)}{16.1849}\ S_3 + 10.0973$$

R^2 .965 S.E.E. 3.106 D.W. 2.24

(Equation 8.6)

(6) ***Trading Banks' Penal Borrowing***

LTRP = DRTP

(7) ***Trading Banks' Statutory Minimum Requirements***

DRTM = ((DDT + DGT) * NTD) + (DFT * NTF) — NOT

(8) ***Trading Banks' Holdings of Government Securities plus Net Free Cash*** (balance sheet residual)

REST = (DDT + DFT + DGT + DTT + DWT + LTRP) — (NOT + COT + LPT + LLT + DRTM + DRTP + AOT)

(The following additional trading bank identities, (a) to (e), are not required for the model as such, but may assist in explaining its structure. They should be read in conjunction with the text and the earlier table outlining the balance sheet format used in the model.)

(a) Total Borrowing from Reserve Bank
LTR = LTRP + LTRO

(b) Total Cash
DRT = DRTM + DRTP + DRTF

(c) Net Cash
DRTN = DRTF — LTRO

(d) Residual Assets
REST = GT + DRTN

(e) Trading Banks' Total Deposits
DT = DDT + DFT + DGT + DTT + DWT

(9 + 10) ***Either, Savings Banks' Total Deposits***

$$\Delta \text{DS} = \underset{(2.29)}{0.0435}\ \text{YSNP} - \underset{(3.33)}{7.9876}\ (\text{JGS} - \text{JSI}) + \underset{(2.99)}{0.0318}\ (\text{ZJSI} * \text{YSNP}) + \underset{(7.12)}{22.3124}\ \text{ZIS2}$$
$$- \underset{(3.94)}{0.4080}\ \text{TYOG} + \underset{(2.08)}{0.8873}\ (\text{TYOR} + \text{TYSR}) - \underset{(5.14)}{46.3245}\ S_2 - \underset{(5.45)}{26.6278}\ S_3 - \underset{(4.83)}{46.5629}\ S_4 + 47.4105$$

R^2 .850 S.E.E. 5.064 D.W. 3.08

(Period 1961(1) to 1970(1); 37 observations)

(Equation 4.4)

(9) ***Or, Savings Banks' Fixed Deposits***

$$\Delta \text{DFS} = \underset{(2.36)}{0.0892}\ \text{YSNP} - \underset{(2.66)}{0.0150}\ (\text{JGS} * \text{YSNP}) + \underset{(3.49)}{0.0294}\ (\text{ZJSI} * \text{YSNP}) - \underset{(2.61)}{0.2116}\ \text{TYOG}$$
$$+ \underset{(2.96)}{0.9884}\ (\text{TYOR} + \text{TYSR}) - \underset{(4.65)}{11.9298}\ \text{ZIS1} + \underset{(3.07)}{23.2056}\ S_1 + \underset{(3.67)}{7.5128}\ S_2 + \underset{(2.98)}{13.1329}\ S_3 - 1.1278$$

R^2 .852 S.E.E. 3.968 D.W. 2.24

(Period 1961(1) to 1970(1); 37 observations)

(Equation 5.4)

(10) ***And, Savings Banks' Demand Deposits***

$$\Delta \text{DDS} = \underset{(2.27)}{0.1484}\ \text{YSNP} - \underset{(1.59)}{0.0118}\ (\text{JTF} * \text{YSNP}) - \underset{(2.18)}{0.0122}\ (\text{JGS} * \text{YSNP}) - \underset{(3.41)}{0.2368}\ \text{TYOG}$$
$$+ \underset{(3.12)}{8.7972}\ \text{ZIS2} + \underset{(4.00)}{26.9427}\ S_1 - \underset{(4.26)}{7.6139}\ S_2 + \underset{(2.36)}{9.2446}\ S_3 - 7.9473$$

R^2 .844 S.E.E. 3.623 D.W. 2.54

(Period 1961(1) to 1970(1); 37 observations)

(Equation 6.5)

(11) ***Savings Banks' Cash (including Deposits at Banks)***

$$\Delta \text{DTS} = \underset{(4.93)}{0.03423}\ (\text{DDS} + \text{DFS}) - \underset{(4.94)}{0.74902}\ \text{DTS}_{-1} - \underset{(5.88)}{13.71759}\ S_1 - \underset{(7.32)}{9.24119}\ S_2 - \underset{(10.54)}{14.74684}\ S_3$$
$$- 9.83010$$

R^2 .936 S.E.E. 2.59 D.W. 1.99

(Equation 9.1)

(12) ***Savings Banks' Excess Holdings of Government Securities***

$$(\text{GS} - \text{GSR}) = \underset{(2.65)}{4.0914}\ (\text{JGS} - \text{JM}) - \underset{(2.97)}{1288.20}\ (\Delta\, \text{NSG}/\text{NSG}_{-1}) + \underset{(3.13)}{0.3544}\ (\text{GS} - \text{GSR})_{-1} - \underset{(4.27)}{9.6829}\ S_1$$
$$+ \underset{(2.31)}{5.1284)}\ S_3 + 6.1618$$

R^2 .664 S.E.E. 5.74 D.W. 2.37

(Equation 10.1)

(13) ***Savings Banks' Required Holdings of Government Securities***

$$\text{GSR} = \text{NSG} * (\text{DDS} + \text{DFS})$$

(14) ***Savings Banks' Lending to Local Authorities***

$$\text{LLS} = \underset{(2.54)}{0.0061}\ (\text{DDS} + \text{DFS}) - \underset{(2.03)}{0.9438}\ \text{JM} + \underset{(12.66)}{0.8828}\ \text{LLS}_{-1} - \underset{(3.59)}{0.4897}\ S_1 + 2.4489$$

R^2 .998 S.E.E. 0.365 D.W. 1.62

(Equation 11.1)

(15) ***Savings Banks' Lending to the Private Sector*** (balance sheet residual)

$$\text{LPS} = (\text{DDS} + \text{DFS}) - (\text{DTS} + \text{GS} + \text{LLS} + \text{AOS})$$

H. EX POST FORECASTS

Table 9 sets out a series of ex post single equation forecasts generated from data for the three quarters 1970(2) to 1970(4) which immediately follow the close of the model's estimation period. The equations used are those set out in the immediately preceding section, using RT and YSNP as the general activity variables. The levels of the relevant monetary stocks at the end of March 1970 are shown on the left of the table to give some idea of the order of magnitude of each series. Actual changes are shown alongside changes estimated from the set of preferred equations. In most cases the forecasts are reasonable, being of the appropriate order of magnitude and detecting the correct direction of change. But there are, of course, exceptions where the forecasting performance is relatively poor. Trading banks' holdings of notes in 1970(4), bank advances in 1970(3) and trading bank demand deposits in 1970(4) are examples of problem areas. These will be the subject of further detailed investigation.

I. RE-ESTIMATION AND SIMULATION

The preferred equations in the monetary model in respect of the private non-bank sector's holdings of financial assets and liabilities have been re-estimated using the aggregate expenditure variable described earlier in the paper in place of the general activity proxies employed above. This variable, Y, has the advantage of being rather more broadly defined than either of the latter proxies, thus enabling the monetary equations to be more readily assimilated within a model of the economy as a whole. In approximating gross national product, the aggregate expenditure series also provides a theoretically more acceptable framework. Nevertheless, the shortcomings involved in the construction of this type of series should not be overlooked. It is for this reason that the model is presented in this paper on the basis of, first, official data only and, secondly, a mixture of official and unofficial information. The construction and performance of Y is discussed in detail in Lumsden and Deane (10).

The outstanding feature of a comparison of the model in these alternative formats is the similarity between the respective pairs of equations. In terms of both the overall fit—R^2 and S.E.E.—and the significance of the individual explanatory variables, the two sets of results are closely comparable. Hence the following set of results, which incorporate Y in place of RT or YSNP, confirm virtually without exception the detailed and general conclusions of this paper. Re-estimated equations are provided for CUR, DDT, DFT, LPT, DFS and DDS. The equation numbers correspond with those in section G of the paper. The estimation period is 1960(2) to 1970(1), a total of 40 observations, unless otherwise specified.

TAI

EX POST FORECASTS FRO

$ m

	Dependent Variable	Stock, End March 1970	Equation No.	June Quarter 1970 Estimate	Actual	Residual
1	△ CUR	168.7	1.9	— 3.8	—13.8	—10.0
2	△ DDT	608.3	2.7	43.6	36.8	— 6.8
3	(1 + 2)	770.0	—	39.8	23.0	—16.8
4	△ DFT	230.8	3.8	27.8	22.5	— 5.3
5	△ DDS	1,125.1	6.5	2.4	1.8	— 0.6
6	△ DFS	555.9	5.4	31.9	23.6	— 8.3
7	(5 + 6)	1,681.0	—	34.3	25.4	— 8.9
8	△ DS	1,681.0	4.4	34.1	25.4	— 8.7
9	(3 + 4 + 7)	2,688.8	—	101.9	70.9	—31.0
10	△ LPT	685.8	7.4	—42.5	—12.5	30.0
11	△ NOT	29.3	8.6	13.0	10.9	— 2.1
12	△ DTS	48.4	9.1	3.5	— 3.8	— 7.3
13	(GS — GSR)	1,458.1*	10.1	— 7.1	—15.4	— 8.3
14	LLS	45.5	11.1	46.7	47.9	1.2

* GS as at 31 March.

** Average residual (ignoring sign) expressed as a percentage of the level of the stock of that variable as at 31 March 197

NOTE: These ex post forecasts are based on the single equation estimates appearing in section G of this paper. These equatio those referred to in section I of the paper which involves a full model dynamic simulation using the aggregate expenditu

(1) *Currency*

$$\Delta \text{CUR} = 0.00632\,Y - 0.24079\,\text{CUR}_{-1} - 11.29994\,\text{ZDC1} + 14.25911\,\text{ZE} - 35.77662\,S_1 - 21.90384\,S_2$$
(2.06) (2.17) (3.19) (6.17) (13.15) (14.18)

$$- 19.02159\,S_3 + 48.61776$$
(12.64)

R^2 .955 S.E.E. 3.32 D.W. 2.27

(2) *Trading Banks' Demand Deposits*

$$\Delta \text{DDT} = 0.05506\,Y - 0.32939\,\text{DDT}_{-1} - 24.53169\,\text{JGS} - 0.18275\,(\text{TYOG} + \text{TYCG}) + 1.62830\,\text{XPB}$$
(3.55) (3.00) (3.55) (8.00) (2.80)

$$- 36.60628\,S_3 + 16.14470\,S_4 + 276.46539$$
(7.89) (2.78)

R^2 .934 S.E.E. 10.38 D.W. 2.10

(3) *Trading Banks' Fixed Deposits*

$$\Delta \text{DFT} = 0.1641\,Y - 0.8582\,\text{DFT}_{-1} - 0.0206\,(\text{JGS} * Y) + 0.0412\,(\text{JTF} * Y) - 8.8565\,S_1 - 15.7575\,S_2$$
(2.05) (5.19) (2.60) (2.86) (1.40) (3.30)

$$- 98.1366$$

R^2 .881 S.E.E. 7.955 D.W. 2.46
(Period 1965(3) to 1970(3); 21 observations)

(4) *Trading Banks' Advances*

$$\Delta \text{LPT} = 0.09930\,Y - 0.31366\,\text{LPT}_{-1} - 8.32275\,\text{ZA}_{-2} + 0.35888\,(\text{TYOG} + \text{TYCG}) + 50.53803$$
(2.65) (3.25) (2.17) (13.66)

R^2 .897 S.E.E. 16.02 D.W. 1.92

(9) *Savings Banks' Fixed Deposits*

$$\Delta \text{DFS} = 0.02689\,Y - 0.19014\,\text{TYOG} - 12.75341\,\text{ZIS1} + 0.89188\,(\text{TYOR} + \text{TYSR})$$
(2.92) (2.54) (5.27) (2.85)

$$+ 0.01134\,(\text{ZJSI} * Y) - 4.25534\,\text{JTF} + 20.52913\,S_1 + 5.57074\,S_2 + 12.57875\,S_3 - 3.63518$$
(3.36) (2.70) (2.95) (3.05) (3.10)

R^2 .866 S.E.E. 3.79 D.W. 2.27

(10) *Savings Banks' Demand Deposits*

$$\Delta \text{DDS} = 0.02653\,Y - 0.22222\,\text{TYOG} + 10.88233\,\text{ZIS2} - 0.00676\,(\text{JGS} * Y) + 25.59633\,S_1 - 7.35183\,S_2$$
(2.22) (3.29) (4.70) (2.86) (3.92) (4.32)

$$+ 8.58180\,S_3 + 17.35831$$
(2.25)

R^2 .820 S.E.E. 3.70 D.W. 2.22

9
'REFERRED EQUATIONS
n

September Quarter 1970			December Quarter 1970			Average Residual Ignoring Sign	
Estimate	Actual	Residual	Estimate	Actual	Residual	Actual	% of Stock **
2.2	6.9	4.7	20.0	33.3	13.3	9.3	5.53%
—16.9	—33.3	—16.4	85.4	41.9	—43.5	22.2	3.65%
—14.7	—26.4	—11.7	105.4	75.2	—30.2	19.6	2.54%
22.8	27.8	5.0	33.2	25.5	— 7.7	6.0	2.60%
9.0	14.7	5.7	9.5	24.1	14.6	6.8	0.60%
25.3	14.1	—11.2	15.5	7.8	— 7.7	9.1	1.63%
34.3	28.8	— 5.5	25.0	31.9	6.9	7.1	0.42%
33.2	28.8	— 4.4	27.4	31.9	4.5	5.9	0.35%
42.4	30.2	—12.2	163.6	132.6	—31.0	24.7	0.92%
—20.7	23.8	44.5	—31.8	—18.7	13.1	29.2	4.26%
3.2	— 2.6	— 5.8	27.0	16.7	—10.3	6.1	20.71%
3.0	4.3	1.3	14.2	24.3	10.1	6.2	12.88%
16.0	— 0.2	—16.2	0.8	—18.8	—19.6	14.7	1.01%
48.9	49.5	0.6	50.4	50.1	— 0.3	0.4	0.95%

se RT and YSNP as the general economic activity proxy variables rather than Y. The results should be distinguished from
ries as the national income proxy.

It is worth mentioning that a 63 equation version of the whole model has been simulated incorporating the monetary sector and using Y as the major general economic activity variable. The simulation covered the period 1965 to 1970 and was dynamic in form, meaning that the model generated values of lagged variables were carried forward from quarter to quarter. In other words, the only information supplied to the model beyond the 1965 base period was the exogenous data, such as government expenditure, exports, tax rates, interest rates, and so on. Consumption, investment, imports, employment, prices, monetary stock variables, tax flows and Y itself were thus determined endogenously. A brief preliminary outline of the method and results is contained in Deane (1). From the point of view of the monetary sector, the simulation was relatively successful.

The sample results presented in Table 10 should be interpreted with some care. They do not constitute a test of the model's forecasting ability as such. This is because the simulation involved supplying actual values of the lagged endogenous variables for the base quarter 1965(3) only, with the model thereafter generating its own values entirely for all endogenous variables. Instead, the results offer a preliminary guide to the model's structural stability. In particular, they indicate whether or not this particular set of equations when linked as a model is inherently unstable, i.e. whether departures by the model from what actually happened to the monetary sector of the economy during the estimation period are likely to be cumulative or otherwise. However, a study of the residuals—the differences between actual and simulation solution values—in Table 10 for 1970(1) suggests that after almost five years the model was still obtaininig solution values in most cases relatively close to the corresponding known values. It will be recalled that the 1970(1) quarter was the end of the estimation period for the majority of the individual equations. The commencing quarter, 1965(3), was determined by the first quarter of the shortest single-equation estimation period (see the DFT equation). Further simulation work will be the subject of a later research paper.

J. CONCLUSION

The equations developed in this paper on the basis of the stock adjustment model appear to provide reasonably good explanations of changes in holdings of financial assets and liabilities within the New Zealand monetary sector. For the non-bank public the principal explanatory factors in most cases emerge as the general activity or national income proxy, relative interest rates, taxation flows and other institutional factors, and the lagged stock of the relevant asset or liability. Some tentative points of interest emerge:

First, despite widespread scepticism in New Zealand about the likely effectiveness of a more positive interest rate policy, the model makes it clear that variations in holdings of financial assets and liabilities do depend on relative rates of interest. In other words, as orthodox theory would suggest, the demand for bank deposits in New Zealand tends to increase as the return on the individual asset rises and/or as returns on alternative financial (and presumably real) [16] assets decline. This is

[16] It is of interest to note that in the expenditure relationships developed to date for a macroeconometric model of the New Zealand economy, interest rate variables perform as expected. Two examples can be cited: first, the yield on short-term government securities is a statistically significant explanatory variable in the consumption equations, attracting the anticipated negative coefficient (see Deane and Giles (2)), and secondly, the average interest rate on new mortgage registrations is a relevant variable in the demand for both dwellings and other buildings (again with statistically significant negative coefficients). Results of this type imply that as returns on financial assets (interest rates) increase, the demand for physical assets declines, other things being equal.

$ million SUMMARY RESULTS OF DYNAMIC SIMULATION O

Variable Name	Variable Symbol
Currency	CUR
Trading banks' demand deposits	DDT
Trading banks' fixed deposits	DFT
Trading banks' total deposits	DT
Trading banks' advances	LPT
Trading banks' note holdings	NOT
Trading banks' statutory minimum requirements	DRTM
Trading banks' cash and government securities	GDRTN*
Savings banks' demand deposits	DDS
Savings banks' fixed deposits	DFS
Savings banks' total deposits	DS
Savings banks' cash	DTS
Savings banks' government securities (required)	GSR
Savings banks' government securities (excess)	GS-GSR
Savings banks' local authority securities	LLS
Savings banks' lending to private sector	LPS*

* Balance sheet residual items — see text, section A.

of course consistent with some of the really significant changes which have occurred in the New Zealand financial system over the past decade or so, especially in respect of the financing of Government's operations. For example, as the gap has widened between private sector mortgage interest rates and yields on official securities, so have mortgages become a more popular outlet for new funds while sales of government securities have had to be propped up with an increasingly widespread net of official controls (i.e. government security investment ratios). Similarly, the very rapid rates of growth of deposit accepting institutions, such as finance houses, and other non-institutional intermediaries, such as solicitors and sharebrokers, when compared with the slower growth of the orthodox monetary sector considered in this paper, can be readily explained in terms of changes in the relative rates of return offered on the various financial assets. Whether the analysis is in terms of econometric equations or casual observation of changes in the system over time, the conclusion is much the same: responses to interest rate changes in New Zealand seem to be of more significance than Government has generally conceded.[17]

(17) But two notes of caution should perhaps be added here. On the one hand, there have not been many really substantial changes in interest rates in New Zealand over the past decade and thus while the coefficients on interest rates in the equations are statistically significant and suggest the theoretically anticipated direction of influence, the magnitude of change expected to result from more frequent and sizeable alterations to rates may be rather different from that implied by the present estimates. Furthermore, it needs to be remembered that the interest rate variables employed for alternative financial assets may be acting as proxies for other rates generally. Accordingly, these rates may reflect substitution between, say, demand deposits and a whole range of competing assets rather than between demand deposits and the specific assets implied by the interest rates included in the relevant equation.

Secondly, as past experience would suggest, changes in direct controls over bank advances via the ceilings system seem to take at least one or two quarters to become effective. Although policy in this area can only be approximated in the model by a suitably constructed dummy variable, it nevertheless provides a guide in the absence of alternative measurement.

Another interesting feature of the equations is the quantification of the influence of institutional factors, particularly the effect of taxation flows on deposits and advances. In time, this may allow more consistent estimates to be made of seasonal peaks and troughs in the financial flows in line with changes in tax payments and economic activity generally. The monetary equations are designed to be used, among other things, for short-term forecasting within a macroeconometric model framework.

Further work on the monetary sector will hopefully include its extension to cover other non-bank financial institutions; closer amalgamation with a larger model covering other areas of economic activity; and further simulation to test the model's ability to track out the past in a realistic manner, to forecast short-term fluctuations and perhaps to test the effects of alternative policy actions. In addition it will no doubt be necessary to take account of some of the more recent theoretical developments and to employ a consistent estimation technique such as two stage least squares.

'ABLE 10

[ONETARY VARIABLES WITHIN 63 EQUATION MODEL

Base quarter 1965(3)			Final quarter estimation period, 1970(1)		
Actual	Solution	Difference	Actual	Solution	Difference
141.8	140.6	1.2	168.7	161.0	7.7
570.6	593.0	—22.4	608.3	611.6	— 3.3
113.7	101.0	12.7	230.8	239.3	— 8.5
701.9	711.6	— 9.7	881.4	893.3	—11.9
491.4	491.4	0.0	685.8	661.4	24.4
32.2	34.1	— 1.9	29.3	33.6	— 4.3
70.1	71.6	— 1.6	21.1	17.3	3.8
33.3	39.6	— 6.3	41.2	77.0	—35.8
982.0	985.8	— 3.8	1125.1	1131.1	— 6.0
269.4	263.8	5.6	555.9	554.1	1.8
1251.4	1249.6	1.8	1681.0	1685.2	— 4.2
24.2	25.3	— 1.1	48.4	48.7	— 0.3
1118.6	1117.2	1.4	1475.1	1479.7	— 4.6
14.7	11.2	3.5	—17.0	—16.6	— 0.4
30.7	30.3	0.4	45.5	45.0	0.5
81.2	83.7	— 2.5	155.2	154.7	0.5

REFERENCES

1. Deane, R. S., *Towards a Model of the New Zealand Economy,* Research Paper No. 1, Economic Department, Reserve Bank of New Zealand, Wellington, September 1971.

2. Deane, R. S., and Giles, D. E. A., *Consumption Expenditure in New Zealand,* Economic Department, Reserve Bank of New Zealand, Wellington, February 1971 (mimeographed paper).

3. de Leeuw, F., *A Model of Financial Behaviour,* Chapter 13 in Duesenberry, J. S. et. al., *The Brookings Quarterly Econometric Model of the United States,* Chicago, Rand McNally, 1965.

4. de Leeuw F., *A Condensed Model of Financial Behaviour,* Chapter 9 in Duesenberry, J. S. et. al., *The Brookings Model: Some Further Results,* Chicago, Rand McNally, 1969.

5. de Leeuw, F., and Gramlich, E., *The Federal Reserve—M.I.T. Econometric Model,* Staff Economic Study, Federal Reserve Bulletin, January 1968.

6. Evans, M. K., and Klein, L. R., *The Wharton Econometric Forecasting Model,* Economics Research Unit, Department of Economics, Wharton School of Finance and Commerce, University of Pennsylvania, Philadelphia, Pennsylvania, 1968.

7. Goldfeld, S. M., *Commercial Bank Behaviour and Economic Activity,* Amsterdam, North Holland, 1966.

8. Goldfeld, S. M., *An Extension of the Monetary Sector,* Chapter 10 in Duesenberry, J. S., et. al., *The Brookings Model: Some Further Results,* Chicago, Rand McNally, 1969.

9. Helliwell, J. F., et. al., *The Structure of RDX1,* Bank of Canada Staff Research Studies No. 3, 1969.

10. Lumsden, M. A., and Deane, R. S., *A Quarterly Aggregate Expenditure Series for New Zealand,* in *New Data for Economic Research,* Research Paper No. 3, Reserve Bank of New Zealand, Wellington, forthcoming.

11. Norton, W. E., *Debt Management and Monetary Policy in the United Kingdom,* Economic Journal, Volume LXXIX, No. 315, September 1969.

12. Norton, W. E., *A Model of the Australian Economy: A Progress Report,* Occasional Paper No. 3A, Reserve Bank of Australia, Sydney, January 1970.

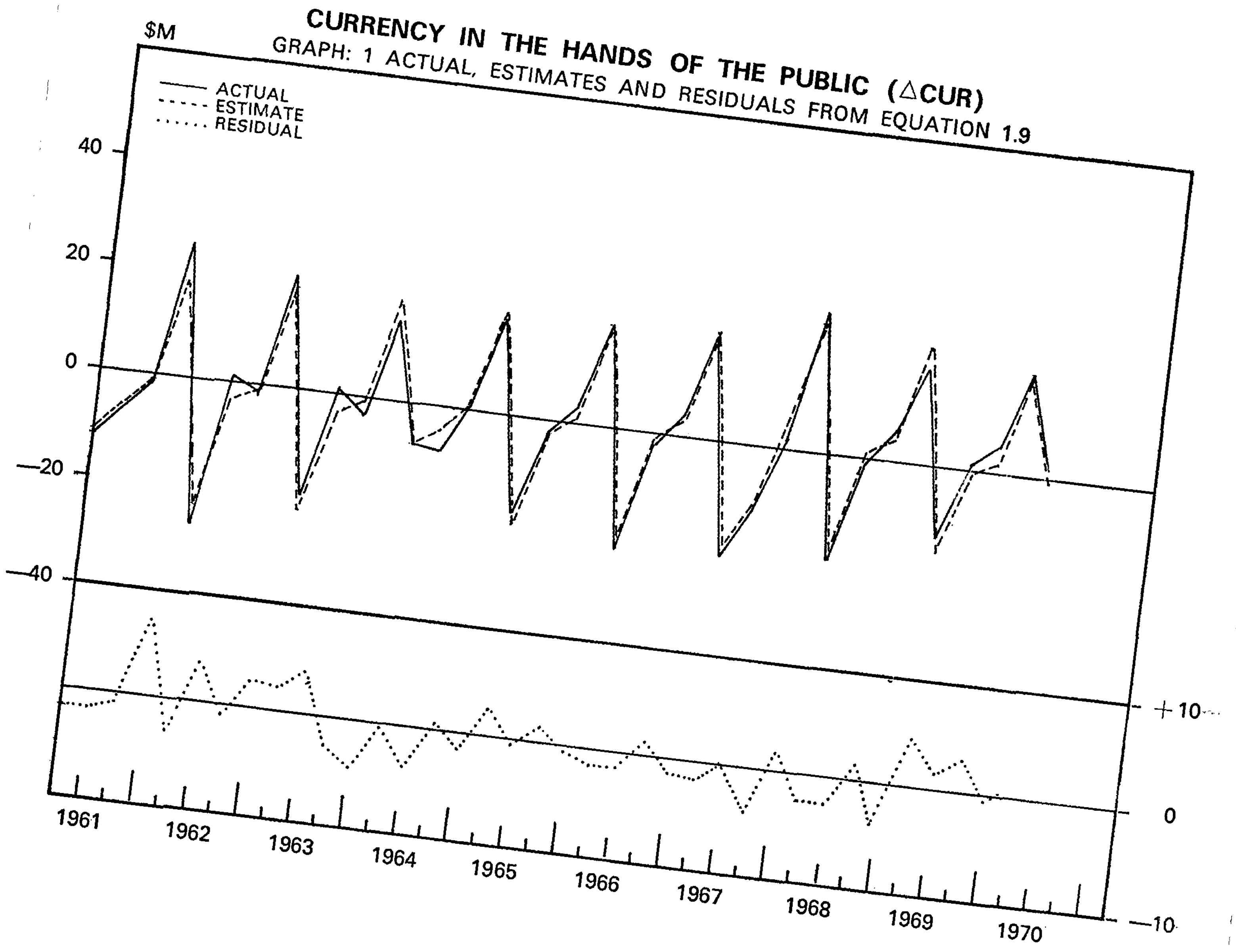
13. Norton, W. F., Cohen, A. M., and Sweeny, K. M., *A Model of the Monetary Sector,* Occasional Paper No. 3D, Reserve Bank of Australia, Sydney, July 1970.

14. Reserve Bank of New Zealand, *Financial Statistics—Selected Liquid Assets,* Bulletin, Volume 30, No. 9, October 1967.

15. Reserve Bank of New Zealand, *Money Supply and Selected Liquid Assets,* Bulletin, Volume 34, No. 3, April 1971.

16. Silber, W. L., *Portfolio Behaviour of Financial Institutions,* New York, Holt Rinehart and Winston, 1970.

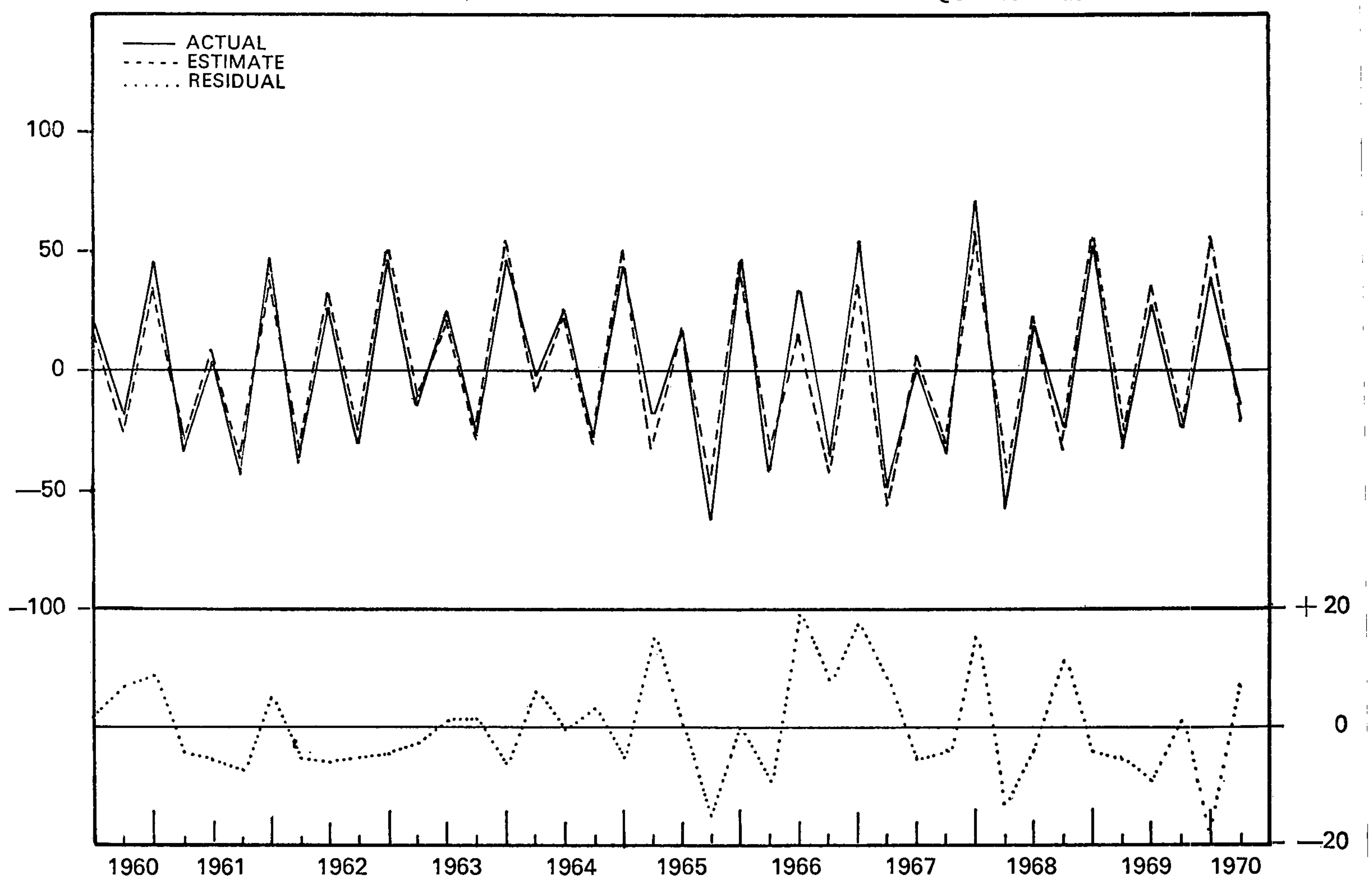
17. Teigen, D. L., *An Aggregated Quarterly Model of the U.S. Monetary Sector, 1953-1964,* Chapter IX in Brunner, K., *Targets and Indicators of Monetary Policy,* San Francisco, Chandler Publishing Company, 1969.



$M
CURRENCY IN THE HANDS OF THE PUBLIC (△CUR)
GRAPH: 1 ACTUAL, ESTIMATES AND RESIDUALS FROM EQUATION 1.9
ACTUAL
ESTIMATE
RESIDUAL
40
20
0
—20
—40
+10
0
—10
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970

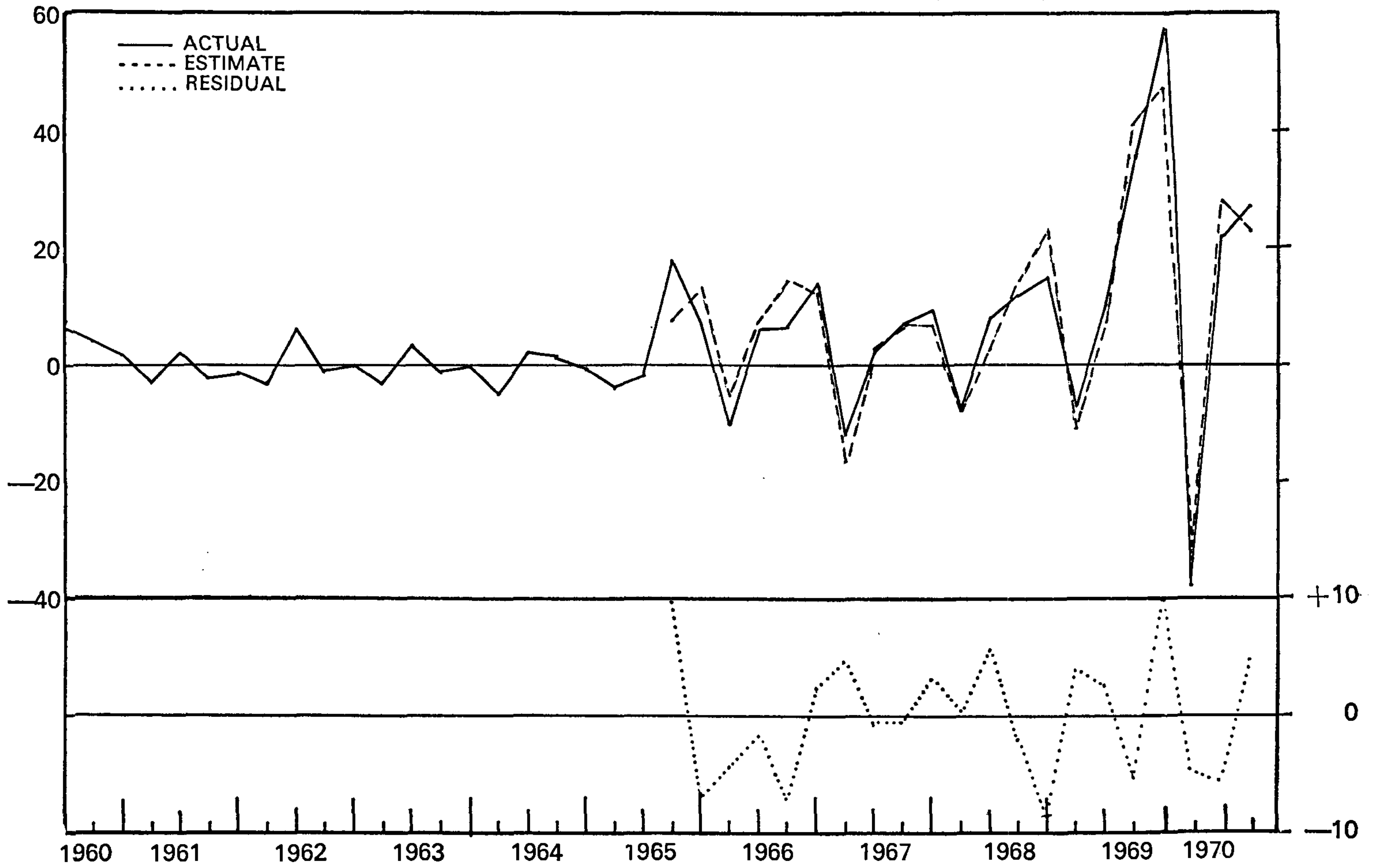
TRADING BANKS' DEMAND DEPOSITS (△DDT)

GRAPH: 2 ACTUAL, ESTIMATES AND RESIDUALS FROM EQUATION 2.7

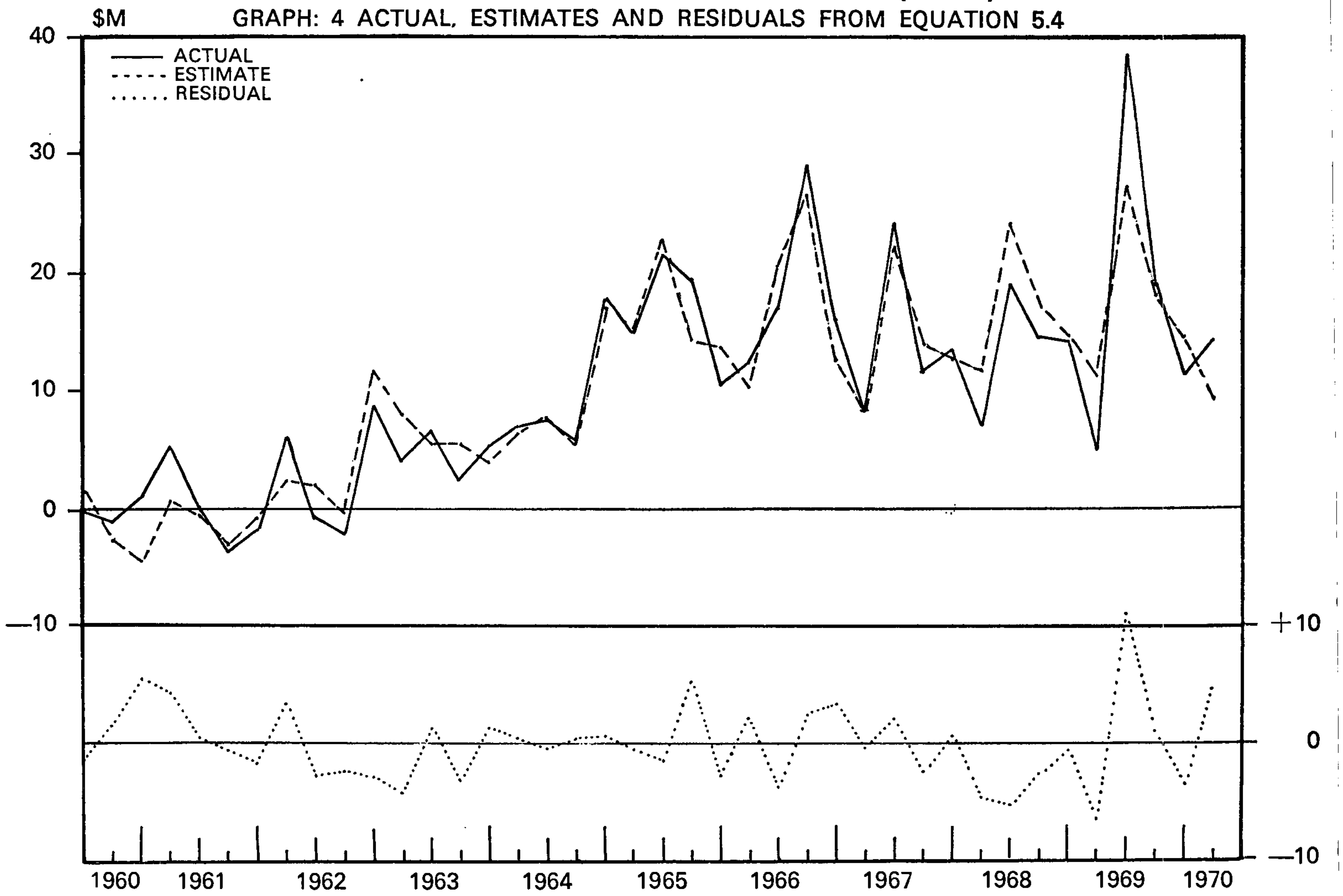


TRADING BANKS' FIXED DEPOSITS (△DFT)

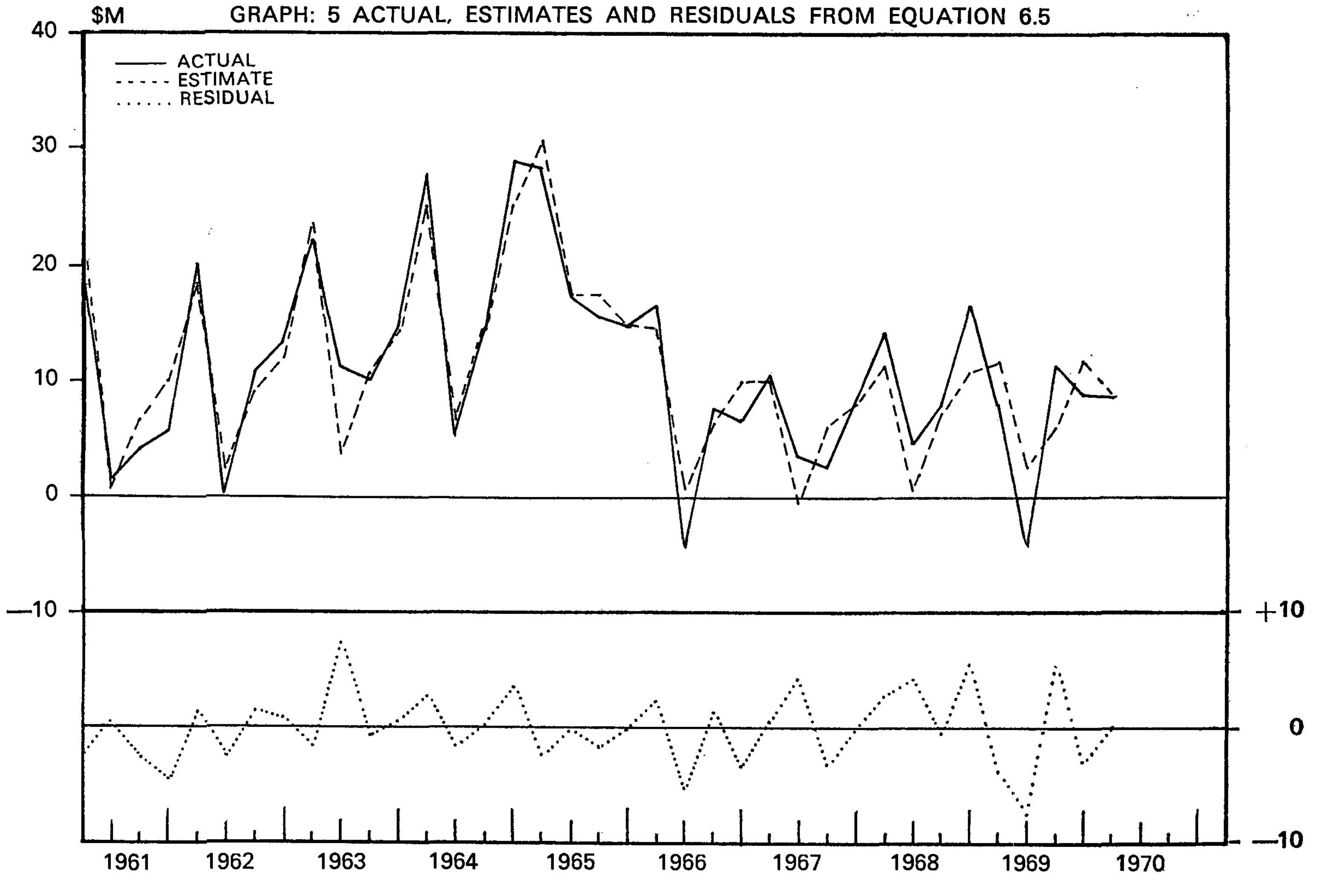
GRAPH: 3 ACTUAL, ESTIMATES AND RESIDUALS FROM EQUATION 3.8



SAVINGS BANKS' INVESTMENT DEPOSITS (△DFS)



SAVINGS BANKS' DEMAND DEPOSITS (△DDS)



TRADING BANKS' ADVANCES (INCL. TERM LOANS, ETC.) (ΔLPT)

GRAPH: 6 ACTUAL, ESTIMATES AND RESIDUALS FROM EQUATION 7.4