

A DISEQUILIBRIUM MODEL WITH RATIONING
IN TWO MARKETS / /

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Research Paper submitted to the Department of
Economics, University of Nairobi, in partial
fulfilment of the requirements for the Degree
of Master of Arts in Economics.

May, 1985.

This Research Paper is my original work and has not been presented for a degree in any other University.

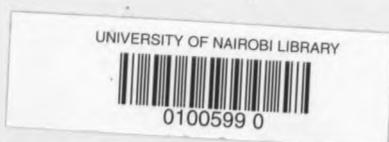
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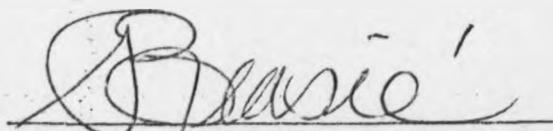
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This Research Paper has been submitted for examination with our approval as University supervisors.



Prof. T. C. I. Ryan





Dr. A. B. Ayako

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ABSTRACT .

Following the growing awareness of the inadequacies of equilibrium economics a lot of effort has gone into the development of a macroeconomic theory where markets do not clear. The disequilibrium models derived from this theory allow for transactions to occur at non-equilibrium prices and therefore, the emergence of rationing and spillover effects.

This study formulates a disequilibrium model for an economy segmented into the goods, labour and money markets while emphasising the money market. The model allows the analysis of simultaneous constraints in two markets, it includes money balances and in the utility function of the household, and money balances and inventories in the objective function of the firm. The model is consistent with the behaviour of individual agents in the economy and captures the spillover effects between markets; it therefore allows a study of some monetary and fiscal policies.

The Kenyan economy is analysed in the light of the model. It is argued that the labour market is characterised by persistent disequilibrium with households on the long side. The goods market is at, or close to, some equilibrium. The money market is hypothesised to be characterised by disequilibrium. It is argued that the commercial banks' liquidity ratio is a reliable indicator of the state of the money market and could be used to test disequilibrium in the money market.

CHAPTER ONE

INTRODUCTION

1.1 Introduction to the Problem

There has been a growing awareness among economists in the past few decades of the inadequacies of equilibrium economics. This branch of economics generally assumes that (i) there is equilibrium of demand and supply in all markets, (ii) the equilibrium is reached by price adjustments, and (iii) agents react exclusively to price signals¹. The failure of prices to adjust to their Walrasian equilibrium levels² has now been widely accepted along with the failure of equilibrium models to accurately record such phenomena as persistent unemployment.

Following the pathfinding work of Clower, Patinkin and Leijonhufvud a lot of effort has gone into the development of a macroeconomic theory where markets do not clear. Such a disequilibrium theory assumes that "(i) some markets may not be in equilibrium (ii) adjustments can be made by quantities as well as by prices and (iii) agents react to quantity signals as well as to price signals"³.

The disequilibrium models that are derived from this theory allow for transactions to occur at non-equilibrium prices. Further, following rationing of the agents whose expectations⁴ are not fulfilled, their actions in other markets will change in the light of the constraints that they encounter. Such spillover effects, rationing in one market affecting the actions of agents in other markets, are more accurately analysed within disequilibrium models.

1.2 Statement of the Problem and the Significance of the Study

The clearing of markets is not only of academic interest, but also of importance in the formulation of policies. Appropriate policy recommendations can only follow a correct analysis of the economy; taking into consideration such phenomena as the non-clearance of markets. Monetary policies in Kenya have so far ignored the existence, and the effects, of this phenomenon and could therefore have been sub-optimal.

This study attempts to formulate a model within the disequilibrium "tradition" with special emphasis on the money market. The model should allow the analysis of simultaneous constraints in two markets, it should include money balances in the utility function of the household, and money balances and inventories in the objective function of the firm. The model should be consistent with the behaviour of individual agents in the economy and should capture the spillover effects between markets. It is expected that the model will reveal in a more accurate way the effects of various monetary and fiscal policies and therefore form a framework from which they can be studied. The model will therefore be of interest to policymakers and theoreticians alike.

1.3. Outline of the Study

After a review of the literature in the next chapter, the model is developed and analysed in chapter Three. In chapter Four we examine the Kenyan economy in the light of the model produced in chapter Three, but with particular emphasis on the money market.

Footnotes

1. Bennassy (4), p.1.
2. There is a lot of literature discussing the stickiness of prices and market failure especially in the less developed economies. See for instance, Ranis, G. "Unemployment and Factor Price Distortions" in R. Jolly, E. Dekadt, H. Singer and F. Wilson. eds, Third World Employment, Penguin, Harmondsworth, 1973, pp.144-152.
3. Bennassy (4), pp.2-3.
4. The word "expectations" is used loosely.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter we review the literature from the point of view of our study. In the first section we define and explain various terms as they have come to be used in the literature. This will be followed by a section on the development of disequilibrium macro-modelling and another on the various explanations for the inflexibility of prices. The fourth section will describe the position that money takes in the literature on disequilibrium economics. Finally, we will mention how our study fits within the work that has already been done.

2.2 Definitions and Preliminary Remarks

2.2.1 Equilibrium

In the economic literature, equilibrium has come to describe two different concepts. The first is that of a system being in a steady state or state of rest, with no forces tending to change this state. The second meaning refers to a market, when the quantity demanded equals the quantity supplied, i.e. the market clears. The market clearing price and quantity need not remain constant but can vary with other factors.

The dual-meaning of the word equilibrium has been noted by Benassy (4), Muellbauer and Portes (25) and others. We will use this term in such a way as it will remain clear from the context which of the two concepts we are referring to.

2.2.2 Notional and Constrained Functions

Clower (9) distinguished the demand (or supply) curve of an agent who does not face any quantity constraints that restrict his trade in any of the other markets from the demand (or supply) curve of the agent when he faces such constraints. The first set of curves are what Clower called the "notional" curves and are therefore functions of prices and other factors such as technology etc. Agents express their "constrained" demand (or supply) functions when they face quantity constraints that restrict their trade in other markets¹. The constrained supply or demand functions are therefore functions of prices, technology and also the constraints in the other markets.

The effective curve will be the ruling curve, constrained or notional, depending on the presence or absence of quantity constraints in the other markets. This is essentially the "dual decision hypothesis" suggested by Clower (9).

2.2.3 Disequilibrium Economics

Economic theory has been dominated by the often implicit assumption that transactions take place only when the equilibrium or market clearing prices are attained. This could be arrived at by either a Walrasian tatonnement process or Edgeworthian recontracting. One of the points made by Leijonhufvud (24) is in fact that such a Walrasian theory is valid only with instantaneous price adjustments to clear the markets. Economics has, however, developed along Walrasian type analysis² against which most of the discontent is addressed.

It is important to note that the agents in such a Walrasian world will only express their notional demands. Market clearing prices imply no quantity constraints and therefore, no constrained functions arise.

A different type of analysis results from the realisation that prices may not adjust completely to the (Walrasian) market clearing level; transactions therefore occurring at non-equilibrium prices. Thus, there will be a set of agents (those on the "long side") who will be rationed and not able to fulfill their

notional demand (or supply). The behaviour of such agents in other markets will therefore change in the light of the rationing they now face. This will be expressed in the form of constrained functions.

The branch of economics that allows this sort of analysis has come to be known as disequilibrium economics. This is an unfortunate term especially when we realise that within Walrasian economics we have a disequilibrium of a kind when we consider a point on the demand (or supply) curve which does not correspond to the market clearing price-quantity combination. Such a case is outside disequilibrium economics since the demand (or supply) curves under considerations are still notional functions.

2.3 The Development of Disequilibrium Macromodelling

Though other economists and specifically Keynes himself, had set their attack on Walrasian economics, the development of disequilibrium economics begins with Patinkin (31). In his model, Patinkin distinguishes the supply and demand functions for labour when agents face quantity constraints from the Walrasian functions when the agents do not face any constraints.

Patinkin analysed labour unemployment as a consequence of excess supply in the goods market, and thus rationing of producers, leading them to demand less labour than they would have otherwise demanded.

Clower (9) broadened Patinkin's work and formalised the attack on Walrasian type analysis. He analysed incomes and consumption by households, relating them to disequilibrium in the labour market. Using the "dual decision hypothesis" he argued that the constrained³ demand expressed by households when they are faced with quantity constraints in the labour market differs from the (notional) demand when they are unconstrained. Thus, unemployment persists because it cannot be translated into effective demand.

Clower, therefore, showed the inconsistency of Walrasian economics and Keynesian unemployment and argued for a reappraisal of Keynesian economics along non-Walrasian lines.

Barro and Grossman (1) put together the work of Patinkin and Clower to make a macroeconomic model with both firms and households. Starting from an analysis of the behaviour of individual agents and assuming exogenously fixed prices, they showed how quantity constraints result. By working out their model, they derived the cases of Walrasian equilibrium, Keynesian unemployment, classical unemployment and repressed inflation.

Howard (20) strengthened the choice-theoretics of the Barro and Grossman model, and proved some assertions in the original model. Howard (19) takes credit for empirically testing the repressed inflation case of the Barro and Grossman model with data from the Soviet Union economy.

Muellbauer and Portes (25) extended the work of Barro and Grossman by taking into account inventories by firms and intertemporal decisions. This allowed them to derive the cases of Keynesian unemployment, classical unemployment, repressed inflation and underconsumption along with Walrasian equilibrium as a special case. Muellbauer and Portes take credit of the "double wedge" representation of these cases in the labour-goods space. The effects of fiscal

policies are shown clearly in these diagrams.

Their work, however, suffers from a weak treatment of money balances by households, which they have traded off in favour of a deeper analysis of the role of expectations. The same applies to their treatment of inventories of firms. Their model also does not consider money balances held by firms.

There are basically two types of models in use within disequilibrium economics. As Drazen (11) notes⁴, the first is the Dreze-type formulation in which an agent forms his constrained demand (or supply) function in a market after considering the constraints in all markets including the one in question. The second, Benassy-type models, on the other hand, allow the agent to form the constrained functions after considering the constraints in all other markets except the one in question. The theory has developed along Benassy-type models with the Barro and Grossman (1) and Muellbauer and Portes (25) models as examples of these.

2.4 Why Prices are Inflexible

The models considered above are all fixed price models. They show what happens when prices do not adjust to clear the market but do not explain why prices do not adjust.

As Benassy⁵ points out, the absence of perfect information, imperfect competition, institutional barriers and other factors such as imperfect markets can restrain price adjustment. But as Leijonhufvud, however, emphasised

Keynes was adamantly opposed to theories which "blamed" depressions on such obstacles to price adjustments (as monopolies, labour unions, minimum wage laws or other institutional constraints). The implied proposition that if competition could only be restored "automatic forces" would take care of the employment problem was one of his (Keynes') pet hates⁶

It can therefore be argued that prices do not adjust because it is in no ones interest that they adjust. Price setting would therefore be related to the behaviour of individual agents. As Drazen notes following an observation by Arrow⁷:

In a situation of aggregate excess supply (or demand) agents must abandon the notion that they can sell (buy) as much as they want at the going market price. When this perfect competition assumption breaks down, it is no longer sensible to argue that agents treat price signals parametrically. Agents act as price setters in the presence of constraints, even though the market is characterised by a large number of sellers.

This has led to the development of disequilibrium models with endogenous price setting. Benassy (3), Grandmont and Laroque (12), Hahn (17), Negishi⁹, and Varian (35) are but some of the attempts in this line.

2.5 The Position of Money in This Context

Most, if not all, the works cited above have considered money in so far as it is a medium of exchange and facilitates trade. Such works accept or show that it is not the use of money in trade per se that allows the occurrence of quantity constraints since they could arise in a non-monetary economy.¹⁰

Clower (10) hinted a case of a controlled supply of money that could lead to restricting trade. This point was, however, obscured in the confusion that followed the article¹¹. Benassy (2), Negishi (27) and others have broadened the role of money so that

households can carry money balances across time periods and thus derive indirect utility from holding it in the present period. However, all models that have been encountered assume such agents hold as much money as they desire. Thus, no restrictions on money holding is allowed in such models.

. Two empirical studies of the money market have been encountered. The first is that by Laffont and Garcia (22) on the Canadian credit market. Their basic models were, however, not built on any choice-theoretic but rather on conventional economic wisdom of the supply and demand for credit. While first assuming that the price for credit changes sufficiently to equate supply and demand in each period, the models are estimated using ordinary least squares and two stage least squares techniques. The equilibrium hypothesis is then assumed away and the (disequilibrium) models estimated with two stage least squares and maximum likelihood methods.

The second study is that by Ryan and Savosnick (32) in the Kenyan money market. Using commercial banks' liquidity level as the distinguishing variable, the data was sorted into demand curve and supply curve observations. Demanding agents were divided into four groups and their demand functions estimated using ordinary least squares method on the already sorted demand observations.

2.6 . Point of Departure

This study attempts to build a disequilibrium model from a foundation of the behaviour of individual agents, while including money balances in the behavioural function of households, and money balances and inventories in that of firms. We will relax the assumption that households and firms are not constrained in their access to money balances. Money will be supplied by agents who seek to fulfil their objectives; thus the quantity of money supplied need not equal the quantity demanded. Prices will, however be assumed exogenous.

Footnotes

1. Clower's original terminology was notional and effective demands. Following Muellbauer and Portes (25) and others, we will use the better term, constrained demand (or function)
2. Weintraub (36), p.128.
- 3.. His term was "effective demand".
4. Drazen (11), p.290.
- 5.. Benassy (4), p.9.
- 6.. Leijonhufvud (23), p.403. Within brackets mine.
7. Arrow, K. J. "Towards a Theory of Price Adjustment", in A. Abramovitz, ed., The Allocation of Economic Resources, Stanford University Press, Stanford, 1959.
8. Drazen (11), p.290
9. Negishi, T. "Involuntary Unemployment and Market Imperfection" Economic Studies Quarterly, vol.25, 1974, pp.32-41.
10. See, for instance, Drazen (11), p.300 and Hahn (16).
11. Drazen (11), p.300.

CHAPTER THREE

THE THEORETICAL MODEL

3.1 Introduction

In this chapter we attempt to build a theoretical disequilibrium model that allows agents to encounter quantity constraints in their demand for money. The model is inspired by the work of Muellbauer and Portes¹ with differences arising due to our inclusion of money balances and inventories in the utility function of the representative firm, the exclusion of an analysis of expectations of the future and the existence of quantity constraints in the money market of our model. We continue to assume exogenously fixed prices.

We consider a simple monetary economy with four sets of agents; households, firms, government and banks, and three commodities, goods, labour and money. Households purchase goods from firms in the goods market while they supply (sell) labour to firms, banks and the government in the labour market. Households sell an exogenously fixed amount of labour to the government and banks, even though the level of employment in banks can be assumed to be negligible. To effect transactions in both these markets and in the pursuit of their goals, firms and households independently seek to hold money balances.

Banks, on the other hand, have their own supply plan for money into the money market. We assume that all markets are efficient or frictionless² and therefore the transactions that are realised are the minimum of the quantity supplied and demanded at any given price. For the moment we will develop the model without the government.

3.2 Households

Following in the spirit of Muellbauer and Portes, households make their plan for two time periods; the current period and the future. The time periods are identical, synchronised, in all the markets. A household seeks to maximise the utility it derives from the consumption of goods in the current period, security for the consumption of goods in the future and the consumption of leisure. Money balances held by the household at the end of the current period link the present period with the future by allowing consumption in the future. The household will therefore derive utility by holding money balances since they offer the security of consumption in the future. We assume away, or at least assume the stability of such factors as expectations of future prices, wages and market conditions. We also assume that the household does not carry forward any goods into the future period.

The representative household's optimisation problem is therefore

$$\text{Max } U = U(Y_t^h, M_t^h, L - L_t^h)$$

$$\text{s.t. } Y_t^h P_t + M_t^h = W_t L_t^h + \pi_t^h + B_t^h + M_{t-1}^h - r_t \beta_t^h$$

where Y_t^h is the intended current real consumption, M_t^h is the quantity of money balances demanded, L is the total labour (time) available to the household, L_t^h is the intended quantity of labour supplied, P_t is the current price level, W_t is the current nominal wage rate, π_t^h is the level of profits by households, B_t^h is the net borrowing during the current period, M_{t-1}^h is money balances from the previous period, r_t is the current rate of interest and β_t^h is the outstanding debt from borrowing in the previous periods. Note that B_t^h and β_t^h can be negative.

Current borrowing affects (reduces) the utility that the household derives from its money balances since borrowings are claims on future consumption. To capture this phenomenon we will envisage the household's problem as

$$\text{Max } U = U(Y_t^h, M_t^h, L - L_t^h, B_t^h)$$

$$\text{s.t. } Y_t^h P_t + M_t^h = W_t L_t^h + r_t^h + B_t^h + M_{t-1}^h - r_t \beta_t^h$$

where $U_1, U_2, U_3 > 0$ and $U_4 < 0$.

This can be solved by the Lagrangian method;

$$\Gamma = U(Y_t^h, M_t^h, L - L_t^h, B_t^h) + \lambda (W_t L_t^h + r_t^h + B_t^h + M_{t-1}^h - r_t \beta_t^h - Y_t^h P_t - M_t^h)$$

$$\partial \Gamma / \partial Y_t^h = U_1 - \lambda P_t = 0$$

$$\partial \Gamma / \partial M_t^h = U_2 - \lambda = 0$$

$$\partial \Gamma / \partial L_t^h = -U_3 + \lambda W_t = 0$$

$$\partial \Gamma / \partial B_t^h = U_4 + \lambda = 0$$

$$\partial \Gamma / \partial \lambda = W_t L_t^h + r_t^h + B_t^h + M_{t-1}^h - r_t \beta_t^h - Y_t^h P_t - M_t^h = 0$$

$$\therefore \lambda = \frac{U_1}{P_t} \quad U_2 = \frac{U_3}{W_t} = -U_4$$

From these first order conditions we deduce that the household will be maximising its utility when an additional monetary unit spent for either goods, money balances, leisure (reduction in the sale of labour) or the reduction of borrowing (or lending), will yield the same utility. This is so when we realise that money is taken as the numeraire and therefore has a price of unity..

From the system of equations given above, we have four endogenously determined variables of interest (excluding λ) and five independent equations. We can therefore solve for the endogenous variables in terms of the exogenous variables to yield

$$Y_t^h = Y(P_t, W_t, q_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.1)$$

$$M_t^h = M(P_t, W_t, q_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.2)$$

$$L_t^h = L(P_t, W_t, q_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.3)$$

$$B_t^h = B(P_t, W_t, q_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.4)$$

These are the notional functions for the demands for goods, money balances and borrowings, and the notional supply of labour; since the household is not

restricted or constrained in any of the markets. If the household was able, these are the functions it would express in the various markets.

We can consider the case of the household being rationed in the money market. Rather than the household being restricted in the amount of money balances it carries forward, we can envisage the more realistic constraint on the amount of borrowing that the household can acquire in the present period. Thus borrowing in the current period is constrained to \bar{B}_t^h .

The utility maximisation problem reduces to

$$\max U = U(Y_t^h, M_t^h, L - L_t^h, \bar{B}_t^h)$$

$$\text{s.t. } Y_t^h P_t + M_t^h = W_t L_t^h + \pi_t^h + \bar{B}_t^h + M_{t-1}^h - r_t \beta_t^h$$

This can be solved in a similar manner as the previous problem to yield the solution

$$Y_t^h = Y(P_t, W_t, \bar{B}_t^h, \pi_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.5)$$

$$L_t^h = L(P_t, W_t, \bar{B}_t^h, \pi_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.6)$$

$$M_t^h = M(P_t, W_t, \bar{B}_t^h, \pi_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.7)$$

These are the constrained demand functions for goods and money balances, and the constrained supply function for labour when the household is constrained in its access of borrowing to a level of \bar{B}_t^h .

If the household is confined to a level \bar{Y}_t^h of goods in the goods market, its optimisation problem reduces to

$$\text{Max } U = U(\bar{Y}_t^h, M_t^h, L - L_t^h, B_t^h)$$

$$\text{s.t. } \bar{Y}_t^h P_t + M_t^h = W_t L_t^h + \pi_t^h + B_t^h + M_{t-1}^h - r_t \beta_t^h$$

This can be solved to yield

$$M_t^h = M(P_t, W_t, \bar{Y}_t^h, \pi_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.8)$$

$$L_t^h = L(P_t, W_t, \bar{Y}_t^h, \pi_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.9)$$

$$B_t^h = B(P_t, W_t, \bar{Y}_t^h, \pi_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.10)$$

If the household is rationed in the labour market to a level of \bar{L}_t^h , ($L - L_t^h$) since L is fixed, the optimisation problem would reduce to

$$\text{Max } U = U(Y_t^h, M_t^h, L - L_t^h, B_t^h)$$

$$\text{s.t. } Y_t^h P_t + M_t^h = W_t \bar{L}_t^h + \pi_t^h + B_t^h + M_{t-1}^h - r_t \beta_t^h$$

which yields

$$Y_t^h = Y(P_t, W_t, \bar{L}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.11)$$

$$M_t^h = M(P_t, W_t, \bar{L}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.12)$$

$$B_t^h = B(P_t, W_t, \bar{L}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.13)$$

We now consider the household facing simultaneous constraints in two markets. If the two markets are the goods market and the money market, we can derive the constrained functions the household will manifest by solving

$$\max U = U(Y_t^h, M_t^h, L - L_t^h, \bar{B}_t^h)$$

$$\text{s.t. } Y_t^h P_t + M_t^h = W_t L_t^h + \bar{q}_t^h + \bar{B}_t^h + M_{t-1}^h - r_t \beta_t^h$$

This solves to yield

$$M_t^h = M(P_t, W_t, Y_t^h, \bar{B}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.14)$$

$$L_t^h = L(P_t, W_t, Y_t^h, \bar{B}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.15)$$

If the household is rationed in the goods market and the labour market simultaneously, its optimisation problem will now be

$$\max U = U(\bar{Y}_t^h, M_t^h, \overline{L - L}_t^h, B_t^h)$$

$$\text{s.t. } \bar{Y}_t^h P_t + M_t^h = W_t \bar{L}_t^h + \bar{q}_t^h + B_t^h + M_{t-1}^h - r_t \beta_t^h$$

The solution of which yields

$$M_t^h = M(P_t, W_t, \bar{Y}_t^h, \bar{L}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.16)$$

$$B_t^h = B(P_t, W_t, \bar{Y}_t^h, \bar{L}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.17)$$

Finally, if the household is rationed in both the money and the labour markets it will seek to maximise

$$U = U(Y_t^h, M_t^h, \overline{L - L}_t^h, \bar{B}_t^h)$$

$$\text{s.t. } Y_t^h P_t + M_t^h = W_t \bar{L}_t^h + \bar{q}_t^h + \bar{B}_t^h + M_{t-1}^h - r_t \beta_t^h$$

This will yield

$$Y_t^h = Y(P_t, W_t, \bar{L}_t^h, \bar{B}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.18)$$

$$M_t^h = M(P_t, W_t, \bar{L}_t^h, \bar{B}_t^h, \bar{q}_t^h + M_{t-1}^h - r_t \beta_t^h) \quad (3.19)$$

The scenarios set above can be expressed in the wedge diagrams attributed to Muellbauer and Portes (25). When markets clear, households express and realise their notional demands for goods, borrowing and money balances together with their notional supply of labour as at a point H in figure 3.1.

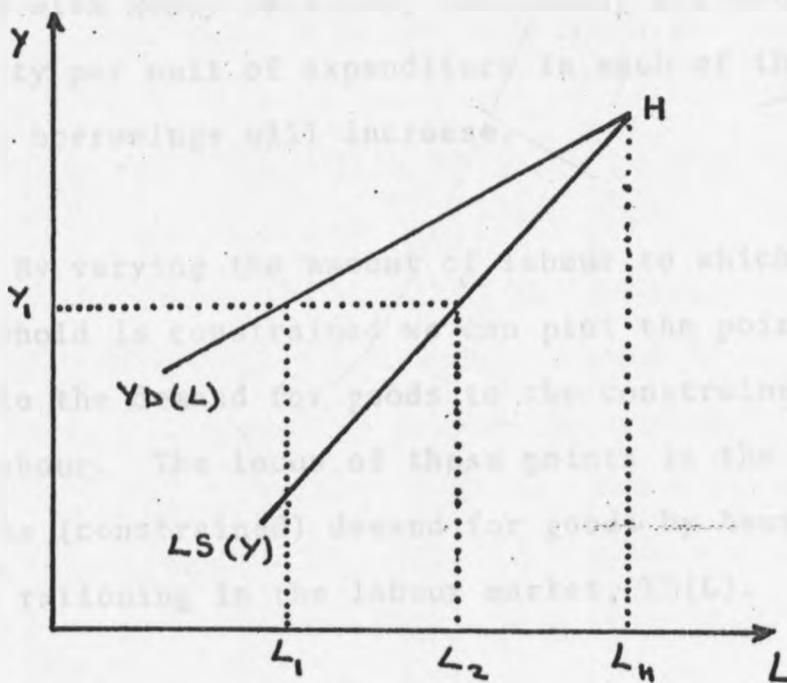


Fig.3.1 The household's constrained functions

Point H is contingent to the variables in the demand and supply functions for goods and labour respectively. If the household is compelled to supply less labour than L_H , say L_1 with other variables

such as price and the wage rate remaining unaltered, the household will receive lower incomes and therefore have a smaller budget. This will imply a reduction in the household's expenditure in goods and money balances but while maintaining the equality of the marginal utility per monetary unit in goods and money balances and the negative of the marginal "disutility" of borrowing. Thus goods consumption will decrease along with money balances, increasing the marginal utility per unit of expenditure in each of these, while borrowings will increase.

By varying the amount of labour to which the household is constrained we can plot the points that relate the demand for goods to the constrained level of labour. The locus of these points is the curve of the (constrained) demand for goods by households with rationing in the labour market, $YD(L)$.

If we consider that the household is constrained in the goods market to the purchase of, say, Y_1 , we can derive the amount of labour the household would now like to supply. If the household continued selling L_H of labour and borrowing just as much as at H , it would have to carry a lot more money balances

into the next period than it would have carried at H. This would mean that the additional money balances would lower the marginal utility per monetary unit that households derive from these balances, and thereby shattering the equality of the marginal utilities per monetary unit in money balances, leisure and the negative of the marginal "disutility" of borrowing per monetary unit. Thus for the equality to hold after the constraint on goods, money balances will increase but the consumption of leisure increases as well while borrowings decrease. This is so as to maintain the equality of the marginal utilities per monetary unit in money balances, leisure and the negative of the marginal "disutility" per monetary unit in borrowing. Therefore, the amount of labour the household now wishes to supply, in the light of the constraint in the goods market is less than L_H while it holds more money balances and less borrowings than at H.

However, given the goods constraint, the supply of labour by the household will be greater than the corresponding amount of labour on the household's labour constrained demand for goods curve.

A constraint on labour reduces the ability of a household to purchase goods and also carry money balances. If the household is constrained in its purchase of goods it will carry extra money balances into the next period and therefore sells more labour. Thus if the household is constrained to Y_1 in the goods market (see figure 3.1), the quantity of labour it supplies, L_2 , will be greater than L_1 but less than L_H . By changing the level of goods to which the household is constrained we can derive the (constrained) labour supply curve $LS(Y)$.

Each point on either of the curves corresponds to a different level of money balances and borrowing. As we move up the $YD(L)$ curve towards point H, the household increases its holding of money balances and decreases its borrowing. Further, as we move down the $LS(Y)$ curve away from H, the household increases its holding of money balances and reduces its borrowing. This follows from the preceding discussion. We can now analyse the behaviour of the household in the face of rationing in the money market.

If the household was constrained in only the level of its borrowing, its behaviour in other markets will change accordingly. The household cannot borrow as much as it would have borrowed at H in figure 3.1. The household therefore has less finances than it would want to have. The household will therefore lower its expenditure accordingly but maintaining the equality of the marginal utilities per monetary unit in the variables that it can alter. Thus the household's consumption of goods will decrease, money balances will decrease and the consumption of goods will decrease, money balances will decrease and the consumption of leisure will decrease as well. A constraint on borrowing will therefore reduce the household's demand for goods and money balances while increasing its supply of labour. In figure 3.1 we can envisage H moving to the south east under a constraint in borrowing at a level lower than what the household borrows at H. We note that rationing of an even lower level of borrowings will push H even further to the south east.

We can now consider the household being constrained simultaneously in the money market and one other market. We begin by considering the labour market. If the household is constrained to a maximum of borrowing corresponding to the level of borrowing at point A in figure 3.2 (a) while it is simultaneously constrained to L_1 of labour, point A will still be an attainable combination of goods, labour and money balances. All the points to the right of A on the $YD(L)$ curve will be attainable since they correspond to lower levels of borrowing; the borrowing constraint will not be binding.

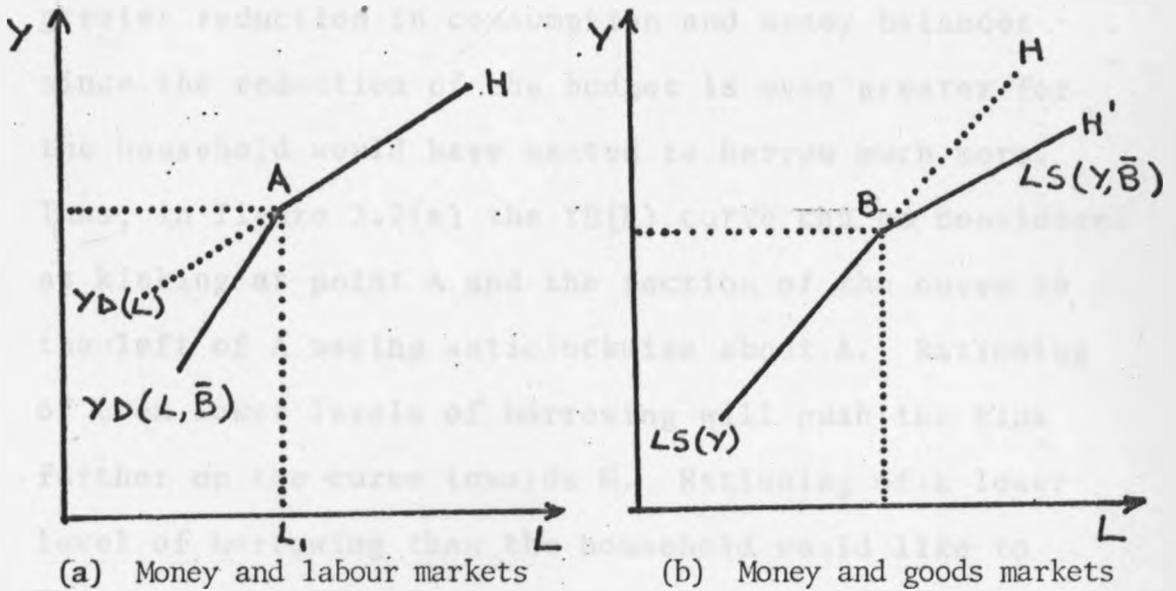


Fig.3.2. The household's functions with constraints in two markets

However, all the points to the left of A on the YD(L) curve will be unattainable since they correspond to greater borrowings than at A and therefore the borrowing constraint is binding. To the left of A the household has less finances given the constraint and therefore needs to reduce its expenditure while remaining at the rationed level of borrowing and rationed labour. Thus it will reduce its consumption of goods and its holding of money balances while maintaining the equality of the marginal utilities per unit of expenditure in goods and money balances. Rationing of the same amount of borrowing with rationing of even less labour will result in an even greater reduction in consumption and money balances since the reduction of the budget is even greater for the household would have wanted to borrow much more. Thus, in figure 3.2(a) the YD(L) curve can be considered as kinking at point A and the section of the curve to the left of A moving anticlockwise about A. Rationing of even lower levels of borrowing will push the kink further up the curve towards H. Rationing of a lower level of borrowing than the household would like to borrow at H will shift the YD(L) curve anticlockwise about H and move it to the south east as H moves to H'. This follows from the preceding discussion.

As was argued before, points on the $LS(Y)$ curve correspond to less borrowing than the $YD(L)$ curve. Also points further away from H on the $LS(Y)$ curve correspond to lower levels of borrowing. Thus for a constraint on borrowing to have any effect on the $LS(Y)$ curve the level of borrowing that the household should be constrained to should be lower than the borrowings at H .

We consider simultaneous constraints in the money and the goods market. Consider rationing of borrowings equal to the borrowing that the household would have at point B in figure 3.2 (b). Point B will be attainable given the constraints on goods and borrowing. All the points to the left of B on the $LS(Y)$ curve will be attainable since they correspond to lower levels of borrowing than the constrained level. None of the points to the right of B are attainable given the constraint on borrowing. The household finds itself with less finances and in order to reduce its expenditure it will decrease its holding of money balances and also decrease its consumption of leisure in order to equate the marginal utilities per monetary unit in each of these. Thus, the household will want to supply more labour given the constraints on goods

and borrowing. Thus, as shown in figure 3.2 (b) the LS(Y) curve kinks at B and the section to the right of B shifts clockwise about B. Rationing of an even lower level of borrowing pushes the kink on the LS(Y) curve even further down with H' moving even further to the south east.

3.3 Firms

The representative firm can be seen as trying to maximise an objective function containing profits as one of the variables. Economists have over the years expressed their dissatisfaction for taking profit maximisation as the only goal for the firm. This has led to the development of other theories of the behaviour of the firm but none has so far overtaken the profit maximisation goal among researchers³.

In this study we consider the firm deriving utility from a number of variables the first of which is profits. Secondly, the firm seeks to hold inventories as buffer stocks, for speculation and transactions purposes⁴. Finally, the firm

derives utility from the holding of money balances since they will allow access to factor markets and thus will be used as working capital in the next period.

The firm therefore seeks to solve

$$\max U = U(\pi_t^f, M_t^f, i_t)$$

$$\text{s.t. } P_t(X_t + i_{t-1} - i_t) + M_{t-1}^f = \pi_t^f + W_t L_t^f - B_t^f + r_t \beta_t^f$$

$$X_t = f(L_t^f, M_{t-1}^f)$$

where π_t^f is the profit distributed by firms, M_t^f is the desired money balances at the end of the period, i_t is the intended inventory level at the end of the period, P_t is the current price level, X_t is the current population, i_{t-1} is the inventory from the previous period, W_t is the wage rate, L_t^f is the intended level of employment or labour demand, B_t^f is the net borrowing by the firm during the current period, r_t is the rate of interest and β_t^f is the outstanding debt from previous borrowing. Note that $B_t^f + B_t^h$ need not equal zero since banks, from whom borrowings are obtained, can and do practice fractional reserve banking. A similar comment can be made about $\beta_t^f + \beta_t^h$.

As in the case of the household, B_t^f affects the utility derived from a given level of money balances. We could therefore include B_t^f in the utility function, reducing the optimisation problem to solving⁵

$$\max U = U(\eta_t^f, M_t^f, i_t, B_t^f)$$

$$\text{s.t } P_t(X_t + i_{t-1} - i_t) + M_{t-1}^f = \eta_t^f + M_t^f + W_t L_t^f - B_t^f + r_t \beta_t^f$$

$$X_t = f(L_t^f, M_{t-1}^f)$$

where $U_1, U_2, U_3 > 0$ and $U_4 < 0$

This can be solved by the Lagrangian method

$$\Gamma = U(\eta_t^f, M_t^f, i_t, B_t^f) + \lambda_1 (P_t(X_t + i_{t-1} - i_t) + M_{t-1}^f - \eta_t^f - M_t^f - W_t L_t^f + B_t^f - r_t \beta_t^f) + \lambda_2 (X_t - f(L_t^f, M_{t-1}^f))$$

$$\partial \Gamma / \partial \eta_t^f = U_1 - \lambda_1 = 0$$

$$\partial \Gamma / \partial M_t^f = U_2 - \lambda_1 = 0$$

$$\partial \Gamma / \partial i_t = U_3 - \lambda_1 P_t = 0$$

$$\partial \Gamma / \partial B_t^f = U_4 + \lambda_1 = 0$$

$$\partial \Gamma / \partial \lambda_1 = P_t(X_t + i_{t-1} - i_t) + M_{t-1}^f - \eta_t^f - M_t^f - W_t L_t^f + B_t^f - r_t \beta_t^f = 0$$

$$\partial \Gamma / \partial \lambda_2 = X_t - f(L_t^f, M_{t-1}^f) = 0$$

$$\therefore \lambda_1 = U_1 = U_2 = \frac{U_3}{P_t} = -U_4$$

From these first order conditions we deduce that the firm will maximise its utility when an additional monetary unit spent in profits, money balances, inventory or a reduction in borrowing (the negative of the "disutility" of increasing borrowing) yields the same utility. We have got money as the numeraire with a price of unity.

Solving this system of equations the solution for the endogenous variables can be obtained in terms of the exogenous variables. Thus, if Y_t^f is the quantity of goods supplied, $Y_t^f = X_t + i_{t-1} - i_t$, then

$$L_t^f = L(P_t, W_t, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.20)$$

$$M_t^f = M(P_t, W_t, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.21)$$

$$B_t^f = B(P_t, W_t, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.22)$$

$$i_t = i(P_t, W_t, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.23)$$

$$Y_t^f = Y(P_t, W_t, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.24)$$

These are the notional demands for labour, money balances and borrowing, the planned level of inventories and the notional supply of goods.

Following an argument similar to that of the household we can derive the functions the firm expresses when it faces a quantity constraint in the goods market \bar{Y}_t^f . These constrained functions are

$$L_t^f = L(P_t, W_t, \bar{Y}_t^f, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.25)$$

$$M_t^f = M(P_t, W_t, \bar{Y}_t^f, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.26)$$

$$B_t^f = B(P_t, W_t, \bar{Y}_t^f, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.27)$$

$$i_t^f = i(P_t, W_t, \bar{Y}_t^f, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.28)$$

Analogous functions can be written for the case of the firm facing a quantity constraint in the labour market \bar{L}_t^f , or a constraint in the money market, constraining borrowings to \bar{B}_t^f .

Similarly when the firm faces simultaneous quantity constraints in two markets, say, the goods market and the money market, its constrained functions can be derived in terms of the exogenous variables, in this case yielding.

$$L_t^f = L(P_t, W_t, \bar{Y}_t^f, \bar{B}_t^f, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.29)$$

$$M_t^f = M(P_t, W_t, \bar{Y}_t^f, \bar{B}_t^f, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.30)$$

$$i_t = i(P_t, W_t, \bar{Y}_t^f, \bar{B}_{t-1}^f, M_{t-1}^f, i_{t-1}, r_t \beta_t^f) \quad (3.31)$$

Analogous functions can be derived for simultaneous constraints in the goods and labour markets and the money and labour markets.

The scenarios expressed by such functions can be represented in wedge diagrams as was done for the household . When all markets clear the firm expresses its notional demands for labour, money balances and borrowing, as well as the notional supply of goods. This is shown as point F in figure 3.3. The location of F is dependent on the variables in the (notional) supply and demand functions for the firm.

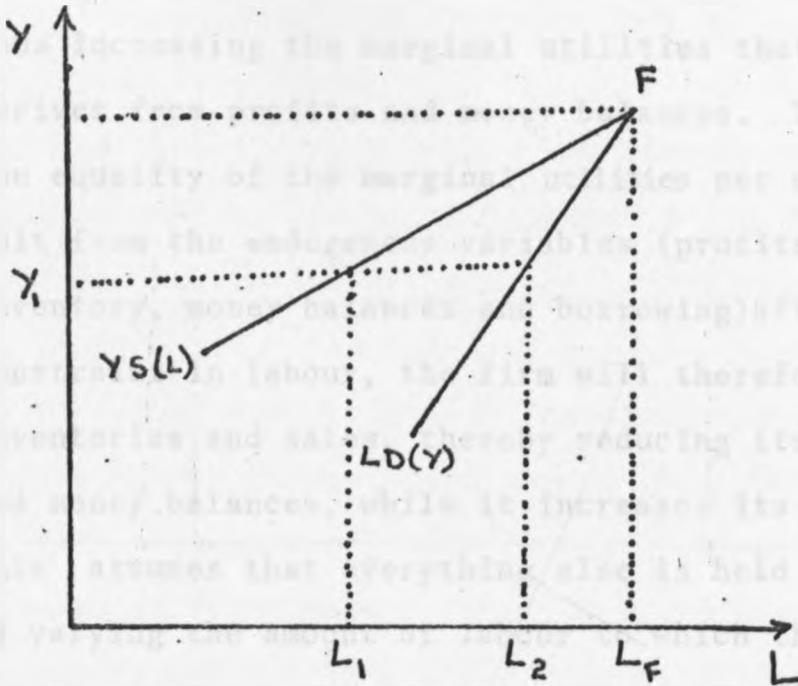


Fig. 3.3. The firm's constrained functions

If the firm was constrained in only the labour market to L_1 units of labour (the firm wants to buy more labour but it cannot since it is restricted to L_1) its production capacity will be lowered. This can be accommodated by either lower inventories or lower sales or a combination of both. Lowering inventory will increase the marginal utility per monetary unit that the firm derives from inventories and the lowering of sales will reduce the finances that can be distributed into profits or money balances, even

after the implied reduction of the wage bill, and thus increasing the marginal utilities that the firm derives from profits and money balances. To maintain the equality of the marginal utilities per monetary unit from the endogenous variables (profits, inventory, money balances and borrowing) after the constraint in labour, the firm will therefore reduce inventories and sales, thereby reducing its profits and money balances, while it increases its borrowings. This assumes that everything else is held constant. By varying the amount of labour to which the firm is constrained we can derive the (constrained) supply of goods curve when the firm is constrained in the labour market, $YS(L)$ in figure 3.3.

We note that all the points on the $YS(L)$ curve correspond to different levels of money balances and inventories. Points with rationing of lower amounts of labour correspond to lower money balances and greater borrowings.

If the firm now faces a constraint in the goods market restricting its trade to say, Y_1 , we can derive its demand for labour L_2 . The firm cannot sell as much as it would have wanted and therefore cannot finance profits and money balances as it would have wanted. As profits and money balances fall the marginal utility per monetary unit in each of these rises. We therefore need to reduce inventories and increase borrowings to maintain the equality of the marginal utilities per monetary unit in each. Thus after a constraint in sales the firm increases its borrowing, decreases its profits, money balances and inventories and therefore reduces its demand for labour. L_2 is therefore less than L_F . However, L_2 will be greater than L_1 since the firm is expected to carry more inventories than it did when it was constrained in the labour market. Thus L_2 will be greater than L_1 but less than L_F . By changing the level of goods to which the firm is constrained we can plot the (constrained) demand curve for labour with a constraint in the goods market. This is the $LD(Y)$ curve in figure 3.3.

We note that points that are closer to F on the LD(Y) curve correspond to greater money balances and lower borrowings. Also, of two points with an equal level of goods on both curves, the point on the LD(Y) curve corresponds to a higher level of inventory and money balances and a lower level of borrowing than the point on the YS(L) curve.

We now consider the firm facing a constraint in the money market only. Following the preceding discussion this is by restricting borrowings to a level less than what the firm would like to acquire. Faced by such a shortage in finances the firm could reduce its profits and money balances together by a similar amount or increase its sales to cover the decrease in the finances. The increase in sales could be via reductions in inventory or an increase in the production level. However, as profits and money balances decrease, inventories should decrease so as to maintain the equality of the marginal utilities per monetary unit in each of these. Thus, if the adjustment in the profits, money balances and inventories equating the marginal utilities per monetary unit, is sufficient to cover the reduction in funds there will be no change in production and therefore a constant level of employment. We can assume that in the general case these adjustments

fully cover the reduction in funds.

It follows that the firm will sell more goods, reduce its profits, money balances and inventory, and employ the same quantity of labour. The new location for equilibrium (constrained by borrowings) will therefore be a point F' , with a greater quantity of goods supplied, similar employment and lower levels of profits, inventory and money balances than the initial position. Thus in figure 3.3, a quantity constraint in the level of borrowing from the initial position F will shift it to F' , somewhere to the north of F .

We will now consider simultaneous rationing in the labour and money markets. Analogous to the household we consider a quantity constraint on borrowings equal to the borrowings by the firm at point A on the $YS(L)$ curve in figure 3.4. The firm is also facing a constraint on the quantity of labour it can employ.

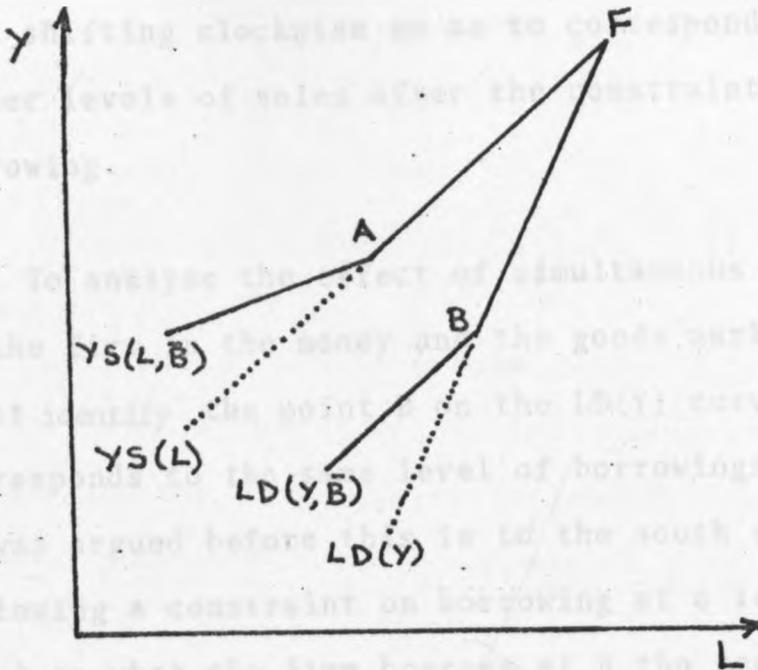


Fig. 3.4 The firm's effective function with constraints in borrowings and another market

Increasing the quantity of labour that the firm is constrained to employ (moving up the $YS(L)$ curve) makes the firm demand less borrowings than at A. Thus, to the right of A the constraint on borrowings is effective.

However, rationing a smaller quantity of labour than at A while holding fixed the level of borrowings leaves the firm with lesser borrowings and therefore finances that it would like to have. This leads the firm to adjust its holding of money balances and profits after a trade off with greater sales, having reduced inventories. Thus the $YS(L)$ curve can be seen as kinking at A and the section to the left of

of A shifting clockwise so as to correspond to higher levels of sales after the constraint on borrowing.

To analyse the effect of simultaneous constraints on the firm in the money and the goods markets, we first identify the point B on the LD(Y) curve that corresponds to the same level of borrowings as at A. As was argued before this is to the south east of A. Following a constraint on borrowing at a level equal to what the firm borrows at B the section of the LD(Y) curve to the right of B is unaltered given that it corresponds to lower levels of borrowings. However, to the left of B given the constraints on goods and borrowings the firm will decrease its money balances and profits along with its inventory. Thus production will decrease and therefore employment decreases. The LD(Y) curve will therefore kink at B and the section to the left of B shift clockwise about B.

Rationing of lower levels of borrowings pushes the kinks further up the curves towards F. Rationing of even lower borrowings than the firm wants at F will shift the curves north so that F corresponds to a

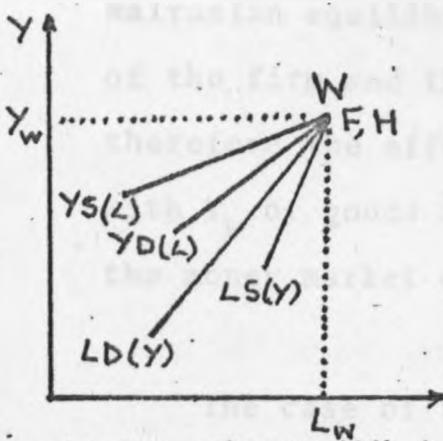
new location to the north of F, with the final curves not as steep as the original.

3.4 Analysis of the Model: Passive Money Market

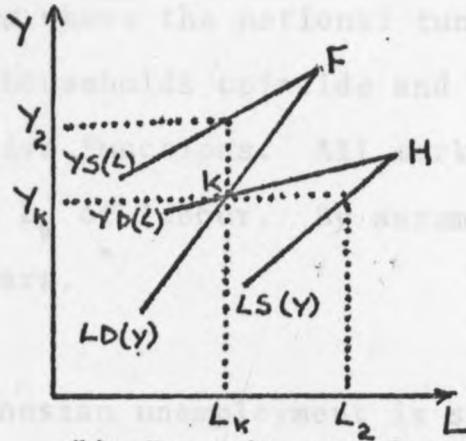
In this section we investigate the predictions of the model with respect to the ruling regimes and changes in the exogenous variables while assuming away constraints in the money market. Muellbauer and Portes (25) analysed their model in an analogous manner obtaining results that can be produced by our model. Such include the effect of a reduction in the wage rate, an increase in government expenditure, etc. However, as has been mentioned differences arise due to our inclusion of money balances and inventories in the utility function of the firm, our exclusion of an analysis of expectations of the future, and the introduction of borrowings in the utility functions of the firm and the household.

If we assume a passive money market, the regimes (combinations of the firm's and household's wedges) of the Muellbauer and Portes model can be reproduced.

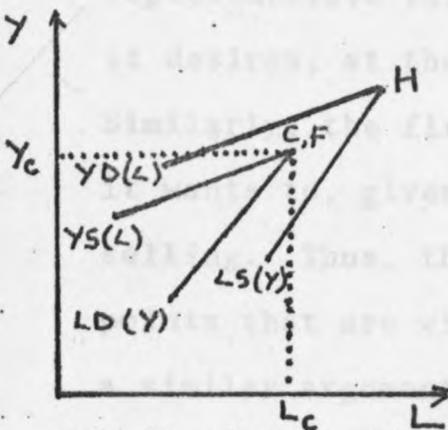
These are shown in figures 3.5 below.



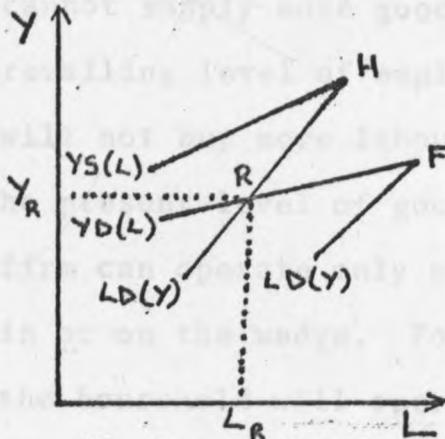
(a) Walrasian equilibrium



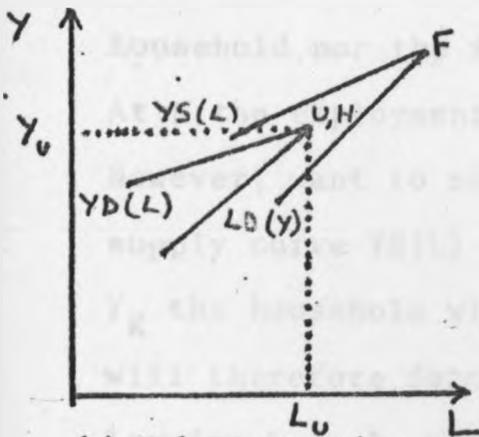
(b) Keynesian unemployment



(c) Classical unemployment



(d) Repressed inflation



(e) Underconsumption

Fig. 3.5 Regimes of the firm's and household's wedges

Diagram (a) of figure 3.5 depicts the case of Walrasian equilibrium where the notional functions of the firm and the households coincide and are therefore the effective functions. All markets clear with Y_W of goods and L_W of labour. By assumption the money market clears.

The case of Keynesian unemployment is shown in diagram (b). Voluntary exchange implies that the representative firm cannot supply more goods than it desires, at the prevailing level of employment. Similarly, the firm will not buy more labour than it wants to, given the present level of goods it is selling. Thus, the firm can operate only at those points that are within or on the wedge. Following a similar argument, the household will operate on or within its wedge. In figure 3.5 (b) the economy will therefore settle at K since neither the household nor the firm can achieve H or F respectively. At K the employment level will be L_K . The firm will, however, want to supply Y_2 of goods on its (constrained) supply curve $YS(L)$ given the present level of consumption Y_K the household will want to supply L_2 of labour. It will therefore face rationing in the labour market leaving $L_2 - L_K$ openly seeking employment.

Classical unemployment is shown in figure 3.5(c). The economy will settle at C (i.e. F) effecting the firm's notional supply and demands. The household will be rationed in both the labour and the goods markets.

While continuing to assume a passive money market the effects of policies can be studied in the light of the diagrams given above. A decrease in the wage rate alters the firm's notional functions by increasing the amount of labour the firm wants to buy and the level of sales (supply of goods) it would like to have at the fixed price. Point F, and following a similar argument the rest of the wedge, moves upwards to the right (to the north east) as wage falls. The household on the other hand reduces its expenditure on goods and increases its consumption of leisure as wages fall. Point H and the rest of the household's wedge moves down and to the left after a reduction in the wage rate.

We now introduce the government sector. We assume that the government buys labour to produce a non-market commodity. Employment by the government, therefore, has the effect of shifting the household's wedge to the left by an amount equal to government employment. This assumes a uniform wage rate in the economy.

An increase in the purchase of goods from firms increases the total demand for goods in the economy. Everything else remaining constant, the demand for goods increases with no change in the supply of labour. In our wedge diagrams, this is indicated by a vertical shift in the household's wedge by an amount equal to the increase in government expenditure.

In a model that includes taxation, a tax cut to households will lead to higher disposable incomes. The additional disposable income will be spent for additional consumption and money balances after a trade off with additional leisure. The household's wedge will therefore shift upwards and to the left (to the north west) after a tax cut to households. A tax cut of the same magnitude as an

increase in government expenditure will lead to a smaller increase in the (total) demand for goods due to the trade off of additional consumption with money balances and leisure. This point is analogous to the analysis of the balanced budget multiplier.

The Keynesian unemployment problem as shown in figure 3.5 (b) cannot therefore be solved by reductions in the wage rate. The remedy is that set of policies which lead to a smaller deviation and to the eventual coincidence of points F and H, as in the case of Walrasian equilibrium. A reduction in the wage rate will move the firm's wedge to the north east while the household's wedge moves to the south east, leading to a greater divergence between F and H. The effective position of the economy might very well remain at K, with no change in output or employment.

An increase in government expenditure on the other hand leads to a reduction in the deviation between F and H as the household's wedge rises. The effective position of the economy will be higher up the LD(Y) curve with more goods and employment. A tax cut to households will move the household's

wedge to the north east allowing a closer matching of F and H, with effectively higher levels of employment and consumption.

The government could also increase its own employment at the going wage rate. If the government therefore took as much labour as it wanted from what households supply in the labour market, the firm will be faced with the residual amount of labour. Thus, to the firm, the household's wedge has moved to the left by an amount equal to the increase in employment by the government. Moving the household's wedge to the left pushes the economy to a final point of more goods being traded and a greater amount of labour employed by the firm. The total employment in the economy is the sum of the employment by the government and the firm.

Thus, increases in government expenditures, an increase in employment by the government or a tax cut to the household are all feasible solutions for Keynesian unemployment. All these policies give rise to higher level of effective employment and goods traded within the economy.

In the case of classical unemployment, figure 3.5 (c), a reduction in the wage rate will shift the firm's wedge to the south west. This brings F and H together and gives rise to higher effective levels of goods and employment. Increases in government expenditure, government employment or tax cuts to the household will have no effect on the effective position of the economy since their effect is felt by shifts in the household's wedge. Excessive use of such policies could produce large shifts in the household's wedge and push the economy to a different regime. Thus, classical unemployment would be solved by reductions in the wage rate, while increases in government expenditure, employment or additional tax cuts to the household do not alter the effective position of the economy.

Similar analysis can be done for the cases of underconsumption and repressed inflation, shown in figure 3.5 (e) and (d).

What if the price does change? What are the effects of a change in the price level on the firm and the household? A rise in the price will make the firm want to supply more goods into the goods market

and purchase more labour. Thus, the firm's wedge will shift to the north east after a rise in the price level. Assuming away the case of Giffen goods, the household will reduce its demand for goods and increase its consumption of leisure and therefore supply less labour into the labour market. This has the effect of shifting the household's wedge to the south west to a final position with less goods and less labour than before the price rise.

It is interesting to note that, while assuming this behaviour of the household, an increase in the price level is not a suitable solution to a Keynesian unemployment problem. The final position of the economy cannot be unambiguously determined. However, in the case of classical unemployment a price rise will push the economy to a position of higher levels of goods and employment. Nevertheless, the magnitude of the increase in employment depends on the nature of the trade-off within the firm's utility function.

3.5 Analysis of the Model: Active Money Market

3.5.1 Interest Rate

We now introduce an active money market by considering the effects of a change in the interest rate. A decrease in the rate of interest will lower the household's payment on debt (increase the household's disposable funds) allowing for more present consumption, more money balances, more leisure and less borrowings. This can be termed as the "income effect". Along with this, lowering the interest rate reduces the marginal "disutility" that the household derives from the borrowings. This is because, as was mentioned in section 3.2, current borrowings are claims on future consumption. A constant amount of borrowing after a reduction in the interest rate implies a smaller claim on future consumption and thus a lower marginal "disutility" on the borrowing. To return to the original marginal utility level the household would have to increase its present borrowings. However, the increase in the consumption of goods, the holding of more money balances and the increase in the consumption of leisure that this increase in funds supports, lowers the marginal utilities of each of these. This effect, the "price effect", would therefore lead the household to a position of more borrowings, more goods, more

money balances and a higher consumption of leisure. Summing these two effects will therefore lead us to a final position with more goods, more money balances and a higher consumption of leisure. The net effect on borrowing after the decrease in the interest rate is ambiguous. This depends on the relative magnitudes of the two effects. In the case of the household having low levels of debt we can assume that the "income effect" on borrowing due to a decrease in the interest rate is insignificant when compared to the "price effect". Thus, borrowings are inversely related to the interest rate. Conversely, negative borrowings (savings) would be positively related to the rate of interest. If the household's debt is large we could assume the "income effect" would be significant and could even have a larger magnitude than the "price effect". For our analysis we assume only the low debt situation and thus borrowings are negatively related to the interest rate.

Firms will also find it attractive to increase their borrowing after a decrease in the interest rate.

The firm's current borrowings have a smaller marginal "disutility" after the decrease in the interest rate. Thus, this suggests that the firm will increase its borrowings, increase its profits, money balances and inventory with no change in employment, and thus reducing its supply of goods. Along with this is the "income effect" on borrowing due to the decrease in the firm's payments to cover its debt. In an analogous way as that of the household we will assume that the firm's debt level is such that the "price effect" on borrowing is larger than the "income effect". The final position is therefore one of more borrowings, more profits, money balances, inventory and a lower supply of goods.

It is interesting to note the effect of a reduction of the rate of interest when the ruling regime is one of Keynesian unemployment.

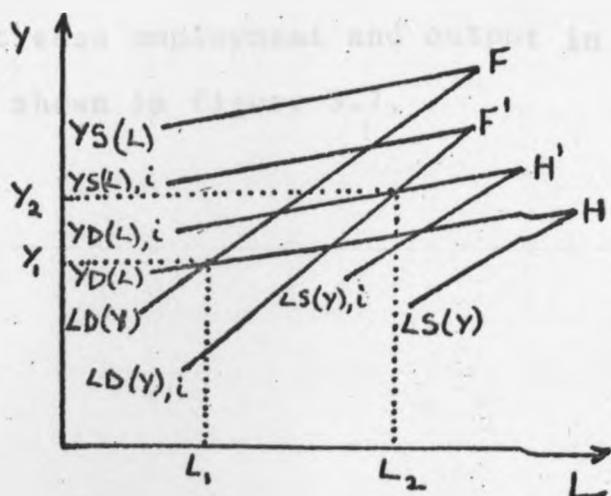


Fig. 3.6 Keynesian unemployment and a reduction in the rate of interest.

As shown in figure 3.6 a reduction in the rate of interest would move the wedges F and H to the new position F' and H'. The final position of the economy could very well correspond to a higher level of goods and labour, Y_2 and L_2 , than the initial position. Reductions in the interest rate would therefore be a feasible solution for Keynesian unemployment, if interest rates were changeable.

3.5.2 Quantity Constraints in the Money Market

As was explained, firms and households adjust their behaviour in the light of a constraint on the level of their respective borrowings. Borrowings could be rationed to either firms, households or both. Rationing of such borrowings improve the position of the economy only if it is in a repressed inflation regime. Rationing of a suitable amount of borrowing to the household, the firm or both will increase employment and output in the economy. This is shown in figure 3.7.

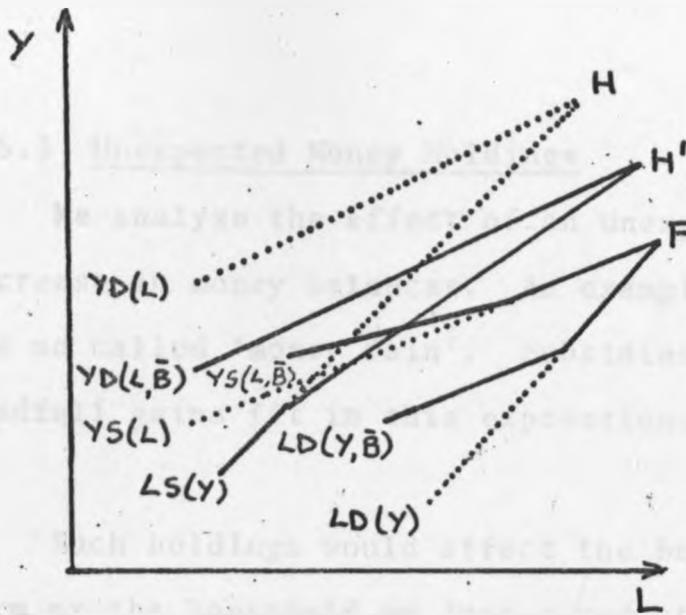


Fig. 3.7 Rationing of borrowings in the case of repressed inflation.

Rationing of less borrowings to the household will move the household's wedge even closer to the firm's wedge allowing for more output and employment in the economy.

Rationing of less borrowings to the firm than its notional demand would appear to be a solution of the classical unemployment in figure 3.5 (c). The final position of F will be closer to H after the constraint on borrowings by the firm, allowing the economy more output and employment .

3.5.3 Unexpected Money Holdings

We analyse the effect of an unexpected (windfall) increase in money balances. An example of such is the so called 'money rain'. Subsidies and other windfall gains fit in this expression.

Such holdings would affect the behaviour of the firm or the household as does a reduction in the interest rate. Thus, the firm will find itself with more money balances than it would have wanted to have, and after a trade off with profits and inventories the final position would have more money balances, inventories and profits but less borrowings, with no change in employment and production. The household will also trade off the additional money balances for consumption and leisure. This will move its wedge to the north west, to a position of more goods and money balances but a less supply of labour and less borrowings.

On the other hand, a lump sum tax will have the reverse effect of a subsidy. Continuing with the assumption set previously, this will move the firm's wedge to the west while the household's moves to the south east.

3.6 Summary

In this chapter we have derived a disequilibrium model that considers the behaviour of agents in the goods, labour and money markets. We have also discussed, albeit not exhaustively, the mechanics and some of the predictions of the model. The rest of the paper investigates the disequilibrium phenomenon in the Kenyan economy.

Footnotes

1. Muellbauer and Portes (25) and (26)
2. In the sense of Benassy (4), p.21.
3. For a good summary of the controversy and alternative theories, see Koutsoyiannis, A. Modern Microeconomics Macmillan, London, 1975, ch.11-18.
4. See Ott, et.al, (30), p. 131-132.
5. See the appendix to this chapter for an example.

APPENDIX TO CHAPTER THREE

In this appendix we illustrate by a simple example the decisions that the representative firm makes as regards the levels of inventories, money balances, profits, production and sales.

We assume the firm's production function to be $X_t = 2L_t$ and initially, $t = 0$, the firm holds 5 units of inventory and 4 monetary units as money balances. We assume the wage rate is 1 monetary unit per unit of labour and the price of the output is unity.

In the first period, $t = 1$, the firm could decide to produce anything from nothing to 8 units of output. The wage bill for employing 4 units of labour exhausts current money holdings. The firm decides on the levels of inventories i_t , profits π_t and money balances M_t depending on the utility function and therefore, implicitly, makes a decision on the actual production level X_t and sales level Y_t . The firm could therefore decide to produce 8 units, hold 6 units as inventory, sell 7 units and distribute the proceeding revenue between profits and money balances at levels of 2 and 5 monetary units respectively.

In the second period, $t = 2$, in the light of the firm's utility function the decision could be to produce 10 units, hold 7 units as inventory, sell 9 units and distribute the proceeds between profits and money balances at levels of, say, 3 and 6 monetary units respectively. The trade-off between profits, money balances and inventories are expressed in the form of the utility function.

This could be summarised in the following table.

Period	π_t	M_t	i_t	X_t	Y_t
$t = 0$		4	5		
1	2	5	6	8	7
2	3	6	7	10	9

CHAPTER FOUR

DISEQUILIBRIUM IN THE KENYAN ECONOMY

4.1 Introduction

In this chapter, we discuss equilibrium and disequilibrium as they exist in the Kenyan economy. In the light of the preceding discussion we attempt to establish or deny the existence of disequilibrium in the money market while making a broad overview of the labour and goods markets. Each market will be studied separately and the criteria for establishing disequilibrium will be discussed. We abstract from the aggregation problems that might result in the generalisation to a macro-aggregate level¹. We also assume the inflexibility of prices (wages in the labour market, the price of goods in the goods market and the interest rate in the money market).

4.2 The Labour Market

Following the discussion in chapter Two, the expectations of one set of agents, purchase plan in the case of buyers or supply plan in the case of sellers, remains unfulfilled when the market is in disequilibrium. This will imply the rationing of this set of agents who are on the "long side" of the

market via some non-price mechanism. Market disequilibrium will therefore be accompanied by non-price rationing schemes and the existence of frustrated agents, those on the "long side" of the market.

If households are on the long side of the labour market, disequilibrium will be accompanied by prospective workers openly seeking employment together with discriminatory employment practices. Thus, at an aggregate level the establishment of the existence of unemployment implies the existence of disequilibrium in the labour market.

The extent and urgency of the unemployment problem in Kenya is demonstrated by the number of studies that have so far been done. Ghai and Godfrey in 1979 asserted that "unemployment continues to be one of the most important social, political and economic problem in Kenya"². Earlier, in 1972 the ILO report had noted that Kenya's growth "has been notably strong in agriculture, particularly in the small-scale sector, as well as in industry and services. Yet unemployment and gross inequality continue and in some respects may even have increased"³.

While recognising the existence of unemployment in Kenya⁴, the government has conducted several studies the latest of which was the 1983 Presidential Commission on Unemployment that gave rise to the Wanjigi Report⁵. Indeed, despite an overall Gross Domestic Product growth rate of 5.6% in 1976-81, unemployment as a fraction of the labour force has risen from 7.1% in 1976 to 10.5% in 1981⁶. This is despite the employment and wage policies that have been pursued in the economy⁷. Thus, the employment of Kenya's labour force continues to be one of the goals of the current Development Plan⁸.

The evidence cited above establishes the existence of persistent unemployment in the Kenyan economy. This is aggravated by the disguised unemployment or underemployment of some workers in the economy⁹. This implies that the Kenyan labour market is characterised by persistent disequilibrium with households on the long side of the market. This conclusion is valid even after considerations of the segmented nature of the labour market in Kenya, with acute shortages of some categories of manpower.

4.3 The Goods Market

Disequilibrium in the goods market would imply the frustration of one set of agents and their subsequent rationing using non-price mechanisms. If supplying agents (firms) were on the long side it would then be difficult to identify directly their frustration. Nevertheless we could expect to observe unplanned inventories, price cutting wars and non-price rationing mechanisms such as the establishment of quotas, the proliferation of supplying contracts and the effort to offer appreciably better terms to the buyers, e.g. forward credit, etc.

If on the other hand the buyers in the goods market were rationed, we would expect the use of such mechanisms as queuing, formal rationing, waiting lists, purchase by quota, etc. The frustration of buyers even though conceptually easier to grasp than that of sellers, would still be difficult to identify directly.

None of these features can be said to characterise the Kenyan goods market as a constant phenomenon. It is true, however, that there is a certain amount of supplying by contracts, competition for better terms to buyers, and even in some cases queuing by buyers, but nevertheless it is difficult to apply any of these characteristics at an aggregate level; at least not in the manner Podkaminer¹⁰ suggests of the Polish economy or Howard (19) of the Russian economy or, in the extreme, a wartime situation.

We can therefore assert that despite the price control on some goods¹¹, the Kenyan goods market is not characterised by a persistent state of disequilibrium. No attempt is made to validate this hypothesis further.

4.4 The Money Market

4.4.1 Preliminary Remarks

The frustration of the demanding agents in the money market would be via various non-price credit rationing schemes such as binding restrictions on the amount of credit, acute discrimination by type of borrower, etc.

Even though initial suppositions can be made about the existence of such phenomena in the Kenyan economy it would be difficult to conclusively argue their existence and their efficacy from such a standpoint. This is the case even after considering the control that the government maintains on the rate of interest.

If on the other hand supplying agents were rationed their frustration and subsequent rationing would be even more difficult to establish.

The solution seems to be the identification of a variable that captures the forces in the market and can therefore be used as a dummy or proxy variable to establish the existence or absence of disequilibrium. We will hereby argue that the liquidity of commercial banks is such a variable and can therefore be used in subsequent analysis. A brief history and description of the money market and monetary control in Kenya is therefore in order.

4.4.2. The Kenyan Money Market: Colonial Period
Through 1966

The monetary authority during the colonial period was the East African Currency Board. This was established in 1919 and operated for the three East African colonies jointly under three main rules. The East African shilling (domestic currency) was freely exchangeable for sterling at a fixed rate (stg.£1 = E.A.Shs.20), the Currency Board had to hold reserves of sterling assets of at least 100% of the value of its domestic liabilities and finally the government had little or no control of the management of the currency¹². As a result the Board had little control on the level of its liabilities or the lending behaviour of the commercial banks in the Kenyan economy¹³. The interest rates that the big three banks, accounting for 80% of all banking services in Kenya,

charged for advances and paid on deposits in Kenya were directly related to, and determined by, interest rates in London; the amount of lending which they undertook in Kenya was governed by the number of safe lending opportunities which they perceived locally; given this level of interest rates; and their local deposits depended upon what Kenyan residents chose to hold. 14

The currency board could not hold Kenya government securities in its reserves fund up until December 1955, following which strict limits were placed on the value of such securities in the reserve fund¹⁵. Thus augmentation of the supply of money by government borrowing was restricted to what it could borrow from the London market at acceptable rates.

As Newlyn (28) and Selsjord (34) have argued, due to the extreme ease of moving funds between the three East African economies, commercial banks could maintain their liquidity at the level that they wanted.

As political independence drew nearer, the Currency Board began to increase its influence on the behaviour of the commercial banks. The Board aimed at creating a "local market for the Treasury Bills and other short term securities of the East African governments, and also for some private short term securities".¹⁶ The Board was able to stimulate demand for such assets by making them slightly more profitable than similar assets in London. The Kenya government was, however, reluctant to issue short term securities, so as to hold about Kshs.100 million of its borrowing entitlement in the Currency

Board in view of a long term debt of the same value due to be repaid in 1965.¹⁷

The Board had also got the power to extend credit to commercial banks. Such credit did not rise substantially since the government encouraged commercial banks to borrow from external markets. Concurrently, by 1960 commercial banks in Kenya began to regulate their local lending in accordance with their local domestic liabilities. Due to the reduction in deposits by uncertain depositors in the early 1960's, liquidity ratios "were generally much lower than the banks would have liked; and the result was that fairly severe credit rationing was maintained throughout these years".¹⁸

In May, 1962 the Currency Board took the functions of a clearing agent by inviting commercial banks to open clearing accounts with it.¹⁹

4.4.3 The Kenyan Money Market: With the Central Bank

Following the disintegration of the East African Monetary Union, the Central Bank of Kenya was established by the Central Bank of Kenya Act of 24th March 1966. The Bank was set up mainly

to regulate the issue of notes and coins, to assist in the development and maintenance of a sound monetary, credit, and banking system in Kenya conducive to the orderly and balanced economic development of the country and the external stability of the currency and to serve as a banker and a financial adviser to the government.²⁰

In the pursuit of these goals an upper limit of Kshs.240 million was set for total government borrowing from the Bank. This was amended in 1972 to a maximum of 25% of the gross recurrent revenue.²¹

It was also laid down that the Bank maintains a "reserve of external assets at an aggregate amount of not less than the value of four months' imports as recorded and averaged for the last three preceding years."²²

The Bank concentrated in the issue of national currency during its first years, with minimal changes in the existing monetary policies. Commercial banks on the other hand were carrying excess liquidity with modest growth in credit to the private sector,

but less than what the Central Bank would have liked to have seen²³.

From 1966 to the end of 1969 three events are worth mentioning. The first is the "sterling crisis" following the devaluation of the pound sterling on 18th November, 1967. Due to the business community's expectation of a subsequent devaluation of the shilling there was an upsurge of foreign payments financed by advances and withdrawals of deposits from commercial banks. The liquidity of banks was thus diminished in early 1968 and the "foreign assets of the monetary system fell sharply below the Central Bank's minimum target".²⁴ However, the situation normalised without any action from the Bank as expectations of a devaluation disappeared and the diminishing bank liquidity took effect.

The second event was the introduction of government Treasury bills as an instrument for short term borrowing. These were first issued on 21st March, 1969 and were heavily over-subscribed²⁵ as a result of the high liquidity in the system.

The third event was on 1st December, 1969 when under the Banking Act the Central Bank required

banks to maintain a minimum liquid asset (defined as notes and coins, balances at the Central Bank, net inter-bank balances at the and Treasury bills) to a deposit ratio of 12½ per cent. This move was taken at a time when banks were fairly liquid and the intention was to equip the Central Bank with a credit instrument for use in case of need. ²⁶

This minimum liquidity ratio was very low indeed when compared to the actual ratio in the whole banking system of about 40%. ²⁷

1970 saw the introduction of Keynesian ideas into the Treasury leading to a sudden leap in the budget deficit and government borrowing from the monetary system. ²⁸ Along with this, in mid 1970 the Bank stopped payment of interest on its deposits by banks. This led to a larger increase in credit by banks to the private sector. ²⁹

However, by April 1971 instability in the monetary system began to show through rising prices, rapidly falling foreign reserves and excessive expansion in bank credit along with a steep fall in the liquidity of banks. ³⁰ The Bank responded

to this in July 1971 by selective restriction on credit by banks especially for the importation of consumer luxury goods. Due to the ineffectiveness of these measures, on November 1971 the Central Bank required all banks to deposit with it minimum cash balances equivalent to 5% of their deposit liabilities as special deposits, over and above the existing minimum liquidity ratio of 12½%. This had the effect of raising the minimum liquidity ratio to 17½%.³¹

This, in effect, was a binding constraint on most banks. However, due to its undesirable effects on specific target groups such as small borrowers, special deposits were abolished but, together with direct import restrictions, commercial banks were asked to limit the expansion of their loans. These policies did not produce the desired effects since excessive credit expansion continued along with the decline in foreign reserves so much so that on 1st October, 1972 the Bank "in an effort to reduce bank's liquidity and contract credit, raised the prescribed minimum liquid asset ratio from 12½ to 15 per cent."³²

This effectively cut down credit expansion and improved bank's liquidity upto mid-1973 when, in view of the improved balance of payment position, import and credit restrictions were relaxed.³³ The economy therefore began the 1973/74 financial year with private sector advances growing strongly and a rising demand for goods and services.³⁴

Very soon, however, increased oil prices quickly worsened the balance of payments position and eroded the reserves; the Central Bank once again went for restrictive credit policies, instructing banks to keep to a 12% annual rate of credit expansion. The 15% minimum liquidity ratio was extended to non-bank financial institutions and the interest rates were revised upwards.

These restrictions remained in force while the balance of payments problems persisted, through 1975/76. Along with these, government borrowing increased,³⁵ the minimum liquidity ratio was raised to 18%³⁶ and the shilling was devalued in October 1975. The minimum liquidity ratio was raised partly so that the government could raise funds. Inflation remained a constant threat.

The 1976/77 year was characterised by an improvement in the balance of payments position as the coffee and tea prices rose. Banks' liquidity rose sharply reaching a peak of 37% in the 3rd quarter, with most liquid assets held as Treasury Bills and balances at the Central Bank.³⁷ Credit expansion continued through 1977. The minimum liquidity ratio was raised to 20% as from 1st January, 1978.

1978 started with falling coffee and tea prices, undermining the economy's balance of payment position. This, together with the on-going credit expansion eroded the excess liquidity in banks and by mid-1978 the overall liquidity ratio was at 22%.³⁸

The period after mid-1978 was characterised by tight liquidity and therefore moderate increases in credit. However, the government's need for credit in 1978/79 led to the introduction of a cash ratio of 4% in June 1978 (apart from the 20% minimum liquidity ratio that was in force) and the subsequent adjustment of the minimum liquidity and cash ratios to 18% and 3% respectively in July 1978.³⁹ The liquidity ratio was further lowered to 16% in mid-1979.⁴⁰

Interest rates were adjusted upwards on two occasions and the minimum liquidity lowered to 15% in March 1981 and the cash ratio was abolished in April 1981.⁴¹ However, heavy government deficit financing and a poor balance of payments position had become chronic features of the system. Continued government borrowing supplied liquid assets and thus supported credit expansion.

Restrictions on the growth in private sector credit, imports and government borrowing, together with two devaluations in 1981⁴² characterised the 1981-1983 period.

Following the foregoing discussion banks' liquidity ratio seems to be a reliable indicator of the status of the money market. Indeed, the Central Bank views this ratio as an important indicator and, as was seen, tries to affect it via legislation on minimum liquidity ratios.

Commercial banks on the other hand want to hold some level of liquid assets. Banks chose their optimal combination of asset holdings from a range of assets with different risk level and returns.

In the pursuit of their profit goals banks would like to hold assets with high returns but this has to be traded off with the risk involved. To shield themselves against risks banks will therefore hold diverse assets with different levels of risks and returns. Liquid assets are some of such assets with specific risk levels and returns.

Along with this, banks need to hold a certain minimum level of liquid assets to enable them to pay depositors on demand. Bearing in mind that liquid assets have relatively low returns (cash has no return but Treasury bills have some return), banks would not want to hold an unnecessarily large level of liquid assets by rather only that level that enables them to pay depositors. This will be a fraction of their deposit liabilities since only a fraction of their depositors demand payment at any one time. Even though Treasury bills cannot be used for settling payments they are nearly as liquid as cash since they can be rediscounted at the Central Bank upon demand. Thus, even in the absence of minimum liquidity legislation commercial banks would hold some amount of liquid assets upon which they would extend credit to borrowers. A high liquidity ratio

would make banks want to expand their credit while a low liquidity ratio, in tune with what the banks view as an optimum level, would make banks resist further credit expansion.

4.5 Summary and Conclusions

We have argued that the Kenyan labour market is characterised by persistent disequilibrium. The households' labour sales plan is not fulfilled in the labour market and they are consequently rationed. The goods market on the other hand does not seem to be characterised by persistent disequilibrium and can be assumed to be at, or close to, some equilibrium.

We hypothesise the existence of disequilibrium in the money market. To test this we could use the commercial banks' liquidity ratio for, as has been argued, it is a reliable indicator of the state of the money market. An exploration of the manner in which this hypothesis could be tested is contained in the appendix.

The Kenyan economy, therefore, seems to demonstrate characteristics that could be better studied within the framework of a disequilibrium model. Such phenomena as credit rationing, "crowding out" of the private sector, the effects of the rigid structure of interest rates, etc, have all been receiving increasing attention in the Kenyan economy. Disequilibrium models promise better analysis of such phenomena. The model derived in chapter Three is but an effort in this line. As was explained, our model improves on the earlier studies in allowing simultaneous disequilibrium in two markets, one of which could be the money market, the inclusion of money balances in the household's utility function, and the inclusion of inventories and money balances in the firms's utility function.

Footnotes

1. See, for instance, Green, H. A. J. "Aggregation Problems in Macroeconomics", in Harcourt (18), pp.179-204.
2. Ghai, D. and Godfrey, M. "Introduction", p.1 in D. Ghai and M. Godfrey, eds, Essays on Employment in Kenya, Kenya Literature Bureau, Nairobi, 1979.
3. International Labour Office, Employment, Incomes and Equality; A strategy for Increasing Productive Employment in Kenya, ILO, Geneva, 1972.
4. See, for instance, Republic of Kenya, Development Plan 1966-70, Government Printer, Nairobi, pp.26-27; Development Plan 1970-74, Government Printer, Nairobi, p.103; Development Plan 1974-78, Part I, Government Printer, Nairobi, p.89; Development Plan 1979-83, Part I, Government Printer, Nairobi, p.35.
5. Wanjigi, M. (Chairman) Report of the Presidential Committee on Unemployment 1982/83, Government Printer, Nairobi, 1983.
6. Republic of Kenya, Development Plan 1984-88, Government Printer, Nairobi, 1983, p.7.
7. For a good record of this see Vandemoortele, J. "The Wage Policy in Kenya: Past Present and Future" Consultancy Report No.12, Institute for Development Studies, University of Nairobi, Nairobi, June 1984.
8. Development Plan 1984-88, pp. 143-148 .
9. See, for instance, Development Plan 1970-74, p.103; Development Plan 1979-83, Part I, p.35 .

10. Podkaminer, L. "Estimates of The Disequilibrium in Poland's Consumer Markets, 1965-78" Review of Economics and Statistics, August 1982, Vol.LXIV, No.3, pp.423-431.
11. See, for instance, Mukui, J. T. ed. "Price and Marketing Controls in Kenya" Occasional Paper No.32, Institute for Development Studies, University of Nairobi, Nairobi, March, 1979.
12. King (21), p.46. Indeed most of the material in this and the following section is drawn from King and the Annual Reports of the Central Bank of Kenya.
13. King (21), p.57.
14. ibid., pp.57-58.
15. ibid., p.58.
16. ibid., p.59
17. ibid., p.62
18. ibid., p.59
19. Ngola (29), p.21.
20. Central Bank of Kenya, Annual Report, 1967, Nairobi, 1967, p.5.
21. Ngola (), p.75.
22. Republic of Kenya, Laws of Kenya. The Central Bank of Kenya Act, Chapter 491, Government Printer, 1967, Nairobi, sec 26.

23. Central Bank of Kenya, The First Ten Years, Nairobi, 1976, p.15.
24. King (24), p.64.
25. The First Ten Years, p.27.
26. ibid., p.15
27. Annual Report, 1970, p.14.
28. King. (21), pp.65-66, and Grubel and Ryan (15), p.11.
29. The First Ten Years, p.15.
30. ibid., p.15
31. Ibid., p.15 and King (21), p.66.
32. The First Ten Years, p.15.
33. Annual Report, 1973, p.11, Annual Report, 1974, p.8, The First Ten Years, p.16.
34. Annual Report, 1974, p.9.
35. Annual Report, 1976, pp.9 and 15.
36. ibid., p.15.
37. Annual Report, 1977, p.15.
38. Annual Report, 1978, p.15.

39. Annual Report, 1979, p.18 .

40. Annual Report, 1980, p.19.

41. Annual Report, 1981, p.18.

42. Annual Report, 1982, p.18.

APPENDIX

In this appendix we discuss the data that could be used in the estimation of such a disequilibrium model in the Kenyan money market. We discuss the functions that could be estimated and the data that could be used. Finally, a simple estimation is then carried out.

An Estimable Model

Following the discussion in the preceding chapters, we can continue to assume that all prices: the price level, the wage rate and the interest rate, are fixed exogenously. To estimate such a model we need to consider time periods that are short enough to allow prices to be considered as fixed within that period. For this reason estimations on annual data are rejected in favour of weekly or monthly data. In Kenya, however, few data are available on a weekly basis and, in view of this, estimations can be done only on monthly data.

From chapter Three the demand functions for borrowings (credit) by the firm and the representative household, given the constraint on labour experienced by the household are:

$$B_t^f = B(P_t, W_t, M_{t-1}^f, i_{t-1}, r_t \beta_t^f)$$

$$B_t^h = B(P_t, W_t, \bar{L}_t, \pi_t^h + M_{t-1}^h - r_t \beta_t^h).$$

Assuming away other problems, it still would not be possible to estimate these functions due to the unavailability of monthly data on such variables as disaggregated money holdings by firms and households. A more aggregated function therefore needs to be derived from these functions, which can be written as

$$B_t = B(P_t, W_t, \bar{L}_t, M_{t-1}^h, \pi_t^h, i_{t-1}, r_t \beta_t^h).$$

where B_t is borrowing by both firms and household, M_{t-1}^h are the money balances held by firms and households, β_t is the total debt of firms and households and the other variables are as previously defined. This, however, raises the problem of determining expectations on the signs of the coefficients of the explanatory variables. This arises since neither the signs of the coefficients in the disaggregated functions nor the relative importance of the borrowings by the firms and the households has been considered in writing out the aggregated function.

A supply function can be considered by relating borrowings (credit) to the value of banks' liquid assets, the rate of interest and the deposits with banks.

Following the discussion in chapter Four the liquidity ratio of commercial banks can be used as an indicator of the state of the money market. We assume that over the range of values within which the liquidity ratio fluctuates there exist both supply function and demand function observations. Following the argument in section 4.4 we can infer that "high" liquidity ratios correspond to observations on the demand for credit function and "low" liquidity ratios correspond to the supply of credit function. Thus, given a "critical" liquidity ratio, we can sort the observations into supply function and demand function observations. Following Ryan and Savosnick (32), the critical liquidity ratio can be assumed to be 23%. Liquidity ratio observations that are lower than 24% can therefore be considered as supply function observations. On the other hand liquidity ratios equal to, or higher than, 24% can therefore be considered as supply function observations. On the other hand liquidity ratios equal to, or higher than, 24% indicate that the money market is operating on the demand side.

Data

The Consumer Price Index can be used as a measure of the price level P_t . Consumer Price Indices are available on a monthly basis as opposed to the Gross Domestic Product deflator available annually. One of the three indices, say the Middle Income Consumer Price Index, could be chosen and obtained from the Central Bank of Kenya Annual Reports and Financial and Economic Reviews. These indices have to be chained over the various base periods that have been used.

Data on modern employment and earnings can be obtained on an annual basis from the Statistical Abstracts or Economic Surveys. These can be assumed to vary systematically with unobserved employment and earnings and so to be good proxies for the total employment and earnings in the whole economy. The average monthly wage rate can be calculated and used for the monthly observations in the corresponding year. Similarly the annual employment figure can be used for all the monthly observations.

The Central Bank published data on the supply of money in its Annual Reports and the Financial and Economic Reviews. For the period before 1975 the data are disaggregated into currency outside banks, private demand deposits, and other deposits. The sum of currency outside banks and private demand deposits can be obtained and used as the statistic on money holding by firms and households. The data for the period after 1974 is not disaggregated in this manner; rather it gives the total demand deposits, from which we need to subtract the government's money holding. It is possible to get figures for both series (currency outside banks plus private demand deposits, and total money supply) for December 1974. By subtracting the first figure from the second we can get an estimate of the government's demand deposits as at the end of December 1974. onto this base we could add the monthly changes in the Pay Master General's account. Quarterly figures are given in the Government Accounts Tables in the Financial and Economic Reviews. To get monthly changes the quarterly figures can be divided by three. Adding up the monthly changes, so derived, to the base figure we are able to get estimates of the government's money holding at the end of each month. This is subtracted from the total money supply to give the money holding by firms and households as

at the end of each month for the period after 1974: This data series consistently disregards the government's holding of currency.

Data on profits to households are unavailable. However, the amount of "Other Operating Surplus" in the economy could be used as a proxy for this. The operating surplus is broader than profits since it includes depreciation, furthermore a part of it goes to other than households. The value of the operating surplus is obtained from the national accounts as published annually in the Statistical Abstracts. The yearly figure can be used for the monthly observations in that year.

Data on changes in stocks are available from the national accounts in the Statistical Abstracts. To convert these to actual inventory levels, as opposed to changes, the annual changes are added up to yield changes in inventory from some base year; or actual inventory less the inventory at the base year. This annual statistic can be used as the figure for the inventory at the end of the months in that year even though it consistently undertakes it.

The Treasury Bill rate can be used as a proxy for the interest rate. As has been argued by Savosnick and Ryan¹, the Treasury Bill rate is a good proxy for "the" interest rate. The monthly rate can be taken to be the average of the rates for the Treasury Bills offered during the month, as shown in the Central Bank's Annual Reports and Financial and Economic Reviews.

Data on total loans and advances by commercial banks are available in the Central Bank's Annual Reports and Financial and Economic Reviews as at the end of each month. Thus, by subtracting loans and advances to the government, available in the same table, we can get the total borrowings as at the end of last month. Also, subtracting the total borrowings at the end of last month from the total borrowings at the end of this month yields the actual borrowings by firms and households this month. This, however, ignores lending by non-bank financial intermediaries and hire purchase firms.

Data on commercial bank's holding of liquid assets and deposits are obtainable from the Central Bank's Annual Reports and Financial and Economic Reviews.

These data needs to be lagged before estimations are made. First, to get the total debt of firms and households in each period, total borrowings are lagged by one period (one month). Money holdings are also lagged so that the observations correspond to money holdings as at the end of the previous period. Since wages and salaries are paid at the end of the month, and therefore available for use over the next month, the wage rate should be lagged by one period and along with it, the employment. Together with this, the actual liquidity ratios can be calculated.

Estimation

A simple estimation was done on borrowings and the interest rate. Both data series were obtained for January, 1971 through December, 1983 as was explained above. These observations were numbered sequentially from 1 to 156. A few adjustments were then made on the data. Firstly five observations were deleted

from the data set owing to the suspicious data entries in some of the variables. This led us to doubt the validity of these entries. The observations that were deleted corresponded to the original data observation numbers 2, 13, 118, 119 and 133. Next, some observations were moved from the curves they were on, with regard to the liquidity ratio, to the other. This was done because they were either high liquidity observations within a stream of low liquidity observations or vice versa. These differences in the liquidity ratios could be attributed to odd movements of liquid assets at the end of the month, e.g. a delayed payroll, and therefore the observations in question are not strictly on the curves that the liquidity ratio implied. The shifted observations corresponded to the original data observations 28, 48, 66, 73, 99, 103, 128, 143 and 152.

The estimation was performed on the following function

$$B_t = \alpha_0 + \alpha_1 D + a_0 r + a_1 r D$$

where $D = 0$ for the demand curve observations and

$D = 1$ for the supply curve observations.

The coefficient on D is therefore the shift in the intercept from the demand curve to the supply curve. The coefficient on r gives the estimate of the slope of the "demand" curve and the sum of the coefficients on rD and r gives the slope of the "supply" curve. The intercept of the demand curve is the constant α_0 and adding this to the coefficient of D gives the intercept of the supply curve.

The results are given below.

	COEFF. \	t
r	-3.3222	-0.463
D	-57.7754	-1.331
rD	6.1923	0.766
CONSTANT	123.5570	
S.E.E.	143.101	
R^2	0.013	

Both coefficients on D and rD are of acceptable magnitudes. The problem, however, is the low statistical significance of these estimates as shown by the t statistics. However, these estimates, in a way, point to the existence of disequilibrium in the money market even though they don't prove it conclusively due to the statistical insignificance of the coefficients.

Conclusion

We conclude that there is reason to believe in the existence of disequilibrium in the Kenyan money market even though we have not proved its existence conclusively. Future work in these lines needs to straighten out the deficiencies in our data and consider the "correct" specification of the functional form of the model.

Footnote

1. Savosnick and Ryan (33), Appendix 2, p.10.

BIBLIOGRAPHY

1. Barro, R. J. and Grossman, H. I. "A General Disequilibrium Model of Incomes and Employment", American Economic Review, Vol.51, 1971, pp. 62-93.
2. Benassy, J. P. "Neo-Keynesian Disequilibrium Theory in a Monetary Economy", Review of Economic Studies, Vol.42, 1975, pp.503-523.
3. _____, "The Disequilibrium Approach to Monopolistic Price Setting and General Monopolistic Equilibrium" Review of Economic Studies, Vol.43, 1976, pp.69-81
4. _____, The Economics of Market Disequilibrium, Academic Press, New York, 1982.
5. Bowden R. J. The Econometrics of Disequilibrium, North-Holland, Amsterdam, 1978.
6. Central Bank of Kenya, Annual Reports, Nairobi.
7. _____, The First Ten Years, Nairobi.
8. _____, Financial and Economic Review, Nairobi.
9. Clower, R. W. "The Keynesian Counter-Revolution: A Theoretical Appraisal", in F. H. Hahn and F. P. R. Brechling, eds., The Theory of Interest Rates, Macmillan, London, 1965.
10. _____, "A Reconsideration of the Microeconomic Disequilibrium Theory" Western Economic Journal, Vol.6, 1967, pp.1-9.

11. Drazen, A. "Recent Developments in Macroeconomic Disequilibrium Theory" Econometrica, Vol.48, 1980, pp.283-305.
12. Grandmont, J. M. and Laroque, G. "On Keynesian Temporary Equilibria" Review of Economic Studies, Vol.43, 1976, pp.53-67.
13. Green, H. A. J. "Aggregation Problems in Macroeconomics" in G. C. Harcourt, ed., The Microeconomic Foundations of Macroeconomics, Macmillan, London, 1977.
14. Grossman H. I. "Money, Interest and Prices in Market Disequilibrium" Journal of Political Economy, Vol. 79, 1971, pp.943-961.
15. Grubel, H. G. and Ryan, T. C. I. "A Monetary Model of Kenya's Balance of Payments" (Mimeo), University of Nairobi.
16. Hahn, F. H. "Keynesian Economics and General Equilibrium Theory: Reflections on Some Current Debates" in G. C. Harcourt, ed., The Microeconomic Foundations of Macroeconomics, Macmillan, London, 1977.
17. _____, "On Non-Walrasian Equilibria" Review of Economic Studies, Vol.45, 1978, pp.1-17.
18. Harcourt, G. C., ed., The Microeconomic Foundations of Macroeconomics, Macmillan, London, 1977.
19. Howard, D. H. "The Disequilibrium Model in a Controlled Economy: An Empirical Test of the Barro-Grossman Model" American Economic Review, Vol.66, No.5, Dec.1976, pp.871-879.

20. _____, "Rationing, Quantity Constraints, and Consumption Theory" Econometrica, Vol.45, No.2, March 1977, pp.399-412.
21. King, J. R. Stabilization Policy in an African Setting Kenya 1963-73, Heinemann, London, 1979.
22. Laffont, J. J. and Garcia, R. "Disequilibrium Econometrics for Business Loans" Econometrica, Vol. 45, 1977, pp.1187-1204.
23. Leijonhufvud, A. "Keynes and the Keynesians: A Suggested Interpretation" American Economic Review, Vol.57, No.2, May 1967, pp.401-410.
24. _____, On Keynesian Economics and the Economics of Keynes, Oxford University Press, London, 1968.
25. Muellbauer, J. and Portes, R. "Macroeconomic Models with Quantity Rationing" Economic Journal, Vol.88, 1978, pp.788-821.
26. _____, "Macroeconomics When Markets Do Not Clear" in W. H. Branson Macroeconomic Theory and Policy, Harper and Row, New York, 1979, Second Edition, ch.16.
27. Negishi, T. Microeconomic Foundations of Keynesian Macroeconomics, North-Holland, Amsterdam, 1979.
28. Newlyn, W. T. "Statistical Analysis of Integration in the East African Banking System" Economic and Statistical Review, East African Statistical Department, Nairobi, No.21, Dec. 1966, pp. viii-xii.
29. Ngola, S. M. Central Banking in East Africa, Unpublished Ph.D. dissertation, The University of New Mexico, August, 1979.

30. Ott, D., Ott, A. and Yoo, J., Macroeconomic Theory, McGraw Hill, Tokyo, 1975.
31. Patinkin, D. Money, Interest and Prices, Harper and Row, New York, 1965, 2nd Edition (1st edition, 1956).
32. Ryan, T. C. I. and Savosnick, K. "Notes on Macroeconomic Policy Model", (Mimeo), May, 1982. Appendix 1.
33. Savosnick, K. and Ryan, T. C. I. "Interest Rate Study", (mimeo), November, 1979.
34. Selsjord, M. "Recent Developments in Commercial Banking in East Africa: A Statistical Analysis" Economic and Statistical Review, East African Statistical Department, Nairobi, No.20, Sept. 1966, pp.viii-xxii.
35. Varian, H. "Non-Walrasian Equilibria" Econometrica, Vol.45, 1977, pp.573-590.
36. Weintraub, E. R. Microfoundations: The Compatibility of Microeconomics and Macroeconomics, Cambridge University Press, Cambridge, 1979.