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DETERMINANTS OF CAPITAL INVESTMENT IN NEW ZEALAND DAIRY FARMING

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ABSTRACT

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An econometric model is used to evaluate their impacts on investment in dairy farming. A dynamic optimisation framework determines simultaneously the long term investment level in plant and machinery, buildings, land improvement, and breeding cows. Implicit rental values of capital items based on the new taxation system are employed in this model.

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An econometric model is used to evaluate their impacts on investment in dairy farming. A dynamic optimisation framework determines simultaneously the long term investment level in plant and machinery, buildings, land improvement, and breeding cows. Implicit rental values of capital items based on the new taxation system are employed in this model.

OBJECTIVES

The objective of this study is to develop an econometric model that could be used to:

1 evaluate the impact of changing government policies, especially taxation policies, on investment levels in dairy farming; and

2 determine the optimum long term investment level in plant and machinery, buildings, land improvements, and breeding cows in dairy farming.

AGRICULTURAL POLICY AND REFORM

During the 1960s there was concern that New Zealand's balance of payments position was constraining the growth of the economy. The potential for further export earnings via the agricultural sector was recognised. As a result the Government introduced the following incentives in 1963:

(a) the State Advance Corporation (precursor to the Rural Bank) was instructed to establish a specific development loan programme for pastoral farmers;

(b) subsidies were established on the transport and price of fertiliser; and

(c) farmers were permitted a 100 percent taxation write-off of certain capital expenditure for the development of their farms.

Further, in 1966 'nil standard values' livestock valuation scheme was established to encourage farmers to expand livestock numbers (Tyler and Lattimore, 1990). This was later modified to a system where livestock could be valued for income tax purposes at (usually low) standard values approved by the Inland Revenue Dept. The differences between these standard values and the purchase or breeding costs of the livestock concerned were fully deductible.

In 1976, the Government introduced the Livestock Incentive Scheme. This offered a combination of low interest loans, and/or reductions of loan principal and tax rebates if certain livestock expansion targets were met. Other tax breaks available were special first year depreciation and investment allowances to encourage modernisation of plant, equipment and some buildings.

In 1978, the Government, still with the export revenue expansion goal in mind, established a more permanent mechanism to supplement farm prices and incomes in years of poor returns by introducing the Supplementary Minimum Prices (SMPs) scheme for all the major pastoral products. SMPs worked in tandem with the producer board stabilisation schemes. The Land Development Encouragement Loan scheme was also introduced in 1978. This included interest free loans and reductions in principal for farmers if certain land development targets were met (Tyler and Lattimore, 1990).

In 1984 the National Government acknowledged that this level of support was unsustainable, and announced a programme for the termination of the SMP schemes and the producer boards' access to low cost funds for price support.

The incoming Labour Government of 1984 announced that the concessionary farm development loans would be terminated and that other loans at concessionary rates would be brought in line with market rates. Subsidies on fertiliser and noxious weed control were to be ended.

Extensive reform of the New Zealand Income Tax Act of 1976 also began around 1984. In December 1985 it was announced that tax deductions for development expenditure would be changed from one of immediate deductibility to one of capitalisation and depreciation (King, 1990). The concessionary livestock valuation system was replaced by market-related values in 1987, to place agriculture on the same footing as other industries. The twenty percent investment allowance on business related plant, machinery and vehicles were terminated in 1985. The first year (accelerated) depreciation allowances on plant, machinery and certain buildings were abolished in 1988.

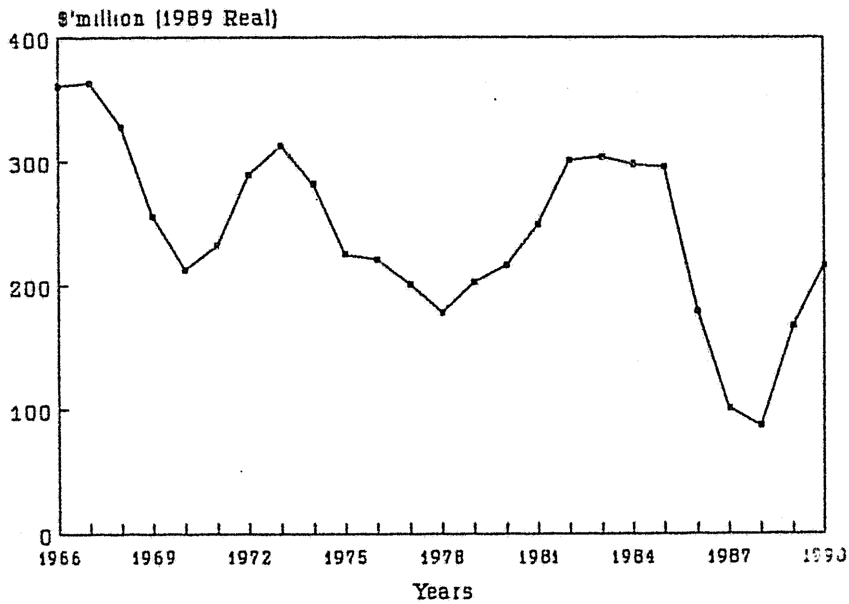
The removal of investment allowances and (accelerated) first year depreciation allowances and other investment incentives have reduced the rate of investment in new plant, machinery and certain buildings throughout the agricultural sector (Narayan and Johnson, 1992). Capital expenditure on all farm holdings showed strong growth during the 1970s and early 1980s in response to both favourable real farm incomes, and government policies which created an environment conducive to investment in agriculture. Since 1984 the removal of price support and taxation incentives for agricultural development, combined with depressed real net farm incomes, saw capital expenditure reduced to very low levels. The levels of capital expenditure have been insufficient to offset depreciation of the total agricultural capital stock base. This has led to a major run down in farm capital levels (Narayan and Johnson, 1992).

Although these policy changes have impacted on all the industries in the New Zealand farming sector, this study focuses on the dairy industry where farm incomes have recovered greatly in the past few years and so have the levels of investment. This turn around has occurred after a few years of low farm income and low levels of investment, and only when prices received by the dairy farmers improved significantly.

INVESTMENT TRENDS IN DAIRY FARMING

Figure 1 shows the aggregate level of real annual investment in dairy farming for the period from 1965/66 to 1989/90. It is clear that there were three periods of high re-investment in the mid 1960s, early 1970s and in the early 1980s. The middle to late 1980s are characterised by high dis-investment.

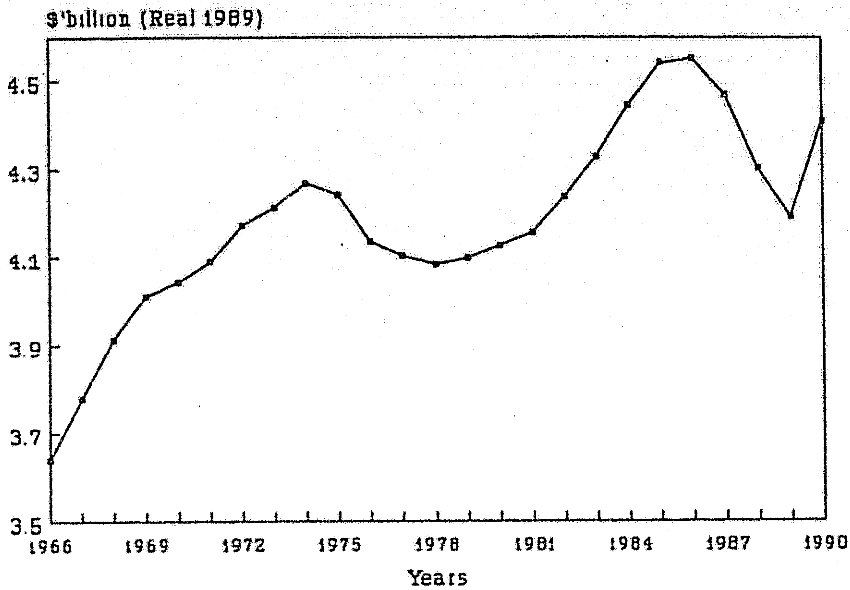
Fig 1: Dairy Farm Annual Investments in Capital Stocks*



* Buildings + land improvements + plant

Value of aggregate stock of capital (see figure 2) in dairy farming, ie land improvements, farm buildings and machinery combined, grew steadily in the late 1970s and early 1980s reached a peak in the mid 1980s and since then started to decline. The peak period, as shown in figure 2, was 1984/85. Between 1984/85 and 1990, the value of the total stock of capital in dairy farming had been declining at a faster rate than the annual investments. Since 1984, the agricultural sector as a whole went through a phase of major policy overhaul by the Government.

Fig 2: Total Capital Stock
in Dairy Farming*



*Farm Buildings + Land Imprv + Plant

After 1985, the Government's policy was to let farming find its own level of production and investment in relation to prices received and paid and at least initially this resulted in a lower level of capital investment than had ever occurred in the past. It is also clear that incomes were depressed and the capacity to borrow was severely restricted through this period.

IMPLICIT RENTAL PRICE CALCULATIONS

Changes in implicit rental rates of an asset can be used to capture the effects of changes in income tax policies on investment (LeBlanc et al, 1992). The rental price of a unit of capital service is the after-tax cost of capital services internally supplied by the firm, ie it is the rate the firm must charge in order to earn the required after-tax rate of return. LeBlanc et al developed the formula for implicit rental rates as the equality between the purchase price of the asset and the present value of the future rents generated by the asset;

(1)
$$q = \sum_{t=0}^{L} \frac{[U\, n_t (1+\pi)^t]}{[1+i]^t}$$

where q is the purchase price of an asset when new, L is the service life, U is the rental rate expressed in terms of an undepreciated unit of capital, n_t is the real capacity of the asset available in year t of its service life, π is the inflation rate, and i is the nominal before-tax interest rate.

When capital income is subject to income tax, the above equation has to be modified to include the effects of the tax. The rental rates then become functions of the price of assets, service lives, rates of capacity depreciation, the tax treatment of assets in question, and discount rates. LeBlanc et al suggest the following equation to include this modification;

$$q = (1-T)UN + \otimes q + T(1-\hbar\theta)Zq \quad (2)$$

where (1-T)UN is the present value of future after-tax rents generated by the asset, ⊗q is the present value of the tax savings produced by the investment tax credit, and T(1-ħθ)Zq is the present value of the future tax depreciation deductions. It is assumed in equation (2) that the firm's marginal tax rate (T) remains constant.

If price expectations and the marginal tax rate are constant, the rental rate is constant over the life of the asset. However, the productive capacity of the asset declines over the life of the asset. LeBlanc et al (1992), suggest the following to determine the sum of the real capacity of the asset over its service life;

$$N = \sum_{t=0}^{L} \frac{n_t(1+\pi)^t}{[1+i(1-T)]^t} \quad (3)$$

where the economic rate of depreciation for each asset category is determined using the double-declining balance depreciation method where the capacity of assets in the ith category in year t is represented as

$$n_{it} = (1-\delta)^{t-1} \quad (4)$$

Although the firm pays taxes on the rent generated by each asset, the firm can deduct the decline in the value of the asset as an expense. The tax depreciation allowances do not distort the asset mix if the present value of depreciation deductions claimed for tax purposes is equal to the true decline in capacity for each asset. If z_t is the allowable tax depreciation rate for year *t* of the asset's tax life (M), the present value of tax depreciation deductions, according to LeBlanc et al, is *TZq*, where

$$Z = \sum_{t=0}^{M} \frac{z_t}{[1+i(1-T)]^t} \quad (5)$$

In addition to the depreciation deduction, firms could also claim an investment tax credit as was the case in New Zealand from the late 1960s up to the mid 1980s. If firms claim the credit at the end of the first year of the asset's service life, the present value of the credit, according to LeBlanc et al, is ⊗q, where

(6) $$\otimes = \frac{\theta}{[1+i(1-T)]}$$

and θ is the nominal rate of the investment tax credit.

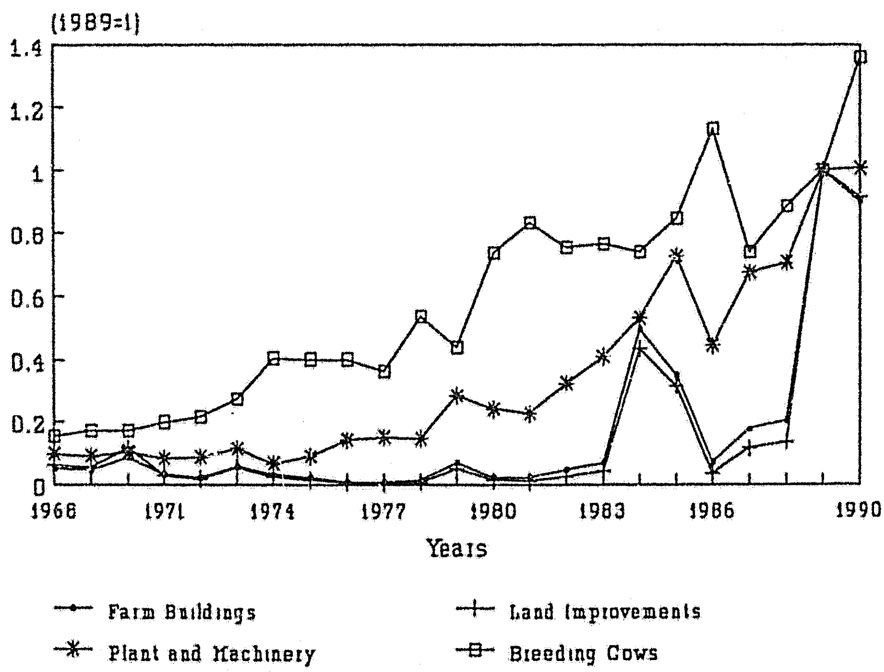
If the purchase price of the asset is known, LeBlanc et al re-wrote equation 2 as

(7) $$U = \frac{q[1-\otimes-T(1-h\theta)Z]}{N(1-T)}$$

which is the rental rate the firm must charge to earn a specified real after-tax rate of return.

In this paper, the implicit rental rates are calculated, as described in LeBlanc et al (1992), for plant and machinery, farm buildings, land improvements and breeding cows. These are presented in figure 3. The calculations are based on the assumption that the service lives for dairy cows is 5 years, for plant and machinery is 15 years, and for land improvements and farm buildings is 50 years.

Fig 3:Rental Values of Capital Assets



INVESTMENT MODEL

The 'cost of adjustment' model (Treadway, 1969; LeBlanc and Hrubovcak, 1986; and Howard and Shumway, 1988) is used to determine the optimal capital policy in the dairy industry of New Zealand. It is assumed that the objective of a dairy farmer is to select levels of capital stocks and inputs to maximise the present value of future net returns.

Net returns (R_t) from a dairy farm is stated as:

(8) $$R(t)/P = G(W,K) - \sum_{i=1}^{m} C_i(\dot{K}_i)$$

where:

	$R(t)$	=	net returns
	$G(W,K)$	=	unit output restricted profit function
	P	=	unit price of output
	W	=	a vector of variable input price normalised on output price
	K	=	a vector of quasi-fixed capital inputs
	$C_i(\dot{K}_i)$	=	cost of capital adjustment
	$\dot{K}$	=	net investment in capital inputs
	i	=	$i = 1,2 \ldots m$ capital inputs.

The net investment in capital inputs, assuming a proportional depreciation rate of capital stock is:

(9) $$\dot{K}_i = I_i - \delta_i K_i \qquad i=1,2,\ldots,m,$$

where: δ_i = rate of economic depreciation.

The critical assumption implied by equation (8) is that the capital stock of a dairy farm can be changed only after incurring an adjustment cost $C_i(\dot{K})$. The adjustment costs reflect the cost of introducing new capital into the farm. It may cover such items as the short-term loss in output during the introduction of new capital, training costs, engineering and administrative costs (Lopez, 1985).

The functional form of equation (8) assumes that the cost of adjustment is separable from the profit function G(W,K). It will also be assumed that $C_i(\dot{K}_i)$ is linear.

Assuming the long-term capital investment objective of a dairy farmer is to select capital stock and variable inputs to maximise the present value of the future net returns, then the objective function of the farmer may be stated as:

(10) $$V(O) = e^{-rt}\int_{o}^{\infty} R(t)dt$$

subject to:

	$\dot{K}_t$	=	$I - \delta K_t$
	$K(o)$	=	Ko
	$K(t)$	>	0

where:

	r	=	required rate of return
	x	=	variable inputs.

Assuming static price expectations with regard to input and output prices, solution to (10) is found, subject to equation (9), by applying the Hamiltonian (LeBlanc and Hrubovcak):

$$(11) \qquad H(X,K,\dot{K},y,t) = e^{-rt}\{G[W,K(t)] - \sum_{i=1}^{m} C_i\dot{K}_i(t)\} + \sum_{i=1}^{m} y_i\dot{K}_i(t),$$

where: y_i = costate or shadow price of capital inputs.

Using the established link between the solution of equation (11) to the flexible accelerator model (Treadway, 1969), an approximate solution to net investment in capital inputs, $\dot{K}$ take the form:

$$(12) \qquad \dot{K} = B[K^*(t)-K(t)],$$

where: $K^*(t)$ is the optimum or long run demand for capital inputs.
B is m x m matrix of partial adjustment co-efficients.

For estimation purposes, equation (12) is replaced by the following difference:

$$(13) \qquad K(t)-K(t-1) = B[K^*(t)-K(t-1)]$$

A quadratic function, normalised on output prices, is defined for G(W,K), the unit output restricted profit function in equation (8) following LeBlanc and Hrubovcak:

$$(14) \qquad \Pi = b + b_i\phi + \sum_{i=1}^{n} b_{wi}\phi W_i + \sum_{i=1}^{m} b_{ki}\phi K_i + \sum_{i=1}^{n} b_i W_i + \sum_{i=1}^{m} a_i K_i + 0.5\left(\sum_{i=1}^{n} b_{ii}w_i^2 + \sum_{i=1}^{m} a_{ii}K_i^2\right) + 0.5\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}W_iW_j + \sum_{i=1}^{n}\sum_{j=1}^{m} c_{ij}W_iK_j,$$

where: n = number of variable inputs
m = number of capital items
a's, b's and c's are parameters
W_i = price of the ${}_i$th variable input
K_i = the ${}_i$th quasi-fixed input
Φ = the measure of technology.

Assuming the cost of adjustment, $(C_i K_i^{\cdot})$, is linear, the steady state capital stock for maximising the present value of profit is (LeBlanc and Hrubovcak, 1986; Denny, Fuss and Waverman, 1981).

$$(15) \qquad K_i^* = -\left(a_i + b_{ki}\Phi + \sum_{i=1}^{n} c_{ij}W_i - u_i\right)/a_{ii} \qquad i=1,2,...,m$$

where: $u_i =$ $q\ (r + \delta_i)$

$q_i =$ normalised price of the ${}_i$th quasi-fixed input
$r =$ interest rate
$\delta_i =$ exponential depreciation rate.

The term $q\ (r + \delta_i)$ in equation (15) is the rental rate of the quasi-fixed input when there is no direct tax or tax depreciation allowances (Hall and Jorgenson, 1967).

Substituting the long run solution for capital from equation (15) into equation (13), the following equation may be developed for estimation purposes:

$$(16) \qquad K_i(t) = a_i^* + b_{ki}^* \Phi + \sum_{i=1}^{n} c_{ij}^* W_i + B_i^* u_i^* + (1-B_i)K_i(t-1) + e_i \qquad i=1,2$$

where:

a^*_i	=	$-B_i\ a_i/a_{ii}$
b^*_{ki}	=	$-B_i\ b_{ki}/a_{ii}$
c^*_{ij}	=	$-B_i\ c_{ij}/\ a_{ii}$
B_i*	=	$-B_i/a_{ii}$
u*	=	rental prices calculated from equation (2)
i	=	1 to n capital type used
j	=	variable inputs

The original parameters of equation (15) can therefore be calculated.

The price of var: 'e inputs, phosphate fertiliser and wages, normalised by the output price (milkfat pr..e) is used to estimate the model. The rental prices are for capital inputs, building, land improvement, plant and machinery and breeding cows, normalised by milkfat price. The average herd size of dairy cows is used as a proxy for technological change.

The model specified in equation (15) was estimated as a system of four equations for each capital input (building, land improvement, plant and machinery and cows) using the LSQ option in the TSP package (Hall, Cummins and Schnake, 1992). This joint estimation technique uses a maximum likelihood estimator to produce least squares of parameters and accounts for inter-equation covariances.

DATA

Study Period

Our analysis uses aggregate time-series data for the New Zealand dairy industry from 1966 to 1990. This is a period when a lot of agricultural sector policy changes occurred. Taxation and other production incentives were introduced into the agricultural sector by the Government during the late 1960s and over the 1970s. Since 1984, the Government had removed these incentives to bring the sector in line with the other sectors of the economy.

Data Source: Capital Stock and Investment Expenditure

Capital stock series had to be built up using data from various sources. Capital stocks can be valued by either assigning new price to an inventory item already in use, or by obtaining the depreciated value of the item in use from the industry sources. The first method relies on a good inventory of capital items being used, while the second which is more complicated requires knowledge of the numbers, age and condition of the capital items. The depreciated values are not readily available in the form and the level of disaggregation required. In this paper, land improvements are valued at replacement cost, while farm buildings were valued at depreciated price using the New Zealand Meat and Wool Boards' Economic Service sample data for all class average farm and then multiplied by the number of full-time dairy farms. For plant and machinery, the depreciated values were obtained from the New Zealand Dairy Board farm surveys.

The annual expenditure on farm buildings, land improvements, and plant and machinery were sourced from the Dept of Statistics.

Price Indices and Normalisation

The investment expenditure values were first deflated by the Statistics Department's price indices for the different asset categories. Price indices used included farming capital expenditure price indices for farm building, land improvement, plant and machinery and the livestock price index.

Implicit rental rates, calculated as shown previously for the different asset types were deflated using the prices paid index for dairy inputs. The wages on dairy farms were deflated using the wage index, fertiliser prices deflated using the fertiliser index and milkfat prices deflated using the producers' price index for dairy outputs.

The rental rates calculated for farm buildings, plant and machinery, land improvements, and dairy cows, together with the prices of all the inputs (ie fertiliser and wages) were then normalised by the real milkfat price.

RESULTS AND DISCUSSIONS

Model Fitness

The estimated parameter values are shown in table 1 together with the *t*-statistics. The estimated R^2 and Durbin-Watson statistics for the equations are; buildings (0.98, 0.88), land improvement (0.99, 1.24), plant and machinery (0.65, 1.36), breeding cows (0.86, 0.95).

Twelve of the 24 *t*-statistics for parameter estimates in these four equations are significant at 1% level of confidence, four at 5% level and one at 10% level.

Table 1: Estimated Parameters

	Parameter	Estimate	Standard Error	t-Statistics
Building	Constant	836.768	328.725	2.546***
	Technology	-2.969	1.077	-2.757***
	Fertiliser	-0.575	0.513	-1.122
	Wage Rates	0.019	0.008	2.465***
	Rental	-0.271	1.028	-0.264
	Lag	0.768	0.097	7.931***
Land Improvement	Constant	307.611	34.583	8.895***
	Technology	-1.695	0.423	-4.010***
	Fertiliser	0.515	0.269	1.915**
	Wage Rates	0.007	0.004	1.885**
	Rental	-0.201	0.746	-0.269
	Lag	0.943	0.016	59.679***
Plant and Machinery	Constant	-452.113	230.547	-1.961**
	Technology	4.833	1.776	2.722***
	Fertiliser	3.678	1.406	2.616***
	Wage Rates	-0.056	0.022	-2.498***
	Rental	-0.298	2.185	-0.137
	Lag	0.837	0.129	6.490***
Breeding Cows	Constant	411.812	283.868	1.451*
	Technology	0.633	1.861	0.340
	Fertiliser	3.758	1.780	2.111**
	Wage Rates	-0.007	0.024	-0.304
	Rental	-0.988	1.462	-0.676
	Lag	0.791	0.079	10.005***

Note: Astericks (*) represent the level of significance at 10% (*), 5% (**), and 1% (***).

All the coefficients of the normalised (normalised using milkfat price) rental price of capital inputs (ie own price of capital) have the expected negative sign, but have low *t*-statistics. This indicates that normalised capital rental price may not be an important determinant of capital investment in the New Zealand dairy industry. By implication (see equation 2), changes to the tax policy that modify investment and depreciation allowances are unlikely to influence greatly capital investment in the New Zealand dairy industry.

Normalised fertiliser and wage inputs, and technological change (measured in this case by the herd size) are likely to have significant effects on capital investment in the dairy industry. The signs of these parameters are however mixed.

The estimated adjustment rates (table 2) are all plausible, and are similar to values reported in the literature for the US (LeBlanc and Hrubovcak; Howard and Shumway). Breeding cow numbers would be expected to take about 4.8 years to adjust to their steady state (or long run values). The rate of adjustment for land improvement capital stock is low at 6% annually.

Table 2: Adjustment rate

	Rate	Years
Building	0.23	4.3
Land improvement	0.06	17.6
Plant and machinery	0.16	6.1
Breeding cows	0.21	4.8

Overall, the model structure and estimated parameters seem plausible (see appendix figures 1-4). Within sample forecasts of capital stock are close to the actual for all capital inputs. The forecasts for plant and machinery inputs are, however, less accurate.

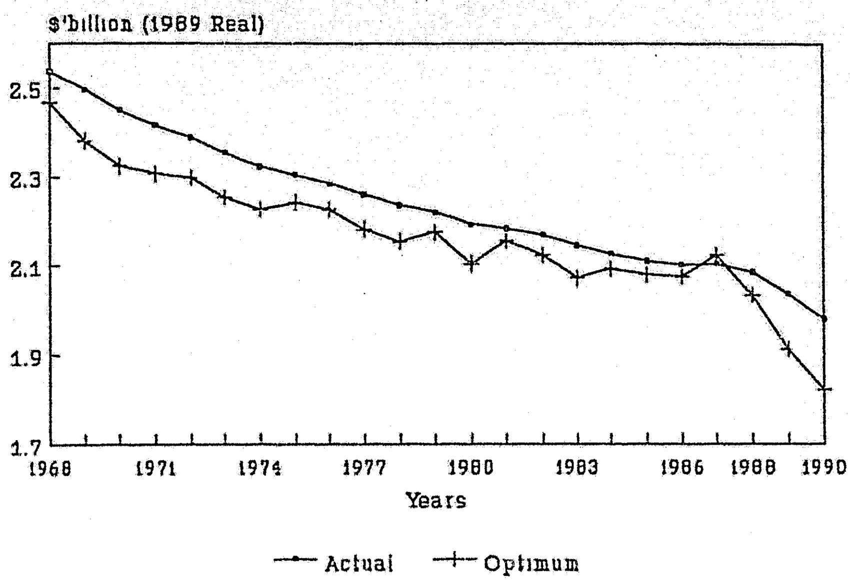
Optimal Capital Stock

The estimated optimal or long run steady state capital stock of building, land improvement, plant and machinery, and breeding cows are shown in figures 4-7. Figure 4 shows that, except in 1988, optimum stock of building has consistently been lower than actual, and has been decreasing. If the policies of 1990 are maintained, then based on the adjustment rate, it would be expected that building stocks would, in the long run, reduce by 9% to about $1822m.

There appears to have been considerable under-investment in dairy farm land improvement (figure 5) in the late sixties and early seventies. The optimum capital stock of land improvement was considerably higher than the actual values for the period. During 1989-90 however, the optimum stock of land improvements and the actual stocks are very similar.

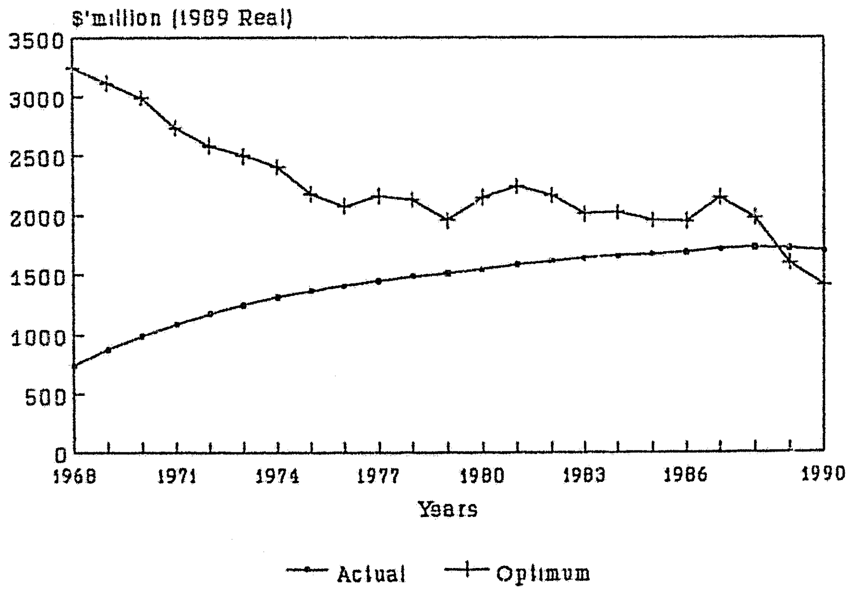
No consistent pattern is discernable between the optimum and actual plant and machinery stock during the late 1960s and 1970s. During the past 10 years, however, it appears that the dairy industry has been somewhat under-capitalised with regard to plant and machinery stock except for two years in the mid 1980s.

Fig 4: Forecast vs (Long Run) Optimal
Dairy Farm Building Stocks



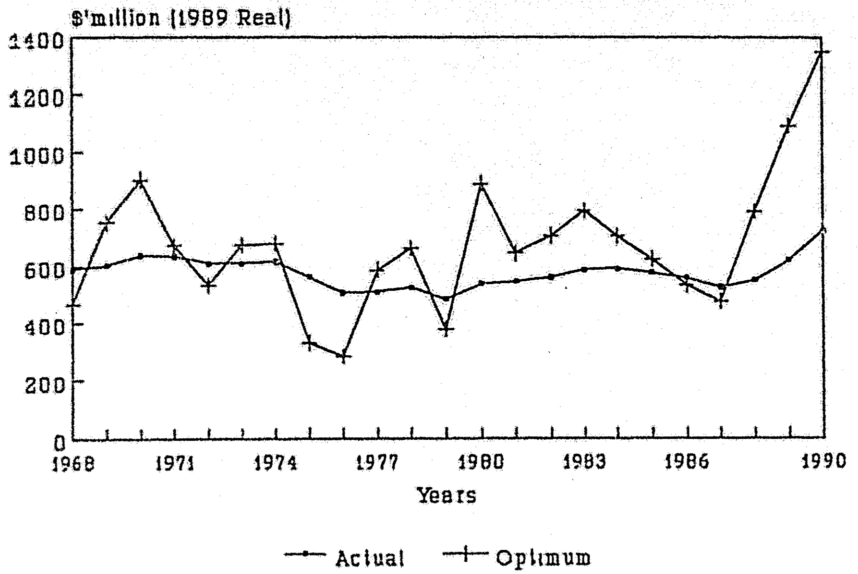
Adjustment = 4.3 years

Fig 5: Forecast vs (Long Run) Optimal
Dairy Farm Land Improvement Stocks



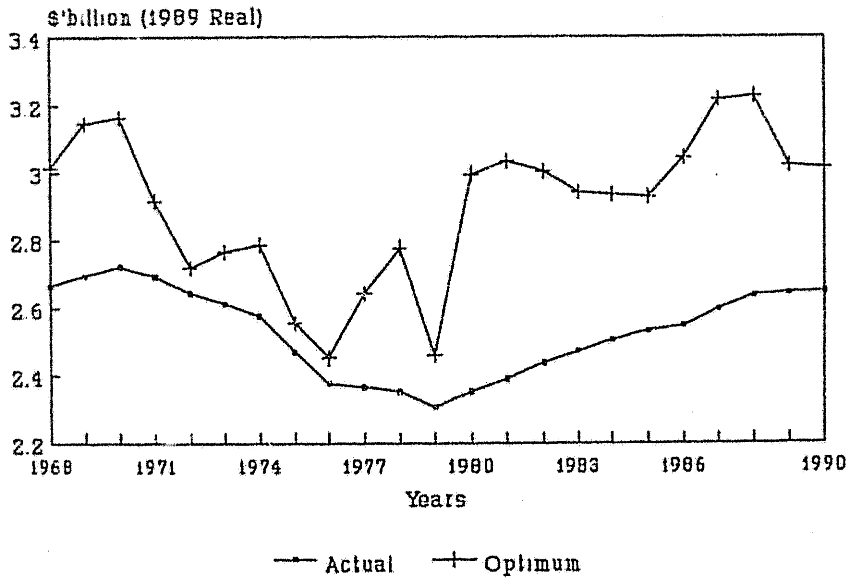
Adjustment = 17.6 years

Fig 6: Forecast vs (Long Run) Optimal Dairy Farm Plant and Machinery Stock



Adjustment = 6.1 years

Fig 7: Forecast vs (Long Run) Optimal Dairy Farm Breeding Cow Numbers



Adjustment = 4.8 years

Figure 7 indicates that the optimum number of breeding cows has consistently exceeded the actual over the past 22 years. Based on 1990 conditions, it is expected that the breeding cow numbers will, in the long run, increase by 14% of the 1990 numbers to over 3 million cows.

Conclusion

In this study, a model that can be used to explain the main determinants of investment in building, land improvement, plant and machinery and breeding cows in the dairy industry was specified and analysed. This model, which is based on the dynamic optimisation of profit and is linked to the multivariate accelerator structure, is used to explain the effect of normalised fertiliser prices, wages and capital rental price on investment.

Unlike the findings of other studies in the US (LeBlanc and Hrubovcak), the normalised rental prices of capital (and therefore tax policy) do not appear to have an important effect on capital investment in the industry. Fertiliser price, wages, and technology (ie herd size) were the most important determinants of investment in the New Zealand dairy industry. The results indicate that the industry was over-capitalised with regard to building stock, and under-capitalised in plant and machinery and breeding cow numbers. The capital structure of land improvement inputs is close to the optimum level.

As in LeBlanc and Hrubovcak, a simple capital adjustment structure was used and static price expectation assumed. Even though the parameter estimates and the total model performance are satisfactory other specifications that allow the coefficients to be stochastic and allow them to vary over time could improve the performance of specific equations, in particular, the forecast of plant and machinery stocks.

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APPENDIX

Changes in Tax Policy*

1 Ordinary Depreciation

Ordinary Depreciation Allowance permitted on farm buildings is 2 percent of the cost price (CP) of the building, 10 percent (DV) on tractor drawn implements and 20 percent (DV) on self-propelled equipment. Ordinary Depreciation Allowances have existed throughout the sample period.

2 Special Depreciation

These allowances were initially introduced for plant and machinery and for farm buildings. They could be claimed in addition to the Ordinary depreciation allowances. From 1962/63 20 percent of the cost of the asset could be claimed over a four year period (successive yearly rates being 10 percent, 5 percent, 3 percent and 2 percent). These were in existence until 1974/75.

3 Initial Depreciation

This allowance was an alternative to the Special Depreciation Allowance, and permitted farmers to claim 30 percent of the cost of plant and machinery during the first year. This allowance was introduced prior to 1960/61 and withdrawn after 1974/75.

4 Investment Allowance

Initially introduced in 1963/63 this allowance was claimable in addition to other depreciation allowances and permitted 10 percent of the cost of plant and machinery to be depreciated in the first year after delivery of asset. In 1965/66 these allowances were suspended, they were reintroduced in 1970/71 and in 1972/73 they were increased to 20 percent. These allowances were removed after 1974/75.

5 Supplementary Depreciation

In 1969/70 a Supplementary Depreciation Allowance was introduced for new hotels, motels and farm buildings. This was in addition to ordinary depreciation and was set at 17 percent of cost for hotels and motels, and 6 percent of cost for new farm buildings. This allowance was removed after 1974/75.

6 1975/76 Revisions

All allowances apart from the Ordinary Depreciation Allowance were cancelled and replaced as follows. For all years except the first year after investment, Ordinary Depreciation Allowances were to apply. For the first year the following depreciation provisions were permitted:

Plant and Equipment,	*Auckland and Wellington*	*40 % Allowance*
Plant and Equipment,	*Elsewhere*	*60 % Allowance*
Land and Buildings,	*Farming Industry*	*40 % Allowance*
Land and Buildings,	*Employee Accommodation*	*22 % Allowance*

7 **1976/77 Revisions**

The 'specified area' provision of the 1975/76 scheme was repealed and First Year Depreciation rates revised downwards but Investment Allowance re-introduced.

The First Year Rates became;	
All Plant and Machinery,	*25 % Allowance*
Employee Accommodation,	*22 % Allowance*
New Farm Buildings,	*40 % Allowance*

The First Year Depreciation rates were in place of Ordinary Depreciation for that year. The Investment Allowances are also claimed in the first year and are in addition to First Year Depreciation.

The Regional Investment Allowance became;		
Plant and Machinery	*Northland, E Coast (NI), W Coast (SI), Otago, Southland.*	*20 % Allowance*
Plant and Machinery	*King Country, Taranaki, Wairarapa, Marlborough, South Canterbury.*	*15 % Allowance*
Plant and Machinery	*Rest of NZ*	*5 % Allowance*

8 **1978/80 Revision**

The 1st Year Depreciation on new investment was dropped to 20 %.

9 **Post 1984 Reform**

It was announced in December 1985 that development expenditure tax deductions would be changed from one of 100 percent immediate deductibility to one of capitalisation and depreciation. These were phased out over 6 years, as follows;

	% of Development Expenditure which is deductible
1987	*100 %*
1988	*90 %*
1989	*75 %*
1990	*55 %*
1991	*30 %*
1992	*0 %*

The concessionary livestock valuation system was replaced by market-related values in 1987.

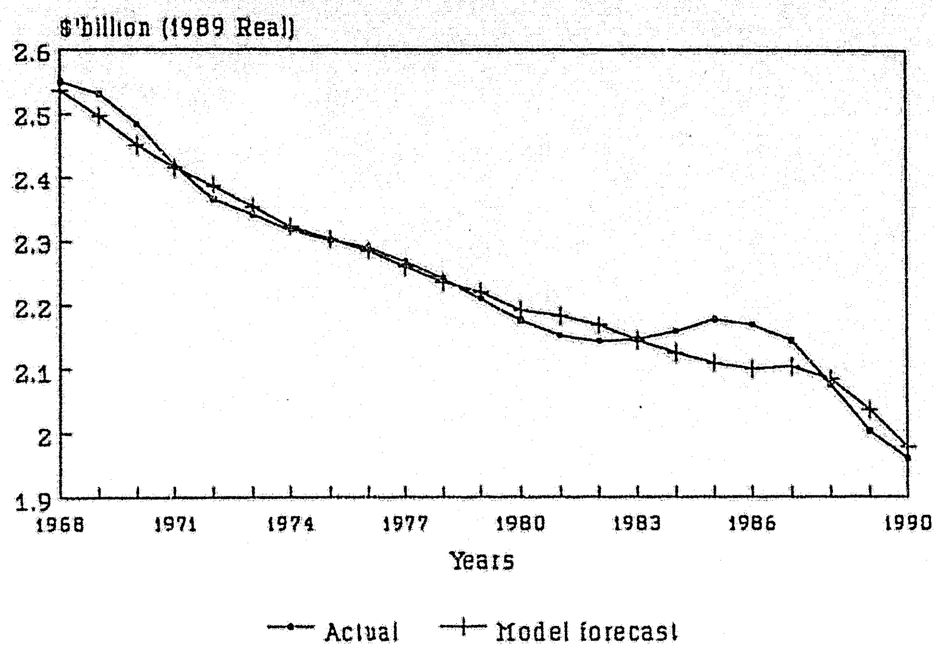
The twenty percent investment allowances on business related plant, machinery and vehicles were terminated in 1985.

The first year (accelerated) depreciation allowances on plant, machinery and certain buildings were abolished in 1988.

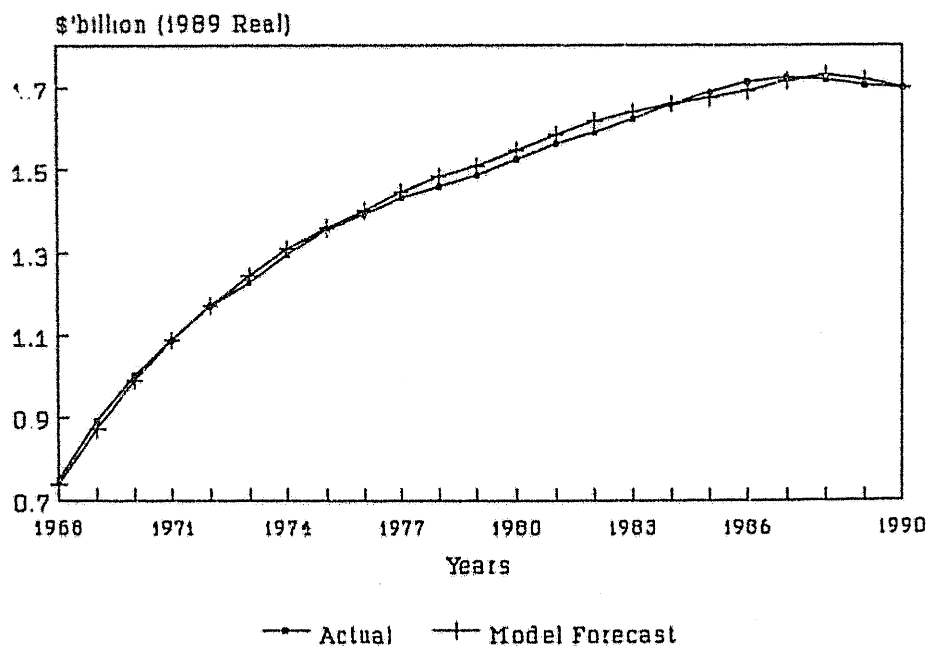
The Ordinary Depreciation Allowances have remained unchanged.

* Ref:Morgan and Evans, PEP; and MAF Policy.

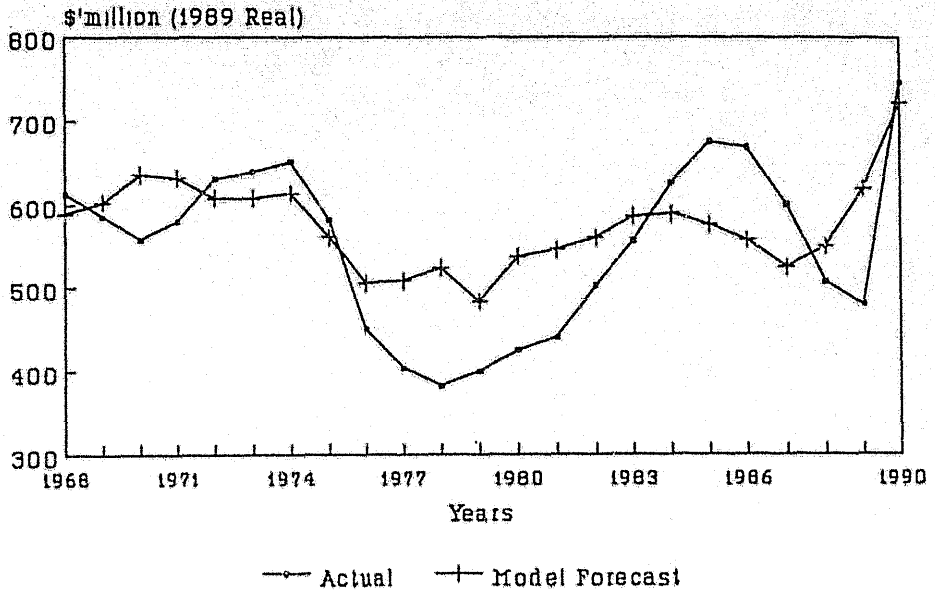
Appendix Fig 1: Model Test for Buildings Actual versus Model Forecast



Appendix Fig 2: Model Test for L.Improvn Actual vs Model Test



Appendix Fig 3: Model Test for Plant
Actual vs Model Forecast



Appendix Fig 4: Model Test for Cow Nos
Actual vs Model Forecast