

THE DETERMINANTS OF PRIVATE INVESTMENT IN URBAN HOUSING  
IN KENYA.

by

Chesang, C. Benjamin.

Research paper submitted to the Department of Economics,  
University of Nairobi, in Partial Fulfilment of the Requirements  
for the Degree of Masters of Arts in Economics.

June, 1991.

TABLE OF CONTENTS.

PAGE.

LIST OF TABLES-----	i
ACKNOWLEDGMENTS-----	ii
ABSTRACT-----	iii

CHAPTER ONE

1.0. INTRODUCTION-----	1
1.1. The Housing Finance Company of Kenya (H.F.C.K.) -----	3
1.2. East Africa Building Society (E.A.B.S.)-----	4
1.3. Commercial Banks-----	4
1.4. The Housing Cooperatives-----	4
1.5. The National Housing Corporation-----	5
1.6. The Importance of Housing Investments-----	7
1.7. Statement of the Problem-----	8
1.8. Objectives of the study -----	12
1.9. Significance of the Study-----	12

CHAPTER TWO.

2.0. LITERATURE REVIEW-----	14
2.1. Theoretical literature-----	14
2.2. The Determinants of fixed investment-----	17
2.3. Empirical literature-----	18
2.4. Overview of the Literature-----	28

CHAPTER THREE.

3.0. MODEL SPECIFICATION AND HYPOTHESES-----	30
3.1. Explanations for variables chosen-----	31
3.2. Type and Source of Data-----	34

3.3. Limitations of the Study----- 35

CHAPTER FOUR

4.0. THE RESULTS OF THE REGRESSION ANALYSIS----- 37

4.1. Summary----- 47

CHAPTER FIVE

5.0. Policy Recommendations and Conclusion----- 48

5.1. Policy Recommendations----- 48

5.2. Conclusion----- 52

Appendix 1.Data used in the Regression Analysis----56

Appendix 2. Correlation Matrix of the Dependent  
Variables.----- 59

BIBLIOGRAPHY----- 60

## LIST OF TABLES

TABLE:	PAGE.
I Gross Fixed Capital Formation in Housing, 1982-1988 at Constant Prices (1982)-----	7
II Recorded Production of dwellings Compared with the formation of New Urban Households-----	9
III Rents Paid and Potential Expenditures on Housing as a percentage of Income-----	10
IV Reported Completion of Buildings for Private Ownership for Main Towns 1986 and 1987.-----	11
V Regression Results-----	37
VI Regression Results after Correcting for Multicollinearity-----	42

ACKNOWLEDGEMENTS.

My sincere thanks go to my supervisors Professor M.S.Mukras and Dr. P.K.Kimuyu. I similarly thank Dr. Kibua for the assistance he gave me during the period he acted as my supervisor.

I am indebted to the University of Nairobi for its generous financial support that sustained me through the period of my study ( and writing of this Research Paper) at the University of Nairobi.

I wish to thank colleagues in the Department of Economics for their contribution to the paper both during the Departmental Postgraduate seminar and in their individual capacities. Thank you classmates- Nyangena, Rose, Owiti, and Odhiombo for your comments.

A word of gratitude to Toroitich, Jackson, Tuikong, and Isaac who encouraged me to join the programme. I also thank Bundotich for his advice and the assistance he extended to me.

Very special thanks go to Grace, Mary T. and Mary for their continued encouragement and cooperation during my studies. I am also grateful to my sisters- Ladona, Rebecca, Jennifer, Jepichii and Milka for their prayers and moral support.

To all those who assisted me in one way or the other, I say thank you.

I wish finally to say that neither the institution nor the individuals mentioned above can be held responsible for any kind of errors that still remain in this paper. I am therefore wholly responsible for any such errors.

ABSTRACT

Kenya's housing sector directly provides wage employment and self employment to many people in Kenya. Others earn regular incomes from collection and transportation networks i.e. transporting materials from area of availability to the area of construction. Housing sector is again one of the most important sector in generating income; it accounted for about eight per cent of Kenya's total Gross Domestic Product in 1987.

Knowledge of investors' responsiveness to changes in economic variables is important in formulating housing sector policies. This study attempts to estimate an investment function for the housing sector and how investors are responsive to change in income, construction costs, credit, housing stock, and investment lagged one year.

Time series data on income, construction cost, credit allocated to housing, gross investment and total housing stock are used to estimate the industry investment function. The Model adopted ( Eisner and Neal ) is found to fit the Kenyan data well.

Empirical results suggest that Kenya's housing investors are highly responsive to income changes, credit and construction costs. Some policy implications are then drawn from these results. Some of these policies are; supply and demand to determine rent rates, the public sector to provide housing services to low income earners while the private sector is left to cater for the high income earners and that more funds be set aside for the housing sector.

## CHAPTER ONE.

### 1.0. INTRODUCTION

Housing<sup>1</sup> is one of the basic economic needs along with food, water and clothing. It is on the recognition of this fact that the government's policy objective since independence has been to provide adequate shelter for all both in urban and rural areas. The government has tried to achieve this by channelling funds through the National Housing Corporation (N.H.C) so as to promote the provision and improvement of the shelter for the urban poor. The private sector on its part has concentrated its efforts on medium and high cost housing.

There is clearly no stated policy on the allocation of public housing funds between urban areas, which appears to be loosely based on studies of housing needs by the Ministry of Housing and Social Services, [Now ministry of Housing, lands and Physical Planning] assessments of the organisational capabilities of the various national and urban authorities, and on initiatives by the different implementing agencies.

The government's current housing policy objectives for the private sector are stated in the 1989 - 1993 development plan. These are as follows:

- (i) To increase home ownership for low income earners,

---

<sup>1</sup> The word Housing is used both about the process and the product of creating shelters for human's - normally shelter consists of a one family dwelling unit. If this dwelling is a flat or a row of houses it is referred to as a housing unit, or a dwelling unit. In official terminology a house is not a house unless it is approved under the existing laws; but here we deal with legal, incomplete as well as complete housing.

- (ii) Provide long term mortgage funds to the purchasers of these houses,
- (iii) Enhance the private sector's capacity to plan, develop and finance low cost housing for low income families and individuals.

It is hoped that housing projects will be initiated by private developers who will engage design consultants to plan and design as well as employ contractors to construct the houses.

The Government's objective of providing housing for the low income group was pursued through a requirement that all new public housing should cost under KL 1200. This requirement was however, found unrealistic. Further, the Ministry of Housing and Social Services [Now Ministry of Lands , Housing and Physical Planning] had to issue a directive in 1973 for the National Housing Corporation to discontinue lending funds for tenant purchase housing Schemes due to high level of defaults. This was supplemented by a subsequent instruction that 90 per cent of all available Government funds should go to site and service or some form of aided low\_cost housing and only 10 per cent for rental schemes. .

Another public organization involved in housing is the Housing Finance Company of Kenya (HFCK) while the private sector institutions dealing with housing include the East Africa Building Society (E.A.B.S.), Agrarian Building Society, Estate Building Society , Family Finance Building society ,Alliance Building



society and Equity Building Society, among others. Commercial banks and housing Co-operatives also have roles to play in the sector. A brief review of the roles played by some selected institutions is presented below:.

#### 1.1. THE HOUSING FINANCE COMPANY OF KENYA (HFCK)

The HFCK incorporated in 1965 is the largest progressive mortgage<sup>2</sup> housing concern. It is a partnership between the government and the Commonwealth Development Corporation (CDC), and has successfully placed large amounts of CDC funds in new housing developments. In terms of total amount of mortgage loans outstanding, HFCK is the largest institution of its kind but a large part of its funds are from CDC and the Kenya Government. It has become associated with lower middle income housing through its involvement in the Buru - Buru Estate in Nairobi, but it also offers loans up to 90 per cent of cost which greatly helps those on the lower levels of the income scale. HFCK is represented in all the main urban areas in the country as for example in Mombasa and Nakuru.

---

<sup>2</sup> By definition mortgage means security and in this way it is often thought of as a security for loan to buy or build a house with the property as the security.

### 1.2. EAST AFRICA BUILDING SOCIETY (EABS)

The EABS is the only institution registered under the Building Society Act . It has been mainly financing owner or builder projects and the company caters for housing needs of the middle income earners . One of its major investment is the Akiba Housing Estate in Nairobi South comprising two hundred units. It rarely grants loans for more than 70 per cent of cost. The institution has made special efforts to promote projects in other towns other than Nairobi and Mombasa where it has branches.

### 1.3. COMMERCIAL BANKS.

Commercial banks also offers credit facilities to individual builders or developers. The Kenya Commercial Bank is singled out among the commercial banks because it has launched a special loan scheme for farmers' housing to encourage housing in the rural areas. Individuals are granted loans only when the borrower is able to contribute 25 per cent of the cost. However, commercial banks have been criticized for their stiff lending conditions which tend to exclude a large number of people wishing to own houses.

### 1.4. THE HOUSING COOPERATIVES.

Among the more informal ways of raising finance for housing is obviously the cooperative societies which cater mainly for the low income group. But so far they are under utilized organizations in Kenya. Very little attention has been paid ,until very recently,

to reap the benefits of housing cooperative Societies. However, the current development plan recognizes their significance and puts more emphasis on them. (see 1989-93 Development plan).

Finally there exists housing companies in the squatter settlements. Documentation of these housing companies, for example in Mathare Valley can be found in some publications by the Housing Research and Development Unit of the University of Nairobi.

#### 1.5. THE NATIONAL HOUSING COOPERATION.

The NHC being the principal executor of government housing policy invests mainly in urban areas but significantly in Nairobi commensurate with the extent of housing shortage. It also co-ordinates the development of institutional and pool housing undertaken by the ministry of public works. The NHC had previously been implementing programmes which were predominantly middle and high income housing as stated in the 1970 to 1974 development plan. However, it has gradually started to shift to low income housing as the current 1989 - 1993 Development Plan states. Its contribution in 1984 was 2398 units but by 1988 it had declined to only 229 units. (Statistical Abstract 1989 table 111 pp 137).

According to the N.H.C. the "Corporation :

(a) Acts as an agency for transmitting loans from the ministry of Housing and Social services to local authorities for the development of housing in towns and to individuals in the rural areas for the development of housing on farms in home areas.

(b) Provides technical assistance in the form of designing, tendering, and supervising construction for those local authorities inadequately staffed with the necessary technical personnel.

(c) Develops and manages housing estates either to supplement the capacities of the local authorities concerned or meet the demand for houses in areas where the local authorities are not able to initiate and manage housing estates on their own.

(d) Supports and encourages the development of housing research through the Housing Research and Development Unit at the University of Nairobi.

(e) Stimulates greater participation of the private sector by developing mortgage housing estates with mortgage loans being provided by Housing Finance Company of Kenya Limited. In this way it acts as an estate developer for mortgage housing schemes which are designed to meet the demand for housing in the middle income groups of the population.''

For each sector, performance has lagged behind plan targets resulting in a short fall in the provision of dwelling units<sup>3</sup> ( see table 11 ). Although the two sectors have notably invested in housing, as table one shows, investment in dwellings is primarily

---

<sup>3</sup> See Kenya's Development Plan of 1984 - 1988 pp 164.

a private sector affair. For example in 1988, the private sector contributed K£80.27m while the public sector contributed K£18.27M towards total capital accumulation in dwellings.

Table 1

GROSS FIXED CAPITAL FORMATION IN HOUSING, 1982-1988 CONSTANT (1982) PRICES K£M.

	1982	1983	1984	1985	1986	1987	1988
Dwellings							
private.							
Non-monetary	54.18	59.35	65.01	56.39	62.42	64.42	53.37
Modern	47.69	24.70	25.56	26.57	39.91	30.39	26.70
Total	101.87	84.05	90.57	82.96	102.31	94.87	80.27
Public	13.59	16.60	20.97	13.37	17.05	23.23	18.87
Total	125.46	100.65	111.54	96.33	119.38	118.10	99.13
Non Residential							
Buildings							
Private	29.29	35.67	25.53	22.10	41.99	20.26	47.34
Public	58.71	44.04	38.82	43.81	42.32	54.94	84.56
Total	88.00	79.71	64.35	65.91	84.31	75.31	131.90
Growth of Total							
Private %		-17.82	6.52	-7.61	19.37	-7.46	-14.60
Public %		-24.81	17.41	-22.82	42.42	-9.74	-33.71
Non-Residential		-8.29	-15.36	1.56	18.40	9.12	56.71

Source: Economic Surveys. Various Issues.

\*Calculated by taking the difference between two consecutive years and divided by total capital accumulation in prior year before expressing as a percentage.

1.6. IMPORTANCE OF HOUSING INVESTMENT TO THE ECONOMY

The effects of housing investment on the economy are discussed in various issues of the Kenya's Development Plan. They point out that in addition to being a major element in living standards and the general welfare, housing accounts for a significant proportion of capital accumulation and thus contributes significantly to national

output and employment both directly and indirectly. It is also a vital force in determining income distribution since it is an important asset in creating income.

Moreover investment in housing acts as an incentive for many kinds of industries and improves health standards both of which increases employment and income creation<sup>4</sup>. Thus housing investments play an important role in an economy by contributing significantly to GDP, capital formation and gainful employment.

#### 1.7. STATEMENT OF THE PROBLEM.

In spite of the notable investment committed to buildings, there is still a challenge in this field as shortages in housing still exists. Table 11 below shows production of dwellings compared with the formation of new urban households.

---

<sup>4</sup> Housing Research Unit. University of Nairobi.: Housing Policy Guidelines. pp 1.

Table II

RECORDED PRODUCTION OF DWELLINGS COMPARED WITH THE FORMATION OF NEW URBAN HOUSEHOLDS: 1976-1988

	1976	1978	1980	1982	1984	1986	1988
Public sector	2567	3237	6944	6000	2398	615 <sup>†</sup>	229
Private sector	791	835	2065	2083	638	1083	1262
Total	3358	4072	9009	8053	3036	1619	1419
Estimated N <sup>o</sup> of Household in/00	237	276	321	374	436 <sup>**</sup>	509	594
New Dwellings as % of Households.	15.0	14.7	28.0	21.5	7.0	3.3	2.5.

\* Includes only those completed by NHC i.e 1983-1988.

\*\* Calculated by assuming an annual increase of eight per cent.(1983-88).

Source Development Plan 1989-1993; Statistical Abstract 1989.

It is evident that there is a housing shortage in urban areas as the number of new households are in excess of dwellings produced. For instance while there were 37400 new households in 1982, only 8053 units were completed.

In Nairobi the supply of private housing is about 2000 units annually, which is far below demand since the average requirement is estimated to be over 5880 units annually. This imbalance has resulted in rental values that give a return on investment that is probably higher than can be obtained from most alternative investments<sup>5</sup>. An analysis of two co-operative companies by Richards J.(1979) reveals that they were able to recover their

<sup>5</sup> Agency for International Development.: Kenya Shelter Sector Study and Aids Experience. pp 60.

investment in about one years time<sup>6</sup>. It shows that the average annual return ranges from 78 per cent to 109 per cent. Jorgenson(1971) had also found the return on investment to be above 50 per cent. Further ,the market for housing is strong particularly in urban areas and especially for the low income earners who are willing to pay 28.6 per cent of their income in form of rent as shown in table 111.

Table 111. RENTS PAID AND POTENTIAL EXPENDITURES ON HOUSING AS A PER CENTAGE OF INCOME .

Income ksh/ month	Rent paid as as % of income	Potential rent as % of income	Potential House payments as % of income.
0-149	34.6	35.0	35.2
150-249	24.4	23.7	25.8
250-299	17.0	16.2	18.5
300-399	16.0	23.8	26.1
400-499	13.4	20.0	28.6
500-699	6.6	19.6	25.7
700-901	5.7	10.7	16.9
Average	16.8	21.3	25.2

Source:Housing Research Development Unit UON (1971).

A large number of buildings are usually approved but a few are completed as shown below:

<sup>6</sup> For details see; Kenya Pre-investment Report Quarterly Program: Housing Agency for International Development. pp 16



Table 1V. REPORTED COMPLETION OF BUILDINGS FOR PRIVATE OWNERSHIP FOR MAIN TOWNS 1986 AND 1987.

	<u>Nairobi</u>		<u>Mombasa</u>	
	1986	1987	1986	1987
Number of new buildings				
Residential	547	547	361	107
Non-Residential	30	22	20	23
Cost k£/000				
Residential	11650	9742	5386	2401
Approved Plans in Residential	611 ✓	743		
Estimated cost: k£/000	26657 ✓	49852 ✓	-	-

Source :Statistical Abstract 1988 pp 133.

- Means data not available.

The data indicates that although large number of plans are approved, the amount of work completed is less. For example while plans worth k£27m was approved in Nairobi in 1986, only k£12.m of residential projects were completed.

Considering therefore, the strong demand for residential buildings and the resultant high rate of return of investment in housing in Kenya ,we could expect developers and investors to invest more in this field. Though the private sector has contributed greatly to gross fixed capital accumulation in buildings, its role in supplying dwellings remains inadequate for investment flows need to be increased progressively in order to cope with the housing shortage. Table 1 clearly shows that in some years their is even declines.

### 1.8. OBJECTIVES OF THE STUDY

This study focuses mainly on urban areas because this is where the problem is greatest. This arises from high urban growth rates which in Kenya averages 7.1 %. Moreover, it is where investment funds fetch high rates of return to the individual. The specific objectives are:

- 1) To formulate and estimate a private investment function for the urban housing in Kenya.
- 2) To find the relative importance of the factors determining the supply of investment flows (for urban housing) and the responsiveness by investors to these determinants.
- 3) Based on (1) and (2) above, make policy recommendations that would assist in increasing investment flows and therefore housing units in the future.

### 1.9. SIGNIFICANCE OF THE STUDY

The major problem currently facing the Kenyan economy is the high population growth rate with its direct implications on basic needs and employment. The low rate of housing investment flows has resulted in housing shortages adding pressure on the already inadequate level of dwellings. The solution of the problem rests partially on the knowledge of the investment function.

The relationship between investment and its underlying determinants is of critical importance in the appraisal of alternative policies. Furthermore it would suggest the nature of the production function which is of considerable practical

importance because it provides the basis for decision making. The study will also provide a basis for further research in this field.

## CHAPTER TWO.

### 2.0. LITERATURE REVIEW.

The literature review is in two parts; theoretical literature and empirical literature:

### 2.1. THEORETICAL LITERATURE.

For us to develop the Theory of Investment Behaviour, the Neo-Classical Theory of Optimal Accumulation of Capital is considered<sup>1</sup>.

The criterion for capital accumulation is to maximize the present value of the firm defined as the integral of future revenues less discounted future outlays on both current and capital accounts. Present value of the firm is maximized subject to two constraints:

First the production function is assumed to be:

$$Q = f(L, K) \text{-----}(1)$$

where K is the flow of capital services, L the flow of labour services and Q the flow of output.

The production function is further assumed to be monotonically increasing with positive marginal rates of substitution between inputs and convex. This implies that for a firm initially in equilibrium, it pays to increase the capital stock for permanent or certainly expected increases in demand for output. Such a production function has been used by Muth (1971a),

---

<sup>1</sup> See Jorgenson, D.W.: "Investment Behaviour in U.S. Manufacturing". *Econometrica* Vol. 35 (1967). pp 173 -179.

Koenker (1972), and Wiscousin and Rydell(1976) to estimate the elasticity of substitution in housing<sup>8</sup>.

Second, net investment is equal to total investment less replacement (  $\delta K$  ) where replacement is proportional to capital stock (K). This is one of the constraints facing the firm and the constraint take the form:

$$K = I - \delta K \text{-----} (2).$$

The revenue function of the firm is:

$$R = PQ - sL - qI \text{-----} (3).$$

where, R = Net revenue, P= price of output, s = wage rate , q = price of investment goods.

Maximizing (3) subject to (1) and (2) we form the lagrangian expression:

$$L = S_0^{\int} [(PQ - sL - qI) + h_1 F(QLK) + h_2 (I - K + \delta K)] e^{-rt} \text{-----} (4).$$

Where r= the cost of capital , t= time period,  $h_i$  = is a langrange ( undetermined ) multiplier for  $i= 1,2$ . S= integral from zero to infinity.

The desired level of capital stock is determined from the marginal productivity for capital input while the actual level of capital stock is determined by constraint (2). If the production function, is of Cobb-Douglas nature the marginal productivity condition may be written as:

---

<sup>8</sup> Details are found in ; Mc Donal, J.F.: Economic Analysis of Urban Housing Market. 1979 pp 76.

$$X Q/K^* = C/P \dots \dots \dots (5)$$

Where C/P = real user cost of capital

X = the elasticity of output with respect to capital services and

$K^*$  = the desired level of capital stock. Solving for  $K^*$  :

$$K^* = X PQ/C.$$

This study assumes that the production function for housing in Kenya is Cobb- Douglas and has therefore tested for this property. The assumption of Cobb- Douglas function is made because in deriving the investment function, this function is used.

The desired level of capital stock is thus a function of X, P/C, and Q implying also that investment is a function of the same variables.

Assuming the desired level of capital is equal to actual level of capital stock plus the backlog of uncompleted investment projects, then investment is a distributed lag function :

$$I_t = u(s) [K_t^* - K_{t-1}^*] + \delta K_t \dots \dots \dots (7),$$

which may be written as

$$I_t - \delta K_t = y(s)/w(s)[K_t^* - K_{t-1}^*] \dots \dots \dots (8)$$

where u(s) is a power series in the lag operator, y(s) and w(s) are polynomials in the lag operator. This means that investment in one period is a distributed lag function in the optimal capital stock.

If the elasticity of substitution is zero<sup>9</sup> then the optimal

---

<sup>9</sup> Feldstein, M.: "Inflation, Tax Rules and Investment: Some Econometric Evidence". *Econometrica.*: Vol. 50 July 1982 pp 854.

capital stock will be identical with output. i.e.

$$K^{\dagger} = Q \dots \dots \dots (9).$$

Equation (9) is the accelerator principle showing that if a firm is initially at equilibrium, an increase in output will induce an increase in capital stock. But this investment is likely to be induced over a number of periods so that we may write:

$$I_t = f(Q_t - Q_{t-1}, Q_{t-1} - Q_{t-2}, \dots, Q_{t-n+1} - Q_{t-n}) \dots (10).$$

where  $Q_t - Q_{t-1}$  = change in income or output.

## 2.2. THE DETERMINANTS OF FIXED INVESTMENT.

From the above theoretical frame work , it can be said that investment in business fixed assets is determined by the real user cost of capital and the level of output i.e. P/C and Q.

Specifically, the Economic Theory analysis emphasises four major factors that determine private investment behavior<sup>10</sup>.

1. The Neo-Classical Theory of investment assumes that the desired stock of capital is equal to the value of output deflated by the price of capital. The variables included in this case are interest rate, depreciation rate , output and changes in capital gains.

---

<sup>10</sup> Among the many discussions that might be cited are: Jorgenson, W.D. and Sibert, D.C. " A comparison of Alternative Theories of Corporate Investment Behavior " . AER LVIII Sept. 1968 pp 681 - 712; Griliches and Wallace N.: " The Determinants of Investment Revisited " .: International Economic Review Sept 1965 pp 311- 329 and Guy, U. and Stephens.: The Multinational Firm and the Determinants of Investment " . ( Mimeographed 1972 ).

2. In the Accelerator Theory of Investment ,the desired stock of capital is assumed to be proportional to output allowing for variation in capacity utilization. Basically ,the main variable is income or output such that if there is an increase in output , more investment flows are expected.

3. The Expected Profits Theory of investment assumes that the desired capital stock of capital investment is proportional to the market value of the firm. The determinant of investment is profits.

4. In the Liquidity Theory of investment ,the optimal capital stock is assumed to be proportional to liquidity which is defined as profits after taxes and depreciation. If net income rises, investments are expected to increase.

### 2.3. EMPIRICAL LITERATURE REVIEW

The factors that determine investments in housing are not necessarily different from those that determine investment in other sectors, as for example manufacturing, plant and machinery , railroads etc because "our guiding principle is that investment and investment plans are determined essentially by the same variables"<sup>11</sup> and that on the literature of business cycles, residential-- construction is described as cyclical in

---

<sup>11</sup> See, Robert Eisner.: American Economic Review (AER). Vol. LII. PP 190.



behavior<sup>12</sup>. Thus we will review studies on investment behavior and then proceed to review some literature that have been specifically done on housing in Kenya.

The role of the factors which explains fixed investment behavior has been discussed at length in the literature .However, the relative importance of these factors in explaining investment expenditures remains a matter of controversy among many writers:

Bower (1965) in his study of investment attempted to discover and explain patterns in the rate of commercial construction (buildings) in the U.S. His prime thesis is that "because commercial construction is an investment flow ,the rate of construction in buildings can best be explained by means of two factors that determine the prospective profitability of the investment: expected revenue and expected costs"[Review of Economics and Statistics 1965, pp 268]. In order to convert this thesis into a testable model ,Bower modifies the investment function so that investment is a function of vacancy rate , construction costs, the stock of old and new space and rent which is a lagged average price of old and new space.He tested the model with both cross- section and time series data (for the same country) and the results show that average rent and vacancy rate are directly and inversely related to investment respectively. However,the sign of construction costs and capital stock takes either positive or negative signs in cross- section analysis.But

---

<sup>12</sup> Bower L. J.: " Investment in Commercial Construction ". Review of Economics and Statistics.1965. PP 268.

with time series analysis construction costs and capital stock have negative, and positive signs respectively. The fitted equations were generally significant.

Kwenta and Jeffrey (1966) hypothesized that investment in American Railroads can best be explained by models appropriate to the various phases of the industry's life cycle ; the period of adolescence, period of maturity , and the period of senility. They postulated that the determinants of investment in railroads, are gross income , capital stock, net operating income ,and the ratio of income to capital stock.Their empirical results are "satisfactory ". The three stage growth models have statistically significant coefficients of the expected signs and the goodness of fit is reasonably high. The limitation in this model is that autocorrelation was present in the middle period.

Jorgenson D W. and Stephen (1967) in their study of investment behavior in U.S. manufacturing, hypothesized that such investment is best explained by the Neo-Classical Theory of Optimal Capital Accumulation.Explaining investment on this basis had been presented earlier through the application of econometric methods such as in Tinbergen's statistical testing of business cycle theories . A similar objective was adopted and subsequently applied by Roos and by Klein . These studies adopted the neo-classical theory mainly to provide a list of variables to be entered in a linear regression equation with investment expenditures as the dependent variable. Their empirical results provide a close fit to historical experience for industry groups.There is evidence of

autocorrelation so that the multiple determination and the standard error of the regression provide a valid indication of the goodness of fit and support the theory of investment behavior.

Neal (1969) in a study of investment by American railroads contented that it can best be understood by emphasizing the role of financial factors and that the determinants of investment are essentially financial, in spite of the fact that the acceleration principle from its inception had been applied to rail road investment. Tinbergen held the same view but preferred using profits as the explanatory variable. The regression equation Neal estimated is the distributed lag accelerator for which his results are

$$I_G = -64.8 + 1.02DX_{t-1} + 0.48DX_{t-2} + 0.84I_G^{\dot{}}_{t-1} + 0.0006K_{t-1}$$

$$R^2 = 0.90 \quad \text{and} \quad dw = 2.15.$$

where  $I_G$  = Gross investment  $DX_{t-1}$  = change in output,  $I_G^{\dot{}}_{t-1}$  = gross investment lagged one year.

In another study, Boatwright and Eaton (1972) estimated investment functions in the U.K. They attempted to explain the level of fixed investment in Plant and Machinery in the U.K. They assumed that at any point in time the actual level of capital will not normally be equal to the desired level. A mechanism is therefore required which will adjust the actual to the desired level. Two types of lags are assumed: a decision lag between a change in the relevant economic variations and the start of a project; a gestation lag between the start of a project and its completion. Then they specified their model as:

$$I_2 = w(L)[K_t^f - K_{t-1}^f]$$

where  $I_{t-1}$  is net investment  $w$  is the proportion of work completed  $i$  periods after the start. The final form of the equation they estimated is:

$$\sum_{i=0}^h w_i d[a^r(p/c)^r Q]_{t-1} + \delta K_{t-1}$$

where  $p$  is the price of output,  $Q$  is output,  $C$  is the user cost of capital,  $r$  is the elasticity of substitution,  $\delta$  is the depreciation rate of capital,  $a$  is the coefficient of capital in the production function and  $d$  represents change. The equation was estimated using the almon variable technique, the general pascal distribution and non-linear technique rather than ordinary least squares due to its poor results arising from multicollinearity. The results of the almon procedure using  $r = 0.47$  are:

$$I_t = 82 + 0.46A_1 + 1.034A_2 + 1.3A_3 + 0.0235K_{t-1}$$

$$\text{Adj. } R^2 = 0.977 \quad \text{S.E.} = 5.4 \quad \text{and} \quad \text{DW} = 1.38$$

( $A_i$ ,  $i = 1, 2, 3$  are weighted average of  $d[(p/c)^r Q]$ ).

They considered their results to be marginally the best.

Wai and Wong (1982) in their paper on determinants of private investment in developing countries; attempted to explore a modified version of the flexible accelerator theory of investment. In considering the various determinants of private investment, they paid attention not only to the theoretical aspects but also to data availability. The main hypothesis they tested is that private investment in less developed countries depends on government investment, the change in bank credit to the private sector, the

flow of foreign capital to private sector and actual capital stock lagged one year . Their empirical results using time series data indicate that adjusted coefficient of multiple determination -

$R^2$

are reasonably high. All the coefficients of the explanatory variables are significant and are of the expected signs. When each of the explanatory variables is treated as the only explanatory variable, its impact is significant for most of the countries. A major limitation of their study is that it is a general research on investment rather than being specific to a specified sector.

There are various studies that have been done on housing, including on the estimation of elasticity of substitution based on the Cobb-Douglas production function. In Kenya, several studies have been done.

Based on the production function described above , researchers have tried to estimate the elasticity of substitution and to find out if it is significantly different from one .Muth (1972a) estimated the elasticity of substitution for single family incomes and found it to be 0.5 which turned out to be significantly less than one. Another study by Koenker (1972) examined using the price of capital to be constant found the elasticity of substitution to be 0.71 which is also significantly less than one. Using data collected on rental housing for the housing supply experiment Wiscousin and Rydell (1976) have also estimated it to be 0.5. In another study of new multifamily housing, Fountain (1977) found an elasticity of 0.57 a figure that is less than one but not

significantly less than 0.71. Fountain also tested for non constant returns to scale , but could not reject the assumption that the production function exhibits constant returns to scale.

Most of the studies done in Kenya focus mainly on the disadvantaged group i.e. the poor. Jorgenson (1970) described the conditions regarding the financing of housing in Kenya and what possibly could be done to enhance the flow of money into housing. His concern was that the private sector meets only a small part of housing demand yet it should have supplied housing to those with strong enough needs ( effective demand). The major constraints in supplying low and middle cost houses, he notes, are lack of sites and mortgage funds. In order to eliminate "exploitation", he suggests the increase of housing supply and that the public sector must do its part in the interest of social development and political stability.

Houlberg et al (1970), concerned about the housing shortage emphasized increasing the supply of low cost housing as the only solution to the housing problem in the urban areas. They proposed that the supply of low cost housing can be increased through private companies and co-operatives. They argued that rather than money being the main constraint to private companies and co-operative societies in providing housing for workers, lack of serviced sites is the chief problem. They further argued that the private sector should be in a position to promote these service plots.

Adala (1978), puts forward the same argument, but uses a

different analysis . In a study concerned with examining the housing market in Nairobi ,she notes that the greatest barrier to new residential construction is the availability of credit finance at volumes that would considerably alter the stock of housing, and at prices that would promote the kind of long term investment that housing requires.She proposes that making mortgage credit available to low income residents would have a positive effect on the supply of low income housing.The role of housing finance, insurance and pension money, and commercial banks is also examined in the light of providing credit facilities to alleviate the housing problems among the low income groups.

Lisa (1982) argued that given the high rates of return to investment in housing ,sites and service schemes raise the temptation of the well to do members of the society to obtain them. She observed this phenomenon and argued that such a public housing project can easily become a housing strategy for the rich, and therefore fail to meet the needs of the poorest housed population.In order to at least reduce this problem, she suggests the building of one -roomed sites and services rather than two or more rooms. Noormohamed (1981) had the same opinion .In his study of the Klender project in Jakarta, he advocates the building of one roomed houses because " those in the upper and middle class do not want them as it is below their dignity to live in such houses." This recommendation was made after observing that the convectional two roomed housing projects mainly benefit the upper and middle class in Jakarta.In a follow up paper, Noormahamed et al

(1983) recommended that the Kenya government should seriously consider improving all the slum areas in Kenya along the lines of Jakarta.

In another study, Opinya (1982), attempted to portray the extent to which certain demographic and development variables have been responsible for the housing problem in Nairobi. His main focus was on the factors responsible for the rapid rate of urban population growth. The study relied mainly on secondary sources of data and participant observation. The major findings are that the geographic location and the socio-economic and political status form the base of the current housing problem and that the main causes are the rapid rate of population growth and the mode of development the colonial administration adopted towards the Africans. He recommends that for a long term solution to the problem, housing policy should constitute an essential component of the National socio-economic development priorities. A major limitation of the study is the lack of sufficient data.

Wahome (1981) was concerned about the aims of the sites and service housing projects which end up benefiting the middle and upper income groups while the target is the poor particularly in urban centres. He aimed at identifying issues and problems which have had an effect on housing conditions in sites and services. The study consisted of a survey of a random sample of 200 heads of households in two parts in the Kibera area of Nairobi. He found that the targeted population has not benefited because of economic reasons; including lack of finance to compete with middle and



upper income groups since on average, the tenants monthly income is high. He thus concludes by arguing that sites and service projects are not a complete answer to the housing problems of the poor for it caters for the housing needs of people with the means. Wahome recommends as a matter of general policy that the subsidy provided in public housing project should not be available to all classes of prospective land users so that resources are released to cater for more houses. His methodology has a drawback for administering questionnaires to people lead to some problems as for instance, respondents giving wrong deliberate information particularly on incomes. However, this limitation is not peculiar to Wahome's work alone. It is a general problem associated with collecting information through questionnaires.

Mulei (1990) addressed the issue of isolating the provision of shelter with other aspects of urban life. He notes that both its production and consumption are closely linked to other difficulties experienced by the urban low income groups. They are the product of the complex linkages which extend through out the entire social-spatial field -from cultural to political psychology. He says that an important result of the isolation has been the superfield assumption of the socio- economic homogeneity of the urban poor and their housing problems, an assumption which has tended to the search for a single universal remedy to housing shortage in the country as for example the provision of high rise estates and the provision of sites and service estates. His other concern is that the overall investment in housing in the country is discouraging since only 3

per cent of the Gross Domestic Product is invested in housing less than half of which is in the modern dwellings. In order to solve the problem he suggests that housing has to be examined within the development process as a whole. A weakness of his work is its descriptive nature and the failure to appreciate some of the efforts done to solve the problem.

Along the same lines (as with Mulei) Aritho (1990), considers housing as the major problem in urban areas aside with infrastructure such as garbage or water supply . He notes that ".....housing is the greatest thorn in the flesh of the towns folk. And if you think the problem can get better, think again". The article sites some of the major causes which have enhanced the problem such as rural- urban migration , high natural rate of population in urban areas, colonial administration and escalating construction costs among others. The weakness with Aritho's work is that it is alarmist and is only an analysis of the housing conditions in urban areas and does not offer a solution to the problem.

#### 2.4. OVERVIEW OF THE LITERATURE.

In general the literature review indicates that the primary determinants of private investment are the real user cost of capital which incorporates the interest rate ,rate of depreciation and capital gains ,output or incomes ,profits ,the

level of capital stock which in most cases has a delaying effect, investment in the sector which also has a delaying effect, equity yield or the rate of return on investment. Empirical studies have been done to ascertain the importance of these factors either through cross-section analysis or time series analysis. Most studies have assumed linear multiple regression analysis. Such analysis has rarely been applied on investment in housing.

It also indicates that the elasticity of substitution in housing based on a production function exhibiting constant returns to scale is on average significantly different from zero. In Kenya research has concentrated on the low income group and the methodology has been on surveys. Most of the studies have based their conclusion on descriptive analysis of field data. The problem which many analysts are concerned with is the shortage of housing in Kenya and what can be done to increase output of houses. Each writer has his own way of explaining the problem and how best it can be solved. The studies have limitations of their own. A general consensus is that the private sector has a role to play in improving the housing situation. Again few studies have been done on housing investment in Kenya and it is the intention of this study to fill this gap.

Although the problem addressed to in this study is similar to those of other studies, an attempt is made to explain in terms of the variables that determine housing investment by employing econometric techniques and leads to more precise results.

## CHAPTER THREE

### 3.0. MODEL SPECIFICATION AND HYPOTHESES.

This study adopts the distributed acceleration model developed by Eisner(1960) and later applied by Neal (1969). This model has been chosen taking into consideration the availability of data. The study hypothesis that housing investment in Kenya is determined by changes in income, construction costs, credit allocation to housing, level of capital stock and investment in the previous period based on a Cobb-Douglas production function. The following modified linear investment function in its structural form is then assumed for multiple regression using ordinary least square method (OLS).

It is assumed that:

$$I_{Gh} = f( DX_{ih} , CS_h , CR_h , I_{th-1} , K_{th-1} , U ) \dots \dots \dots (i)$$

Where:

$I_{Gh}$  = Gross investment in housing

$DX_{ih}$  = Change in output in housing sector;  $i = 1 \text{-----} 2$ .

$CS_h$  = Construction costs.

$CR_h$  = Credit allocated to housing Sector. ✓

$I_{th-1}$  = Gross investment in housing lagged one year.

$K_{th-1}$  = Total capital stock in housing lagged one year.

$U$  = Error term which is assumed to be subject to the usual stochastic assumptions.

### 3.1. EXPLANATIONS FOR VARIABLES CHOSEN.

#### 1. Gross investment ( $I_{gh}$ )

Gross investment is taken as the dependent variable since data on net investment is not readily available. Even though net investment data may be available, it creates a problem for the choice of depreciation rates among institutions differ. There is no standard depreciation rate.

#### 2. Change in Output ( $DX_{ih}$ )

Change in output affects housing investment in that if there is an increase in output or incomes; it will generate more investment flows. However, this investment is likely to be induced over a period of time as for example  $i$  years which in this case is two years. This arises from the assumption that owners of real estates or landlords will re-invest their income in the housing sector. Thus we expect a positive relationship between change in output and investment

$$\text{i.e. } dI_{gh} / dDX_{ih} > 0$$

#### 3. Construction costs. ( $CS_h$ )

Construction costs are expected to affect housing investment in that if it is expensive to construct a residential house arising from high costs in labour and building materials, housing construction is discouraged. The literature review clearly shows that escalating construction costs have hindered the construction of more houses. This is the case in Kenya since construction costs

have been escalating. This could explain why a larger number of buildings are approved but a few are completed. Hence a negative relationship is expected between construction costs and investment.

$$\text{i.e. } dI_{GH} / dC_h < 0$$

The residential building cost index is used as a proxy in order to make construction costs uniform in urban areas.

#### 4. $CR_h$ Credit allocated to housing.

The literature review especially the work by Adala (1978) shows that the greatest barrier to new residential construction in urban areas is the availability of credit. It is expected that if significant credit is made available to the sector, then it will alter the existing housing stock. We therefore consider credit allocated to housing an important factor in determining housing investment, and it is expected that as the volume of credit increases, so does housing investment.

$$\text{i.e. } dI_{GH} / dCR_h > 0.$$

#### 5. Investment in housing lagged one ( $I_{th-1}$ )

This is included as the explanatory variable because we expect a year or even more years before the impact of investment decision is felt in building and other long term type of investment. Hence if the impact is positive, investment will also be positive. The lagged value of investment expenditures is introduced here in order to represent the delayed effects of change in income. The sign is

therefore ambiguous. The lagged value of investment is introduced here in order to represent the delayed effects of change in income.

$$\text{i.e. } dI_{GH} / dI_{t,h-1} > 0 \text{ or } < 0 .$$

6. Capital stock lagged one year. ( $K_{t,h-1}$ )

The Investment Theory and empirical knowledge, which emphasize the gradual adjustment of the capital stock to a desired level, depend on lagged capital stock ; therefore the gradual adjustment of the housing stock to a desired level depends on lagged housing stock which has substance as measured by statistical relations. A positive relationship is expected.

$$\text{i.e. } dI_{GH} / dK_{t,h-1} > 0 .$$

The specific linear model to be estimated take the following functional form:

$$I_{GH} = a_0 + a_1 dx_{1h} + a_2 dx_{2h} + a_3 CS_h + a_4 CR_h + a_5 I_{GH-1} + a_6 K_{t,h-1} \dots (ii).$$

Each of the coefficients is tested for statistical significance at a pre-determined level of significance.

Since the production function is assumed to be linearly homogeneous and with constant returns to scale, the summation of  $DX_i$  coefficients should add up to one.

$$\text{i.e. } \sum_{i=1}^4 a_i = 1.$$

This hypothesis is that the housing production function exhibits constants returns to scale. (  $\Sigma$  stands for summation.)

### 3.2. TYPE AND SOURCE OF DATA.

Time series data covering the period 1970 - 1988 is used to estimate the investment function. The basic data under analysis are gross capital expenditures in housing, output or income, construction cost index and the stock of houses in Kenya. The data were obtained from secondary sources mainly from official publications and annual reports on the housing sector.

Gross housing investment data was taken directly from capital formation tables. No adjustments were made. Income from housing was obtained by taking income contributed by the housing sector towards GDP. Change in income was then got by taking the difference in income between two consecutive years i.e.

$$Y_t - Y_{t-1} = dY$$

Where:

$Y_t$  = income in year t.

$Y_{t-1}$  = income in the previous year.

The data on construction cost index was again taken from construction cost index tables. However, construction cost index data is only available from 1973. In order to overcome the problem the figures for 1970 to 1972 were estimated using an annual growth rate of 12.9%. This is a calculated average growth rate of construction cost index from 1973-1988. The source of the above data are various issues of statistical abstracts.

The data on credit allocated to the housing sector was obtained from Central Bank of Kenya's annual reports. Information on total housing stock was not available directly. However, in



order to obtain the figures , we took a base year in which a survey on housing stock was done. In our case the base year is 1979. The Central Bureau of Statistics (CBS) compiles yearly data on completed houses for private ownership. We then adjusted the 1979 figure by either adding completed houses for years after 1979 or subtracting completed houses for years before 1979 i.e.

$$K_t = K_0 + H_t$$

$$\text{or } K_t = K_0 - H_t$$

Where:

$K_t$  = total housing stock in year t.

$K_0$  = Housing stock in the base year.

$H_t$  = completed houses for private ownership in year t.

The source of base year housing stock was Urban Housing Report of 1983 and the houses completed for private ownership were obtained from various issues of statistical abstracts.

### 3.3. LIMITATIONS OF THE STUDY

It is recognized that due to the nature of the study we have a problem in the formulation of the model because of the intermingling of transitory and permanent changes in output. There is also scant literature on housing investment so that there is high possibility of having omitted other macro or micro economic factors which would influence investments in the sector. This is likely to limit the accuracy of our results.

Further, data used was not available in its required form. We therefore made some adjustments which may have influenced the

results. Again gross investment and gross total housing stock figures are used rather than net figures. The analysis may therefore not reflect the true world situation since we have not allowed for depreciation. This is notwithstanding the fact that houses as assets rarely depreciate in value, but rather they appreciate with overall development provided they are maintained. Considering this fact renders the problem to be less effective.

On opinion considerations, the study is not affected by econometric problems, such as autocorrelation or multicollinearity. However, we acknowledge the fact that investment process is far too complex a process for any single econometric model.

Finally the paper has not investigated the relationship existing between the private and public sector housing investments which would have made the results more useful.

## CHAPTER FOUR

### 4.0. THE RESULTS OF THE REGRESSION ANALYSIS.

The results of our regression model<sup>13</sup> [equation (ii)] with the data provided in appendix 1 are presented in table V below:

The regression coefficients are ordinary least squares estimates. The standard errors of the estimates (std. error), the multiple correlation coefficient ( $R^2$ ),  $R^2$  Adjusted for the degrees of freedom, t- statistic, the Durbin Watson (DW), and F-statistic are also presented.

Table V

#### REGRESSION RESULTS.

<u>Variable</u>	<u>Coefficient</u>	<u>std. error</u>	<u>t-statistic</u>
C	307.48	82.73	3.714
$dX_{1h}$	-0.305	0.088	-3.45
$dX_{2h}$	-0.0748	0.3827	-0.19
$CS_h$	0.16	0.087	1.84
$CR_h$	0.208	0.17	1.218
$I_{Ch-1}$	0.12	0.233	0.51
$K_{th-1}$	-0.0015	0.0004	-3.646

.....

Source: Author

$$R^2 = 0.926 \quad \text{Adj. } R^2 = 0.89$$

$$DW = 1.9 \quad \text{F-statistic} = 25.35$$

standard error of the regression = 6.845.  $n = 19$

---

<sup>13</sup> The data was regressed using ; Micro TSP Version 4.1C by David M. Lilien.

The estimated coefficients of  $dX_{1h}$ ,  $CS_h$ , and  $K_{th-1}$  are statistically significant at 5 per cent level of significance using the t-distribution while that for  $CR_h$  is significant at 15 per cent level of significance. The coefficients of other variables  $dX_{1h}$  and  $I_{th-1}$  are however insignificant. We have chosen to test our hypotheses using the t-distribution because the sample size (n) is small. A sample size which is less than 30 is normally considered small while a sample size of above 30 is large. The null hypothesis tested is that each of the coefficients is zero

(  $H_0: a_i = 0$  ) against the alternative hypothesis that each of the coefficients is not equal to zero (  $H_1: a_i \neq 0$  where  $\neq$  means not equal to ). The null hypothesis tries to show that each of the independent variables individually does not influence the dependent variable while the alternative hypothesis tries to show that each variable is important in explaining the variation in the dependent variable. What this implies is that the explanatory variables  $dX_{1h}$ ,  $CS_h$ ,  $CR_h$  and  $K_{th-1}$  do in fact influence housing investments ( $I_{Ch}$ ) since the test provides evidence that changes in these variables leave  $I_{Ch}$  significantly affected. However,  $dX_{2h}$  and  $I_{Ch-1}$  do not influence housing investments significantly.

The F-statistic tests the hypothesis that all the coefficients in the regression are zero i.e. it tests the hypothesis that the variables included in the model do not explain (in this case) housing investment. The one per cent value of F for degrees of freedom 6,12 from the F tables is 4.82. Thus the value 25.35 is highly significant. What all this means is that the case-mix

variables in our model in explaining the variation in housing investment are important i.e. change in income, construction costs, credit allocation, gross investment lagged one year and total housing stock lagged one year are important in explaining housing investment behavior in Kenya.

The coefficient of multiple determination ( $R^2$ ) shows the percentage of total variation of a dependent variable explained by the regression plane. It is assumed that the higher the  $R^2$ , the greater the percentage of the variation of the dependent variable explained by the regression plane, that is the better the "goodness of fit" of the regression plane to the sample observations. The closer  $R^2$  is to zero, the worse is the fit. Our model therefore explains 92.6 per cent of the total variation in housing gross investment. The adjusted  $R^2$  for degrees of freedom is also high (0.89) implying that the estimated function is "good".

The above analysis shows that the model is stable as shown by significant F- statistic and that the most important factors in explaining housing investment in Kenya are total housing stock, change in income in the past one year, construction costs, and credit availability. Gross investment lagged one year and change in income in the past second year are significant in explaining housing investment.

The Durbin Watson statistic (dw) assists in testing for autocorrelation in regression analysis. We had suspected in our model that autocorrelation would affect our results since the data used is time series. The hypothesis to be tested to find out if

autocorrelation is a serious problem is that the error terms are not autocorrelated with a first order scheme. This is tested against the alternative hypothesis that the error terms are autocorrelated with a first order scheme.

i.e.  $H_0 : e = 0$

$H_1 : e \neq 0.$

In most cases we do not know the value of  $e$ . However it is known that

$$d = 2(1-e).$$

Where  $d$  is the DW statistic.

The estimated  $e$  in our model is 0.05.

The test itself compares the empirical  $d$  with the  $d_l$  and  $d_u$  in the Durbin Watson tables ( $d_l$  and  $d_u$  are the lower and upper limits of the durbin watson statistics respectively )so that if:

1.  $4 - d_l < DW < 4$ ; Reject  $H_0$ :
2.  $4 - d_u < DW < (4 - d_l)$ ; result is indeterminate
3.  $d_u < DW < 2$  ; accept  $H_0$  :
4.  $d_l < DW < D_u$  ;result is indeterminate
5.  $0 < DW < d_l$  ;reject  $H_0$  and accept  $H_1$ .

The test in our case is inconclusive. We can not accept the null hypothesis or the alternative hypothesis . However, it has been suggested that when a model has lagged dependent variables, use of Durbin Watson statistic breaks down<sup>14</sup>.

A test, which can be applied in this study's model is the

---

<sup>14</sup> See for example : Koutsoyiannis, A. (1988).: Theory of Econometrics. pp 215.

h test<sup>15</sup>.

$$h = e [ n / \{1 - n v(a_f)\} ]^{1/2}$$

Where:

n is the sample size

$v(a_f)$  is the estimate of variance of the coefficient of the lagged dependent variable given by the least squares analysis. h is tested as a normal standard deviate.

The estimated e is 0.05,  $v(a_f)$  is 0.054, n is 13 after adjusting for the degrees of freedom ( n - k ). The calculated h statistic is 0.4 so that by testing at 5 per cent level of significance using normal distribution tables, h is insignificant. We therefore conclude that autocorrelation is not serious.

Furthermore the conventional method for solving autocorrelation by means of an autogressive transformation generates a function with more than one lagged value of each of the independent variable and one or more values of the dependent variable. The inclusion of lagged investment expenditures in the model we have estimated eliminates autocorrelation of errors in advance. Thus we can safely say that in the model there is no autocorrelation so that the estimated coefficients are unbiased and efficient and hence make correct conclusions or decisions in our hypotheses.

The correlation matrix of the independent variables is given

---

<sup>15</sup> This test was developed by Durbin J. For more details see; Durbin, J.: Testing for Serial Correlation in Least Squares When Some of the Regressors are Lagged Dependent Variables. Econometrica. 1970 pp 410 - 421.

in appendix 2. The matrix indicates that there is high correlation between the variables which is typical when one is dealing with highly trended time series data. This reveals that the estimated model suffers from multicollinearity. For example there is a high correlation (0.989) between construction costs ( $CS_h$ ) and credit allocated to housing ( $CR_h$ ); the relation is not perfect, it is near multicollinearity. However this does not appear difficult to explain. This is because when construction costs increases, credit allocated to housing also increases. This is logical because if developers have to construct houses when costs are increasing, they have to get more funds in terms of credit. Acknowledging that we have multicollinearity and that if we solve it by dropping one of the variables causing the problem, say  $CS_h$ , then the results will be as in table VI. This is mainly for illustration purposes.

Table VI.

REGRESSION RESULTS AFTER CORRECTING FOR MULTICOLLINEARITY.

<u>Variable</u>	<u>Coefficient</u>	<u>std.error</u>	<u>t- statistic</u>
C	230.98	77.8	2.96
$dX_{1h}$	-0.26	0.09	-2.82
$dX_{2h}$	0.259	0.36	0.707
$CR_h$	0.456	0.11	4.004
$I_{Ch-1}$	0.307	0.22	1.35
$K_{th-1}$	- 0.001	0.0003	-2.9

.....  
 Source: Author.

$R^2 = 0.9$      $Adj. R^2 = 0.87$



S.E of regression = 6.87    DW = 1.33

F- statistic = 25.12

The results are similar to previous ones in that  $C$  ,  $dX_{1h}$ ,  $CR_h$  and  $K_{th-1}$  are still significant and that the  $R^2$  and F- statistic are large. The problem could be serious if we could get different results. Furthermore multicollinearity may be a problem in the model , but the problem does not seem to be important in the light of the significant t and F statistics associated with the results hence the regression results are best, linear, and unbiased estimates (BLUE)

The significant variables listed according to the level of significance are change in income in the past one year , total housing stock , construction costs and credit.

Income is expected to affect investment. Increases in income results in increased savings. Increased income also increases the entrepreneur's desired level of capital and ultimately investment provided that financial capital is sufficient. The marginal effect of change in income on housing investment is negative and less than one. This is contrary to our hypothesis that change in income has positive relationship with investment .The result is a bit strange, however it is possible to get negative change in income coefficients<sup>16</sup>. This result indicate that when there is change in income, investment in housing decreases. Investors do not re-invest

---

<sup>16</sup> See for example the results of Eisner in *Econometrica* Vol. 28, pp 71. Another evidence to show that negative and sometime insignificant coefficients can be derived is on page 111 of ; Reuber, G.L. et al (1973).: *Private Foreign Investment in Development*. Clarendon Press, Oxford.

the proceeds from housing in to the same sector. The explanation is that land is inaccessible to the landlords in which they can construct more residential houses.

Lets consider the situation in urban areas in Kenya. What usually is the case is that once an area is allocated to housing, it becomes difficult to allocate more land to the sector. There is therefore no room for expansion. In this situation therefore, landlords are encouraged to invest in other ventures. Furthermore even if there is space for expansion, it usually takes time before the plots are ready for allocation since there exists a long procedure to follow. For example identifying and surveying the area, provision of infrastructural facilities and allocation of plots themselves are all bottlenecks. Otherwise if plots could easily be available for sale or allocation, then it is possible that landlords or developers would be willing to re-invest into housing. The implication of a less than one marginal effect on gross housing investment given a unit increase in change in income implies that private individuals or developers do not divert the whole gross investment away from housing.

If we consider the effect of change in income in the past two years, the effect is still negative and insignificant. This is in conformity with economic theory where it is known that "current state of affairs" is given more weight than the past "state of affairs". For example, Friedman's permanent income is derived by averaging the past and present incomes such that more weight is given to current income and as we move into the past, declining

weights are assigned.

The lagged investment coefficient represents the effects of changes in income more than two periods where the weights associated with these changes decline geometrically. The case here is that it has positive effect on housing investment. This means that income derived from housing in the past three or four years can be re-invested in housing. The explanation is that investors are able to acquire land or plots in which they can construct houses after a period of time. However, it is an insignificant variable.

The sum of the coefficients of change in income ( in absolute terms ) for the past four periods using data for income as from 1967 is 0.54. This shows that the housing sector production function in Kenya is non-linear, meaning that increasing the inputs proportionately does not increase the number of houses in the same proportion.

Construction costs have direct relationship to housing gross investment. This again was unexpected according to our hypothesis. It shows that when construction costs increase, gross investment in housing also increases. This can be explained by the fact that private investors (landlords) or developers are able to transfer the costs of construction to the consumer (tenant) particularly if we consider the demand for housing in urban areas. Indeed the demand for housing in urban areas is inelastic since the total units is less than the formation of households. (This has been shown elsewhere in this paper). Furthermore, the propensity to consume housing is normally quoted at 25 per cent of income

though surveys show that this percentage varies from around 35 per cent in very low income to 10 per cent in the higher income groups. What this shows is that consumers of housing are willing to spend more in this commodity.

Moreover in the short run, it is difficult to increase the supply of dwelling units. Construction of buildings (including residential construction) usually takes a period of time. Given this situation, simple economics dictates that suppliers (landlords) will capitalize on it. This offers them a conducive environment where they are able to construct houses even if costs incurred in building are high since they can transfer the burden to the tenant. Thus when there is 6% one per cent increase in construction costs, gross investment in housing increases by 16 per cent.

Credit or financial capital has a positive relationship to investments in line with our hypothesis. Credit improves the private individuals or developers cash balances making it easier for them to invest in housing. The significance of credit conforms to general economic theory. The implication of a less than one (0.208) marginal change of investment given a unit increase in credit implies that private developers do not use the whole amount of credit obtained in investing in housing.

The constant ( $a_0$ ) is autonomous investment. The estimated  $a_0$  in our model is 307.48. This represents the number of housing units that need to be replaced by private investors each year. The coefficient of housing stock also measures the rate of depreciation

in the housing sector. In our case it is about one per cent. We know that each year a small percentage of the existing supply of dwellings is lost through fire , windstorm, flood, accident or deliberate demolition. Some residential structures are demolished because they are no longer fit for use, others because they are in the way of a new road or street or renewal project or other improvements.

#### 4.1. SUMMARY.

In sum we estimated an investment function for the housing sector. The significant variables were change in income in the past one year, total housing stock, construction costs and credit allocation relative to change in income in the past two years and the years that fall behind as indicated by the coefficient of lagged gross investment. The model is stable as shown by the F-statistic and is good in explaining total variation in housing investment as evidenced by  $R^2$ . Further the function is devoid of econometric problems like multicollinearity and serial correlation so that our estimates are best, linear, unbiased, (BLU) and efficient and hence make correct conclusions from our analysis. We then proceed to make policy recommendations.

## CHAPTER FIVE.

### 5.0. POLICY RECOMMENDATIONS AND CONCLUSIONS.

In this section, some policy recommendations are drawn from the regression results and a summary of the study is given.

### 5.1. POLICY RECOMMENDATIONS.

The policies that we are going to recommend are essentially based on our findings.

First landlords and developers should be encouraged to get reasonable income from their investments currently since past incomes are less significant. There is no contradiction between this recommendation and the argument that the rates of return in housing are high because income is negatively related to investment as is the case with rates of return. This can be done by letting free market forces (supply and demand) to determine the rates of rent. The effect of such a policy is to make landlords reap profits and hence have a better financial base. The next step is to change their attitudes in order for them to re-invest their income. Note that our model shows a negative relationship between gross housing investment and change in income. One of the ways of achieving this is to make land accessible to them.

Further, surveying of land and allocation of plots should take the least time. Priority must be to establish efficient land registration and land information system. Also administrative measures and legal reforms should be introduced to promote the efficiency of land markets since cumbersome and time consuming

procedures for land transactions delay constructions. Approval of plans should not unnecessarily take a complex process. The public sector on its part should provide infrastructural facilities as for example roads, electricity, schools, water and recreational facilities. Provision of safe drinking water and sanitation is quite important since it is now appreciated that people cannot achieve a quality of life consistent with human dignity unless they have access to these commodities. This will undoubtedly encourage investors to put more of their resources into housing and thus increase housing units.

We should however, be cautious about such a policy since market mechanism has its own side effects. It will be detrimental to the low income earners. What can be done is to let the public sector cater for the low income earners while the private sector caters for the middle and high income earners. The government can also give guidelines on rent but it should be with the minimum control because a large number of regulations would inhibit faster development of housing. Great care should be taken to ensure that the goose that lays the golden egg is not killed.

Secondly, construction costs are a significant factor in affecting investment in housing. Strangely, it has a positive relationship with investment. We therefore run into a tricky situation because if we prescribe a policy of increasing the cost of building materials for example iron sheets, cement, nails, steel and labour (both technical and manual) then the consumers will be affected adversely. If on the other hand, the costs of

materials and labour are controlled, then less investments will be forthcoming. The cause of this problem ( of a positive relationship between construction costs and gross investment ) is the ability of land lords and developers to pass the cost to the consumer (tenant) since the demand for housing is inelastic. It therefore becomes handy if we recommend a policy which makes the burden to fall more on the landlord, rather than the consumer when construction costs are increasing . A fixed tax imposed on the developer either by the government or the local authority would assist in this case. We assume here that fixed costs are irrelevant in decision making so that if a tax of such nature is imposed on an entrepreneur, then it will play a negligible role in his or her decision process. Alternatively costs of materials should be controlled especially those that are quite important like cement and ironsheets. It should not be allowed to increase drastically. The developers will then have an edge in spreading their costs across many housing units. These materials must be used economically.

In relation to the above policy , building materials should be easily accessible to constructors. The depots of materials like cement, ironsheets, or tiles should be well spread throughout the main urban areas in Kenya. In order to achieve this, the Kenya National Trading Corporation (KNTC) should play greater role in the distribution of these essential tools of construction.

Thirdly ,the allocation of credit to housing sector is again important. The relationship between gross housing investment and



credit is positive; hence we strongly recommend a policy of increasing or allocating more credit to the sector. The issue here is how to finance housing investments and one important way is through the provision of credit. Presently there are institutions which provide loans to private investors in the housing sector. These include HFCK, EABS, Commercial Banks ( Here the Kenya Commercial Bank plays a greater role than other Commercial Banks) and Cooperative Bank. It therefore becomes apparent that the government should encourage financial institutions and Commercial Banks to allocate more of their funds to housing sector. This can easily be achieved through monetary policy especially by capital rationing. This will enable private developers to get loans to construct more houses. The government can also concentrate its efforts in the development of financial markets and institutions in order to promote savings, financial intermediation and the free movement of capital throughout the country.

However, we need to be careful in the allocation of credit. Care should be exercised because the credit facility can be used for other purposes by the borrower. The coefficient of the credit allocated to the sector ( 0.21 ) indicates that substantial amount of credit (about 80 per cent ) is used for unintended purposes. We therefore recommend that the credit facility should be both in kind i.e. a certain amount should be given in cash and another proportion be given in form of building materials. The financial institution or Commercial Bank should let the developer purchase goods and tools and then pay directly to the producer or

seller. A higher proportion given in kind appears to be the best choice. This will minimize mis-allocation of resources. Finally there is need to allow for depreciation allowance in the sector to cover for those residential houses which are demolished or destroyed in one way or the other.

The above mentioned policy recommendations can be summarized as follows: market mechanism to determine rent rates, the public sector to provide housing services to the low income earners while the private sector is left to cater for the high income earners, the costs of construction should be borne more by the developer than the consumer; the cost of building materials be controlled and made easily available; the public sector to provide infrastructural facilities, land be easily made available to developers and the process of allocation be reduced, more loans be set aside to the sector by both financial institutions and commercial banks; the credit should be both in cash and kind and finally allow for depreciation.

## 5.2. CONCLUSION,

The stated objectives of this study were: (1) to formulate and estimate an investment function for the urban housing in Kenya over the period 1970-1988, (2) to find the relative importance of the factors determining the supply of investment and the responsiveness by investors to these determinants; and (3) to make policy recommendations that would assist in increasing investment flows in the housing sector based on objectives (1) and (2).

In chapter two we reviewed some of the theoretical frameworks used to analyze the empirical relationships between investment and other variables in an economy. The theoretical literature concentrated on models used for such analysis in both developed and developing countries. Nevertheless, we focused mainly on the Neo-Classical Theory of Optimal Accumulation of Capital. The chapter also considered some of the specific and general empirical literature on investment and its underlying determinants. It further reviewed some studies that have been done on housing in Kenya and offers an overview of the literature.

Based on the literature, in chapter three, a model is then developed so as to yield testable hypotheses about the relationship between investment and its determinants. The model takes change in income, credit, construction costs, housing stock and investment lagged one year as the independent variables. The chapter also discusses the various sources of data used and some of the limitations of the study.

In chapter four, the results of estimation of the model is presented and discussed. It is shown that most of the coefficients have unexpected signs and are significant. The chapter further gives an examination of how well the model performs within the sample period. It is shown that the model performs satisfactorily since the necessary test attests to this. Some policy recommendations are then made from the analysis. The major conclusions arising from the study are summarized below:

Over the period 1970-1988 and specifically 1982-1988, the

supply of investment flows to the housing sector generally declined resulting in housing shortages in urban areas in Kenya.

It has been shown that for every one percentage increase in income in the past one year, investments in the housing sector have decreased by 30.5%, implying that there exists a strong relationship between change in income and investment in housing. It is argued here that it is due to lack of land, the existing land and Plan approval regulations that is responsible for this relationship. Change in income in the past two years has also been found to be negatively related to investment but is an insignificant variable since investment in housing decreases by 7.5%. However, change in income in the past three years and thereafter have positive relationship to investment as given by the coefficient of gross investment lagged one year. But this again is an insignificant factor .

Investments in housing have also been found to be highly influenced by construction costs, where the simple elasticity value is 0.16 i.e. for every one percentage increase in construction costs investments increases by 16%. This unexpected positive sign is explained by the fact that the demand for dwelling units is relatively inelastic which makes investors to easily transfer the costs to the consumer.

It is further observed that housing investments are significantly responsive to credit allocation. When credit allocated to housing increases by one unit, investment in housing increases by 20.8%.

Lastly, there exists a strong negative relationship between housing investment and total housing stock.

The analysis points out that it is possible to make policy recommendations that would improve investment in housing and therefore increase dwelling units in urban areas in Kenya.

## APPENDIX I

## Data used in Regression Analysis

Year	$I_{Gh}^r$	$dX_{Gh}^r$
1967	2.67 ✓	0.41 ✓
1968	3.08	0.80
1969	4.05	1.12
1970	5.65	0.81
1971	7.58	1.16
1972	8.62	9.00
1973	6.11	3.01
1974	13.38	18.40
1975	15.55	3.87
1976	9.45	5.56
1977	12.20	9.44
1978	26.71	10.93
1979	35.43	6.46
1980	34.94	18.52
1981	42.77	24.01
1982	47.69	(13.27)
1983	27.64	13.55
1984	30.57	13.95
1985	36.17	13.50
1986	60.01	25.56
1987	68.10	30.74
1988	48.84	117.94

APPENDIX ONE CONTINUATION.

YEAR	$dX_{2hc}$	$CS_h^c$	$CR_h^d$	$I_{gh-l}^e$	$P_h^c$	$K_{(h-l)}^e$
1970	1.12	79.9	6.086	4.05	470	207799
1971	0.81	90.2	4.694	5.65	1426	208127
1972	1.16	101.8	10.811	7.58	1832	208597
1973	9.00	114.9	12.407	8.62	1499	210023
1974	3.01	148.1	17.145	6.11	1451	211855
1975	18.40	177.1	21.278	13.38	1855	213354
1976	3.87	181.0	19.414	15.55	791	215805
1977	5.56	198.9	21.063	9.45	830	217660
1978	9.44	215.5	36.062	12.20	1239	218451
1979	10.93	247.2	41.063	26.71	2384	219281
1980	6.46	303.2	70.774	35.43	1465	220520
1981	18.52	346.8	85.361	34.94	1939	221985
1982	24.01	395.6	103.189	42.77	2087	223924
1983	13.27	423.0	116.62	47.69	988	246011
1984	13.55	452.1	130.147	27.64	639	246999
1985	13.95	514.8	147.211	30.57	573	247637
1986	13.50	546.1	186.026	36.17	1083	248210
1987	25.56	610.2	181.377	60.01	1042	249293
1988	30.74	687.0	203.052	68.10	1262	250335

Sources: c. Republic of Kenya.: Statistical Abstracts. Various issues.  
 .....: Economic Surveys. Various issues.  
 e.....: Ministry of Works, Housing and Physical  
 planning. Department of housing: Report of the  
 Seminar on the Role of the Private Sector in

Housing Development in Kenya and Author  
calculations.

d. Central Bank of Kenya.: Annual Reports. Various issues.



APPENDIX 2

CORRELATION MATRIX OF THE DEPENDENT VARIABLES.

	$dy_{1h}$	$dy_{2h}$	$CS_h$	$CR_h$	$I_{Gh-1}$	$K_{th-1}$
$dy_{1h}$	1	0.663	0.680	0.655	0.692	0.550
$dy_{2h}$	0.663	1	0.812	0.771	0.847	0.671
$CS_h$	0.680	0.812	1	0.989	0.918	0.955
$CR_h$	0.655	0.771	0.989	1	0.890	0.955
$I_{Gh-1}$	0.692	0.847	0.918	0.890	1	0.818
$K_{th-1}$	0.550	0.671	0.955	0.955	0.818	1

.....  
Source: Author

## BIBLIOGRAPHY.

1. Adala, P.A: An Economic Study of the Urban Housing in Kenya  
M A. University of Nairobi: 1978.
2. Amling, F. (1978): Investment An Introduction to Analysis and  
Management. Prentice - Hall.
3. Arcelus F and Meltzer H A. ' ' The Markets for Housing  
services' ' Journal of Money Credit and Banking,  
feb 1973 pp 78 -99.
4. Beaujeu, G J (1970).: Geograpy and a Crowding World:A  
symposium in population pressures upon physical  
and social services in the less developed  
countries: Oxford University Press.
5. Boatwright, D B and Eaton J R.: ' ' The Estimation of  
Investment Function.' ' Economica vol 39 (1972).
6. Bower, I.J.: ' ' Investment in Commercial Construction' '  
Review of Economics and Statistics. 1965.
7. Branson, H. W. (1988).: Macro- Economic Theory and Policy  
( second edition ) Universal book stall.
8. Central Bank of Kenya.: Annual Reports. Various issues.
9. Clarke Wim (1966).: Private Enterprise in Developing  
Countries: Pergamon press oxford.
10. Eisner, R.: ' ' A Distributed lag Investment Function.' '  
Econometrica vol xxviii pp 1-29.
11. Grubb, C. A. (1972): Industrialization : A New Concept  
for Housing. Praeger publishers New York.
12. HRDU, UON.: Mathare Valley : A Case Study of Uncontrolled  
Settlement in Nairobi.
13. Johnston, J. (1988): Econometric Methods, McGraw- Hill book  
company.
14. Jorgenson, D.: ' ' Econometric Studies of Investment Behavior:  
A summary ' ' Journal of political literature dec.  
1971 pp 1111-1147.
15. Jorgenson, W.D.\* et al.: ' ' A Comparison of Alternative  
Econometric Models of Quaterly Investment  
Behaviour.' ' Econometrica vol 38 march 1970.
16. Jorgenson, N.O.: Housing Policy Guidelines for Africa

17. Jorgenson, N.O.(1977).: Housing Finance for Low Income Groups. General Printers Ltd: Nairobi.
18. Jorgenson, N.O.: 'The Mortgage Market in Kenya'. HRDU, UON.
19. Klein, R.L. (1974).: A Text Book of Econometrics. Prentice Hall inc. Englewood cliffs.
20. Koutsyianis.(1988).: Theory of Econometrics(second edition ): English language book society /Macmillan.
21. Kwenta J and Jeffrey G W.: 'The Determinants of Investment Behavior U.S.Railroads' RES VOL 48 172 -.
22. Larry N.: Investment Behavior by American railroads. Review of economics and statistics (RES) vol 51 pp 126-.
23. Lee, H.T.: The Stock Demand Elasticities of Non Farming Housing. RES vol XLVI PP 82-89.
24. Leigh, A.W.: Economic Depreciation of the Residential Housing of the U. S . RES 1980 pp 200-206.
25. Maddala, S.G.: Econometrics : Mcgraw Hill company ( Aucland)
26. Martin, F.: Inflation tax rules and investment; Some Econometric Evidence. Econometrica vol 50 july 1988 pp 825 - 862.
27. Mc Donal, J.F.(1979): Economic Analysis of an Urban Housing Market . Academic press New York.
28. Muller, S.M.: Housing Co-operative Societies in Kenya . HRDU ,UON.
29. ....(1978): Local Authority Housing in Kenya. Housing Research and Development Unit, U.O.N.
30. Office of Housing Agency for International Development.: Kenya Pre-Investment Report Quaranty Program (1972).
31. Opinya, O.N.: Population Pressure on Urban Housing .The case of Nairobi. M A UON 1982.
32. Pannell Bellhouse Mwangi (1987).: Kenya Tax and Investment Profile. Printed in the U K.

33. Rahim E :Institute of Development Research Discussion monography number E/one.
34. Republic of Kenya.: Development Plans; Various Issues. Nairobi. Gorvenment Printer.
35. ....: Economic Surveys; Various Issues.
36. ....: Statistical Abstracts; Various Issue s.
37. ....:Urban Housing Survey 1983, Basic Report. Department of Housing, Ministry of Works Housing and Physical Planning.
38. Reuber G L and Crookeu H (1973).: Private Foreign Investment in Development. Clarendon press oxford.
39. Robinson, R (1979).: Housing Economics and Public Policy . Macmillan press ltd.
40. Stren,E.R. (1978).: Housing the Urban Poor in Africa. Institute of International Studies. University of California.Berkeley.
41. Sunday Times.2-12-1990.: "Housing Chaos in Every Town"
42. Sunday Standard.2-12-1990.: "' Housing Provision for the poor''.
43. Wohame,G.J.: An Economic Evaluation of Kibera Sites and Services Project. M A UON (1984).
44. Wai T. U. and Wong H.C.:Determinants of Private Investment in Developing Countries. Journal of development studies (1982), pp. 18-36.
45. Wolf, C.Jr(1958).: Capital Formation and Foreign Investment in Underdeveloped Areas. Syracuse university press.