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SOURCES AND USES OF FUNDS IN THE NEW ZEALAND FARM SECTOR

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The changing pattern of funds sources and uses in the New Zealand farm sector, is summarized, using a flow of funds model. Technical problems of data and definition are discussed. The close relationship between cash farm income and investment is observed, and some indication is given of the extent of aggregate cash withdrawals (drawings) from the sector. The increasing reliance of agriculture on external sources of finance is also apparent.

Despite the dependence of the New Zealand economy on the activity and efficient performance of its farm sector, little is known of the magnitude of the sector's aggregate patterns of finance. In particular, information is lacking on the extent of self-finance (ploughback), and the extent of cash withdrawals. Policy decisions are made and production targets set based on limited information of the capacity of the industry to finance itself or its competitive ability to obtain finance from external sources. This is a result of the limited availability of relevant data and of the scattered and inconsistent nature of data that can be collected.

To assist policy makers and researchers in the farm finance discipline this paper attempts, utilizing a wide range of published and unpublished data, to indicate the sources of and uses of funds in the New Zealand farm sector since World War Two, and in particular to highlight the cash withdrawals and ploughback items. The exercise consists of the preparation of a flow of funds matrix of the farm sector. This technique of data summary and analysis has been well described in a general way by Duesenberry [4] as—

> '. . . tracing in a systematic way, the connection between production, prices and expenditure and other variables in a real system and the terms and conditions on which funds can be raised in financial markets . . .'

Conceptually the model represents an *ex post* record of the flows through which the demand for and supply of funds are equated. The underlying assumption is that of an equality between the total funds inflow to (SF_t) and outflow from (UF_t) the farm sector, in a particular period t. Thus

$$\sum_{i=1}^{N_t} SF_t \equiv \sum_{i=1}^{N_t} UF_t \tag{1}$$

The theoretical model for the New Zealand farm sector can now be elaborated, so that[1]

[1] Glossary of terms—

N_t = number of farm households in period t,
t = unit period of one year,

$$\sum_{i=1}^{N_t} SF_t = \sum_{i=1}^{N_t} (RE + B)_t \pm \Delta SB \tag{2}$$

where,

$$\sum_{i=1}^{N_t} RE_t = \sum_{i=1}^{N_t} \{GFY - (LIC + ISS + SC + FCE + T + W) + OFY + G \pm WR\}_t \tag{3}$$

and,

$$\sum_{i=1}^{N_t} B_t = \sum_{i=1}^{N_t} (GMB \pm \Delta STB)_t \tag{4}$$

Similarly, the uses of funds can be defined as

$$\sum_{i=1}^{N_t} UF_t = \sum_{i=1}^{N_t} (FA + MR + DG)_t \tag{5}$$

where,

$$\sum_{i=1}^{N_t} FA_t = \sum_{i=1}^{N_t} (PM + BU + L + ID)_t \tag{6}$$

With the exception of the variables ΔSB and ΔSTB, the model represents gross data flows. It was felt that a 'gross' approach would be more revealing than a 'net' approach. A 'net' approach would result in the suppression of data and would not facilitate an easy comparison of the magnitude of flows. Of particular interest in the approach adopted is the comparison possible between the variables *L*, *GMB* and *MR*.

RE = funds from non-borrowed sources (retained earnings),
B = funds from borrowed sources.
ΔSB = funds from sector balances (positive)); funds to sector balances (negative),
GFY = gross farm income,
LIC = livestock inventory changes,
ISS = inter-sector sales,
SC = sector consumption of farm products,
FCE = farm cash expenses,
T = tax paid,
W = cash withdrawals,
OFY = off-farm income,
G = government grants, subsidies, etc.,
WR = wool retention payments (negative); repayments (positive),
GMB = gross mortgage borrowing,
ΔSTB = net short term borrowing (positive); net short term repayments (negative),
FA = purchase of farm assets,
MR = mortgage repayments,
DG = death duty and gift duty payments,
PM = expenditure on plant and machinery,
BU = expenditure on buildings,
L = expenditure on land purchase,
ID = expenditure on improvements and developments.

All of the variables of the model were generated exogenously, with the exception of the variable W_t, calculated as follows,

$$(7) \quad \sum_{i=1}^{N_t} W_t = \sum_{i=1}^{N_t} \{(UF + LIC + ISS + SC + FCE + T) - (B + GFY + OFY + G) \pm WR\}_t \pm \Delta SB_t$$

In this way, W_t will reflect all accumulated errors and omissions of the model. Whilst this may detract from the empirical validity of the results, the body of theoretical and quantitative knowledge relating to farm sector cash withdrawals is very light. The flow of funds model does represent an attempt, albeit naïve, to quantify this variable.

The basic funds flow technique has already been used by Brake [2] and Penson, Lins and Irwin [12] to describe the flow of funds of the Canadian and the United States farm sectors, respectively. In its attempts to describe the flows in the farm sector, the technique possesses four basic advantages. These are—

(i) that it is comprehensive. The funds flow statement describes a sector's financial structure by way of an intimate linkage of aggregate financial with aggregate real data;

(ii) that it places in perspective the relative role of retained earnings (ploughback) as a source of sectoral funds;

(iii) that it offers a dynamic explanation of changes in financial variables. By highlighting transactions based on current market values the funds flow sectoral technique supplements the distorting effect of inflation on aggregate sectoral income and expenditure statements;

(iv) that it generates a compact summary of data that can be used as a basis for further economic or econometric investigation.

The two principal difficulties in use of this technique are those of precise definition of terms (for instance 'funds') and of the limited availability of reliable data.

The model described above is based on the concept of the balanced funds statement and 'funds' are defined as the entire purchasing power ('total assets') of the farm sector. This definition of 'funds' and the consequent approach has been discussed in depth and criticized by Anton [1]. He argues that the definition is imprecise and that it implies, but never specifically identifies a measure of value. This is because the net change in every financial resource utilized in the farm sector is identified. Under the usual accounting definition of 'funds', such as cash or working capital, changes in the pool of 'funds' themselves are highlighted. On the other hand, the argument in favour of the 'total assets' concept of funds is that it is a generalized approach. It was considered to be the most appropriate practical funds concept after examination and assessment of the data available.

In any such aggregate analysis, a precise definition of the 'farm sector' is also a major theoretical requirement. In practice this is difficult and in this study Johnson's [6] definition is followed. The farm sector is defined to include—

> '. . . all farms in New Zealand which contribute to national production and excluding organizations providing services to agriculture, such as contractors, aerial topdressers, etc. . . .'

TABLE 1—*New Zealand Farm Sector—*

Farming year ending 30 June	1946	1947
Gross Farm Income (GFY)	192·2	222·6
Less Livestock Inventory Changes (LIC)	—0·6	—2·2
Inter-sector sales (ISS)	9·4	9·8
Sector consumption of farm products (SC)	3·4	3·9
Farm Cash Receipts	180·0	211·1
Less Farm Cash Expenses (FCE)	109·5	105·1
Net Cash from Farm Operations	70·5	106·0
Off-farm Income (OFY)	3·5	4·6
Farm Sector Income	74·0	110·6
Less Tax Paid (T)	4·0	6·1
Farm Sector Income after Tax	70·0	104·5
Add Government Grants, Subsidies, etc. (G)	1·2	1·4
Wool Retention Money (WR)		
Net Cash Farm Income	71·2	105·9
Less Cash Withdrawals (W)	12·4	46·0
Funds from Non-Borrowed Sources (RE)	58·8	59·9
Gross Mortgage Borrowing (GMB)	19·4	26·5
Net Short Term Borrowing (ΔSTB)	5·1	7·6
Funds from Borrowed Sources (B)	24·5	34·1
Funds from Sector Balances (ΔSB)		
TOTAL SOURCES OF FUNDS (SF)	83·3	94·0
Purchases of Plant and Machinery (PM)	5·3	6·9
Construction of Buildings (BU)	3·1	4·6
Purchase of Land (L)	25·9	35·5
Improvements and Developments (ID)	6·2	6·8
Purchase of Farm Assets (FA)	40·5	53·8
Mortgage Repayments (MR)	29·2	25·6
Net Short Term Repayments (ΔSTB)		
Repayments of Money Borrowed	29·2	25·6
Death Duty and Gift Duty Payments (DG)	6·3	6·7
Wool Retention Money (WR)		
Funds to Sector Balances (ΔSB)	7·3	7·9
TOTAL USES OF FUNDS (UF)	83·3	94·0

This definition has the necessary quality of flexibility. This is because individual participants in the farm sector will vary over time and a definition is required to ensure that the funds flow model is able to represent a consistent summary of farm sector financial behaviour.

As it is difficult in practice to distinguish between the household and business activities of the farm sector, these have been combined to represent one transacting body. A micro-study by Mueller [8] has adopted this approach.

The second major problem in use of the technique concerns data. Data limitations have been encountered by many researchers investigating resource flow patterns. The problems are basically those of data omissions, and of data quality.

Flow of Funds Statement 1945/46–1968/69 ($ Million)

1948	1949	1950	1951	1952	1953	1954
271·4	293·4	366·2	582·6	436·5	522·2	554·6
4·7	3·0	12·4	36·0	6·7	25·0	23·8
9·7	11·3	11·6	12·5	11·4	11·9	16·2
4·8	5·1	6·4	10·2	7·6	9·1	9·5
252·2	274·0	335·8	523·9	410·8	476·2	495·1
126·2	133·2	164·5	241·4	188·3	248·3	240·3
126·0	140·8	171·3	282·5	222·5	227·9	254·8
5·5	6·1	6·3	7·0	6·8	8·1	8·9
131·5	146·9	177·6	289·5	229·3	236·0	263·7
9·1	13·0	16·5	24·1	51·2	32·7	37·0
122·4	133·9	161·1	265·4	178·1	203·3	226·7
1·3	0·8	1·4	2·1	3·2	2·5	2·3
				5·0	12·0	11·0
123·7	134·7	162·5	267·5	186·3	217·8	240·0
55·6	59·5	73·3	88·7	104·0	77·3	124·5
68·1	75·2	89·2	178·8	82·3	140·5	115·5
26·7	27·5	26·9	33·8	53·3	58·1	54·5
			16·8	2·9		30·2
26·7	27·5	26·9	50·6	56·2	58·1	84·7
				31·4		
94·8	102·7	116·1	229·4	169·9	198·6	200·2
8·5	10·6	14·5	17·5	24·3	25·7	24·2
6·4	8·0	10·0	11·7	13·7	15·1	16·6
30·8	27·2	26·1	35·6	71·9	70·5	77·8
8·2	11·3	13·3	15·8	18·3	22·3	22·7
53·9	57·1	63·9	80·6	128·2	133·6	141·3
25·8	27·5	28·1	29·5	32·3	33·7	35·5
5·2	4·2	6·1				
31·0	31·7	34·2	29·5	32·3	38·4	35·5
6·8	6·9	7·3	8·5	9·4	10·0	10·5
			66·0			
3·1	7·0	10·7	44·8		16·6	12·9
94·8	102·7	116·1	229·4	169·9	198·6	200·2

A number of funds items in the real environment have been omitted from the model developed in this study. For example, no allowance has been made for cash gifts or unsecured non-institutional moneys injected into the sector, such as proceeds from the sale of farm land for non-agricultural purposes, that are reinvested in farming. This may occur when a farmer sells a portion of his land for building purposes. The problem of data omission is however virtually certain in exploratory funds flow analysis and it is hoped that future statistics will help to rectify this.

The problems of data quality as opposed to omissions, are well discussed by Copeland [3], the author of one of the pioneer sectoral funds flow studies. The quality of primary data collected for this study

TABLE 1 (continued)—*New Zealand Farm Sector*—

Farming year ending 30 June	1955	1956	1957	1958
GFY	526·1	554·4	614·0	592·7
Less LIC	12·4	4·5	9·5	21·9
ISS	16·0	16·1	14·9	14·9
SC	9·8	9·7	10·7	10·4
Farm Cash Receipts	523·9	524·1	578·9	545·5
Less FCE	244·8	237·0	260·8	227·3
Net Cash from Farm Operations	279·1	287·1	318·1	318·2
OFY	10·0	10·8	12·3	13·4
Farm Sector Income	289·1	297·9	330·4	331·6
Less T	43·3	40·0	35·6	37·2
Farm Sector Income after Tax	245·8	257·9	294·8	294·4
Add G	2·3	2·2	1·7	1·8
WR	11·0	13·0	12·0	
Net Cash Farm Income	259·1	273·1	308·5	296·2
Less W	112·7	124·3	146·3	158·2
RE	146·4	148·8	162·2	138·0
GMB	64·8	66·5	67·9	74·2
ΔSTB	6·2			21·3
B	71·0	66·5	67·9	95·5
ΔSB		0·7		8·6
SF	217·4	216·0	230·1	242·1
PM	16·1	26·1	21·7	24·2
BU	19·8	21·7	22·3	24·0
L	96·0	80·5	78·1	100·1
ID	27·0	31·2	27·5	29·9
FA	168·9	159·5	149·6	178·2
MR	36·8	41·4	51·5	55·2
ΔSTB		5·9	10·0	
Repayments of Money Borrowed	36·8	47·3	61·5	55·2
DG	10·4	9·2	8·2	8·7
WR				
ΔSB	1·3		10·8	
UF	217·4	216·0	230·1	242·1

for the period prior to 1958 is particularly poor. Improvements made at that time were essentially a result of the 1956 Royal Commission [9] recommendations that the quality of agricultural finance statistics be improved. Even so, in a number of data series, estimates were made using multiple and simple regression equations, and these methods have inevitably introduced the problem of data series correlation. This is particularly true for final data presented for early post-war years. This important source of error therefore limits the value of the statement as a predictive device. Brief details of actual estimation procedures utilized where data are not available, and sources of data, are given in the Appendix.

Flow of Funds Statement 1945/46–1968/69 ($ Million)

1959	1960	1961	1962	1963	1964	1965
564·2	623·5	613·5	613·9	654·0	763·6	792·1
17·2	2·6	21·5	9·8	0·6	9·1	24·8
15·9	19·6	21·2	21·1	21·7	25·0	24·4
9·9	10·9	10·7	10·4	11·4	13·4	13·9
521·2	590·4	560·1	553·6	620·3	716·1	729·0
233·6	258·1	229·2	244·7	278·2	329·8	349·5
287·6	332·3	330·9	308·9	342·1	386·3	379·5
13·2	14·4	15·8	15·4	15·5	16·9	18·7
300·8	346·7	346·7	324·3	357·6	403·2	398·2
42·4	41·8	54·5	50·3	45·1	44·5	52·5
258·4	304·9	292·2	274·0	312·5	358·7	345·7
1·5	1·7	1·1	1·1	1·8	1·6	2·1
259·9	306·6	293·3	275·1	314·3	360·3	347·8
113·0	120·3	132·4	88·1	125·1	162·5	161·7
146·9	186·3	160·9	187·0	189·2	197·8	186·1
74·3	77·7	113·6	106·1	107·0	128·7	167·1
4·0		20·9	0·7		2·2	26·7
78·3	77·7	134·5	106·8	107·0	130·9	193·8
0·5		5·5	7·9			
225·7	264·0	300·9	301·7	296·2	318·7	379·9
21·7	18·6	23·1	25·6	24·3	26·6	26·5
23·6	23·1	25·7	26·9	29·9	27·6	29·5
84·8	95·7	135·8	126·7	99·1	120·8	179·9
29·0	29·8	33·2	34·3	32·1	34·4	39·7
159·1	166·2	217·8	213·5	185·4	209·4	275·6
56·0	62·8	70·3	76·4	80·5	78·6	88·8
	0·6			5·7		
56·0	63·4	70·3	76·4	86·2	78·6	88·8
10·6	12·3	12·8	11·8	10·8	9·4	10·4
					8·0	2·0
	22·1			13·8	13·3	3·1
225·7	264·0	300·9	301·7	296·2	318·7	379·9

On the basis of the developed model, definitions discussed and reservations on primary data input, a funds flow statement of the New Zealand farm sector is presented, covering the period between the 1945/6 and the 1968/9 farming years (Table 1). Constituent variables are defined in the Appendix.

A number of observations from the statement are of immediate interest and on the whole these offer some empirical support to the growing body of farm finance theory. The close relationship between on-farm investment and income in the New Zealand farm sector, already qualitatively observed by Philpott and Stewart [13], is consistent with data contained in the statement. The simple zero order correlation coeffi-

TABLE 1 (continued)

New Zealand Farm Sector—Flow of Funds Statement 1945/6–1968/9
($ Million)

Farming year ending 30 June	1966	1967	1968	1969
GFY	850·5	824·6	826·1	885·6
Less LIC	53·9	45·7	28·2	12·8
ISS	25·6	29·3	31·5	37·1
SC	14·9	14·4	14·5	15·5
Farm Cash Receipts	756·1	735·2	751·9	820·2
Less FCE	393·0	373·0	368·4	424·0
Net Cash from Farm Operations	363·1	362·2	383·5	396·0
OFY	19·5	19·8	*20·0	*20·0
Farm Sector Income	382·6	382·0	403·5	416·2
Less T	55·1	56·9	49·8	*50·0
Farm Sector Income after Tax	327·5	325·1	353·7	366·2
Add G	3·2	4·0	3·6	4·8
WR	4·0	4·0		
Net Cash Farm Income	334·7	333·1	357·3	371·0
Less W	104·6	96·0	108·3	109·7
RE	230·1	237·1	249·0	261·3
GMB	181·4	177·3	151·3	157·5
ΔSTB	9·3	5·3	4·7	9·3
B	190·7	182·6	156·0	166·8
SB	7·2	16·7		
ΔSF	428·0	436·4	405·0	428·1
PM	35·8	34·8	28·6	28·0
BU	35·3	40·1	31·1	31·9
L	197·5	185·3	151·1	161·0
ID	40·0	41·5	40·4	41·1
FA	308·6	301·7	251·2	262·0
MR	108·7	124·5	138·0	146·4
ΔSTB				
Repayments of Money Borrowed	108·7	124·5	138·0	146·4
DG	10·7	10·2	10·0	11·2
WR				
ΔSB			5·8	8·5
UF	428·0	436·4	405·0	428·1

Key: *Estimate.

cients between the derived variable 'net cash farm income' and farm investment items listed are presented below—

	Correlation Coefficient	Significance
Multiple Relationship		
N.C.F.I./Investment	0·863	1%
Partial Relationships		
N.C.F.I./Purchase of Plant and Machinery	0·778	10%
N.C.F.I./Construction of Buildings	0·906	1%
N.C.F.I./Purchase of Land	0·827	5%
N.C.F.I./Improvements and Developments	0·897	1%

With the exception of land purchase expenditure, the investment variables included in the statement are those estimated independently by Johnson [6]. An analysis of variance technique, based on the F-test, was used to test the significance of the correlation coefficients.

These simple results do not offer conclusive support to Ross's [14] assertion that gross investment in plant and machinery in New Zealand is closely related to real net farm income. This may be a result of differences in conceptual approach (i.e., this study was not concerned with 'real' net farm income) or it may be that non-income factors influence such investment in the macro-context. The other correlation coefficients are highly significant, with the exception of land purchase. In this case, the correlation model, relating expenditure on land purchase to net cash farm income, does not provide an entirely adequate explanation. Other factors such as expectations, the availability of external funds and the age structure of the farmer population will influence expenditure on land purchase. A causal model, including net cash farm income as an exogenous variable, is the logical extension of this analysis.

The multiple correlation coefficient is high. A priori evidence [10, 11] suggests that in other countries, the farm sector exhibits a preference for internal finance. The observed correlation suggests that this phenomenon may also be a feature of the New Zealand farm sector. Again, the observed relationship provides an introduction for the development of a causal model to provide a rigorous test for such a hypothesis.

The nature of the construction of the model and of the derived statement allows some observations to be easily made on the aggregate 'cash withdrawals' item. It is important to stress again that this item emerged as a balancing residual and does therefore reflect accumulated errors and omissions. Improvements in data may lead to refinements in subsequent comments, but it was felt that on the whole they are likely to be realistic and valid.

Mean 'cash withdrawals' were 40 per cent of calculated 'net cash farm income' for the whole period, but there was a wide range. A number of relationships were examined, but the three hypotheses that gave best results from regression equations were very simple in concept. These were—

(i) that calculated 'cash withdrawals' (endogenous variable), were related directly to 'net cash farm income' (exogenous variable);

(ii) as in (i) above, but with a time lag of one year;

(iii) that a decrease in 'net cash farm income' was met with an immediate adjustment in sector 'cash withdrawals', but that changes in aggregate drawings in a period of increase in 'net cash farm income' were lagged by one year. This hypothesis was designed to reflect inherent farm sector cautiousness in the macro-environment.

In all three relationships, the regression coefficients were highly significant and results from the Durbin-Watson test also suggested that the hypothesis of random disturbance need not be rejected (Table 2). The correlation between variables was highest in equation (i). The explanatory power of this equation, 63 per cent, whilst not high, was considered to be reasonable, in view of data deficiencies.

TABLE 2

Some Relationships between "Cash Withdrawals" (D_t) and "Net Cash Farm Income" (Y_{D_t})
($ Million)

	Equation	Significance (Regression coeff.)	Significance (F-test)	R^2
(i)	$D_t = 0{\cdot}353 Y_{D_t} + 16{\cdot}318$ $(\cdot 057)$	1%	1%	0·632
(ii)	$D_t = 0{\cdot}319 Y_{D_{t-1}} + 29{\cdot}447$ $(\cdot 055)$	1%	1%	0·604
(iii)*	$D_t = 0{\cdot}333 Y_{DM_t} + 28{\cdot}839$ $(\cdot 056)$	1%	1%	0·617

* Y_{DM_t} represents "net cash farm income" (modified); a concept designed to reflect inherent farm sector cautiousness, as described above.

The implication of these observations suggests that in aggregate there may be quite large fluctuations in cash withdrawals from the New Zealand farm sector, depending on fluctuations in cash earnings. This conclusion contradicts that of Keen [7] who has written, on the basis of a micro-study, that—

> '. . . once a farmer has succeeded in establishing a certain standard of living for himself and his family, he is reluctant to see it fluctuate from year to year . . .'

This inconsistency in research results emphasizes the need for a far closer study of the causes of macro-variation in aggregate 'cash withdrawals'.

Data summarized in Table 1 may be used to examine the dynamic source structure of funds for farm sector capital and other recorded expenditure from external and internal sources. The annual farm sector 'financial leverage' ratio was calculated. This ratio is defined to represent the relationship between funds contributed by the farm sector itself for expenditure (and includes the items 'funds from non-borrowed sources' and 'funds from sector balances') to the funds contributed by external sources, that is funds from borrowing (items 'Gross Mortgage Borrowing' and 'Net Short Term Borrowing'). The apparent gross/net inconsistency is resolved as the items included are both 'flow' rather than 'stock' items. The time series ratio is a measure of the relative

reliance of the farm sector on itself to finance growth and development, and also its *ex post* successful claim on non-farm sector financial resources.

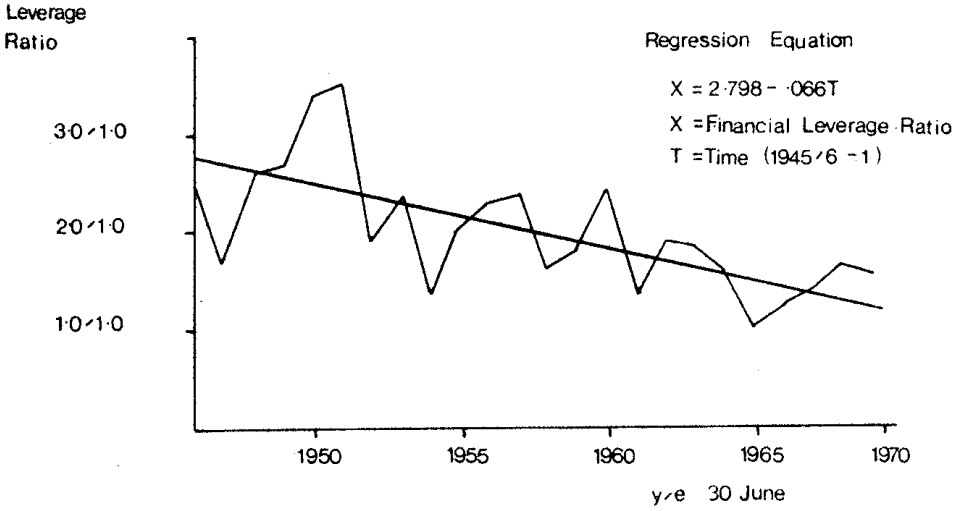

FIG. 1—New Zealand agricultural sector financial leverage ratio (1945/6-1968/9).

The ratio is plotted over the period on Figure 1. Thus for the farming year ending 30 June 1946 the farm sector was able to provide $2.40 from its own resources for the listed expenditures, for every dollar it borrowed.

A linear regression equation was calculated, relating this ratio (X) with time (T), with the structure

$$X = 2{\cdot}798 - 0{\cdot}066T \quad (8)$$
$$(0{\cdot}017)$$

In this relation T is a discrete unit variable measured in years, value one in 1945/6. The regression coefficient was highly significant, but the correlation coefficient between the variables (—0·681) was not high. The d-statistic (1·686) suggested that the hypothesis of random disturbance need not be rejected. The standard error of estimate was 0·425.

Whilst this equation cannot legitimately be used as a predictor, it does summarize well the increasing role of external sources of finance in the New Zealand farm sector and the relative decline of retained earnings as a source of finance.

Conclusions

The funds flow statement utilizes an increasingly common accounting technique to provide a basic and concise description of the financial flows of the New Zealand farm sector. Use of the technique results in the collection of a source of reference material for future researchers and policy makers, and as an *ex post* guide to the financial behaviour of the

farm sector. Presentation of a mass of scattered data in this way has shown clearly three phenomena. These are that—

(i) there is a close relationship between aggregate farm sector cash income and farm investment;

(ii) aggregate cash withdrawals do fluctuate with income, suggesting that farmers do not maintain a constant standard of living from year to year;

(iii) non-farm sector sources are playing an increasing role in the finance of farm sector operations. This phenomenon has important macro-implications for funds allocation in New Zealand in the context of inter-sector productivity and efficiency of resource use. It suggests the need for an increasing volume of work on farm sector productivity in New Zealand. In particular, the returns to the nation from lending large sums of non-farm sector finance for farm purchase need to be ascertained.

These three phenomena, and others arising from a related project, the Lincoln College Credit Survey, have been examined in greater detail by Stanbridge [15].

Finally, it can be seen that the funds flow technique has development potential that will allow it to further explore financial behaviour of the farm sector. This is subject to data availability. For instance, it could usefully be utilized to describe quarterly and seasonal flows of funds, or alternatively, to describe the flows in farm sub-sectors, such as sheep or dairyfarming.

APPENDIX

Data Definitions, Sources and Estimation Procedures

Gross Farm Income: statistics direct from the New Zealand Year Book and available for all years. Definition according to the New Zealand Government Statistician.

Livestock Inventory Changes: New Zealand gross farm income figures include a capital allowance for livestock inventory valuation changes. This change is calculated by multiplying changes in livestock numbers by predetermined standard values. For the period 1945/6 to 1962/3, figures were supplied by the Government Statistician. For the period 1963/4 to 1968/9, estimates were made following this procedure.

Inter-Sector Sales: defined as that portion of farm produce which is sold to other farmers as material for further production. The inter-sector sales figure is included in the gross farm income figure of 'Grain and Field Crops' in the New Zealand Year Book. The approach adopted was to isolate sales of 'grain and field crops' to other sectors, and estimate the inter-sector sales component as a residual. Calculations were made for cereals, peas, potatoes, onions, hay, grass seeds and flax.

Sector Consumption of Farm Products: defined as that portion of potentially marketable farm produce which is consumed on the farm. It includes consumption of meat, milk, potatoes and eggs, valued at farm gate prices. Statistics are available for 'tons of meat slaughtered on farms' and for average farm gate prices. Estimates of milk, potatoes

and eggs consumption were made by estimating numbers in farm families and extracting per capita consumption figures and retail prices from relevant Year Books. The assumption was that the farm sector does not deviate from per capita consumption habits. The estimate of sector consumption was about 1¾ per cent, consistently, of gross farm income, in years for which full data were available. This rule-of-thumb was applied to earlier years, particularly prior to 1956, when less complete data were available.

Farm Cash Receipts: defined as gross farm income, less the sum of inventory change, inter-sector sales, and sector consumption.

Farm Cash Expenses: estimates of the sum of expenditure on farm requisites, fertilizer, lime, imported seeds, fuel, oil and grease, electricity and power, repairs and maintenance, railage and cartage, other inputs, wages, interest, rent, rates and land tax. These items have been defined and estimated independently over the period by Hussey and Philpott [5].

Off Farm Income: defined as income accruing to the farm sector from external sources, e.g. dividends. The source of information was the New Zealand Income Tax Statistics Annual. No statistics of off farm income were published for the income years 1955/6 and 1961/2, and these figures were imputed by means of weighted averages. Before 1957/8 figures for farm sector 'unearned income taxed at source' and universal superannuation were not published. Published figures were raised by a factor of 100/55 to give total off farm income for the years to 1957/8. This factor represented the average proportion of these two variables in the total figure since that date.

Tax Paid: sums paid by the farm sector as tax on all sources of income. Source of data was the New Zealand Income Tax Statistics Annual.

Government Grants, Subsidies, etc.: allowances by the Government paid directly to the farm sector, including lime and fertilizer subsidy and payments for flood and drought relief. In addition insurance benefits received by farmers were included (e.g. for fire losses). Sources of data were Year Books and New Zealand Insurance Statistics.

Wool Retention Money: sums retained or distributed by the Government, either voluntarily or compulsorily, to facilitate income equalization. Data available from the New Zealand National Income and Expenditure Accounts (annual).

Gross Mortgage Borrowing: the dollar value of all new rural mortgages registered, including the refinance of existing ones. Statistics were available from annual Year Books.

Net Short Term Borrowing/Repayments: net changes in resources allocated to the farm sector from lenders other than by mortgage. The sum of net changes in a number of items is included—

(i) trading bank current account lending. Source of data was the Reserve Bank of New Zealand Bulletin. For the period 1945/9, only annual balances were published as at 31 March. These balances were adjusted to a June basis through use of seasonal indices,

(ii) trading bank term loans. These loans were first granted in 1964

and data were available from the Reserve Bank of New Zealand Bulletin,
(iii) State Advances Corporation—current account lending. Figures were taken from the Corporation's Annual Reports to Parliament,
(iv) loans from finance companies. Statistics were first published in the Reserve Bank of New Zealand Bulletin in 1965. Before that time, these loans were assumed to be negligible,
(v) advances from stock and station agents. Figures were first published in 1958 in the Reserve Bank of New Zealand Bulletin, though the data concept was revised in 1962. Before 1958 information was collected in three ways—

(a) from direct enquiry of the leading stock and station agents,
(b) from a multiple regression analysis, developed from post 1958 data. This related stock firm lending to trading bank lending, farm income and investment,
(c) from an interpolation procedure using isolated independent estimates of stock firm debt outstanding before 1958.

These three sets of estimating procedures all have conceptual errors, but gave more or less consistent answers, particularly with respect to trend pattern.

Funds to/from Sector Balances: this variable represents the net adjustment in farm sector credit balances (current and deposit accounts). These are held primarily with trading banks and stock firms. Using an interpolation procedure, estimates were possible for farmers' trading bank credit balances. Data were available from the Reserve Bank of New Zealand Bulletin. A model was developed relating change in farm deposits to change in total bank deposits. The response of total bank deposits to changes in farm deposits was greater when farm deposits were falling than when they were rising. This model was discussed with bankers to ensure the soundness of its logic, and was used to estimate pre-1961 balances. Results of the model were compared with isolated independent estimates of farm sector balances for consistency.

Figures of the farm sector deposits with stock and station agents were available from 1957 from the Reserve Bank of New Zealand Bulletin. Before 1957, deposit account balances were estimated using a linear interpolation model with a special dummy variable to account for the effects of the 1951 wool boom. Current account balances were estimated using a lagged regression model relating balances to income from sales of wool, lamb and mutton. This is reasonable since stock firms are used predominantly by sheep farmers. Income data were available from Year Books.

Purchase of Farm Assets: the items 'purchase of plant and machinery', 'construction of buildings' and 'improvements and developments' were defined and estimated by Johnson [6] over the whole period. Data for the item 'purchase of land' were obtained from Rural Land Transfer Statistics, published in the Year Book.

Mortgage Repayments: these are defined as dollar principal repayments of flat and table mortgages, including cases subsequently refinanced. There is therefore a relationship with the item 'Gross Mortgage

Borrowing' above, which also includes refinanced mortgages. Table mortgage repayments were estimated by a correlogram procedure reconciling published figures for table mortgages registered and discharged, taken from the Year Book. Interest rate series were similarly available, and annual principal repayments were estimated with the help of extensive use of amortization tables.

The average length of flat mortgages was assumed to be five years for the whole period. This was after extensive study of stock-type data obtained from the Lincoln College and other credit surveys and a correlogram analysis. Published figures of flat mortgages registered and discharged were available from 1953. Before that time, flat and table mortgage registrations were combined together in published statistics. Direct enquiry methods were used to develop a breakdown procedure.

Death Duty and Gift Duty Payments: this item is the cash drain resulting from payments of gift duty and death duty to the Government. Figures are available from 1966 in Year Books of death duty paid, classified according to occupational group and to number of estates. Before that time no information was available. Direct enquiry revealed that a '50% of total duty' rule-of-thumb method would be reasonable as an estimate of the farm sector death duty paid. Similarly a 66% rule-of-thumb method was used to estimate farm sector gift duty paid.

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