THE EFFECT OF CREDIT CONTROLS ON THE ALLOCATION OF RESOURCES: THE CASE OF GREECE.

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DECLARATION

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ABSTRACT

This thesis examines the effects of selective credit controls on the real sector of the Economy in the case of Greece.

The analysis of the financial sector indicates that the main source of funds for investment and consumer expenditure has been the banking sector. Throughout the post 1950 period, the Greek monetary authorities attempted to regulate the outflow of these funds from the banking system through a structure of selective credit policies which were designed to increase the flow of funds towards activities promoting economic growth and to restrict the availability of credit towards sectors whose expansion was considered detrimental to capital growth and development.

The present study examines whether the restrictions on the availability of consumer credit in Greece in the 60s succeeded in reducing consumer demand during that period.

In this context, the study constructs a model of consumer demand where the financial flow enters the demand for expenditure equation and empirically estimates the demand for certain consumer durables in Greece between 1960 and 1980. The analysis examines the significance of consumer credit as an explanatory variable and tests for significant shifts in consumers expenditure function over periods between which there were changes in the pattern of consumer credit restrictions.

The evidence of this study suggests that although credit controls may - temporarily - affect economic activity, their use as long-term policy instruments is not recommended; In the long-run not only is their effectiveness diminished but distortions and spillovers between financial markets may occur which could produce undesirable effects in the real sector of the economy.

CHAPTER 1

INTRODUCTION

There is a collection of theories on economic development, which supports the hypothesis that conventional economic policy tools are unable to operate because of structural rigidities inherent in under-developed economic systems. These rigidities result in markets operating under conditions of disequilibrium, or where costing and pricing that is inefficient. This in turn makes it impossible for growth rates which might lead to a rise in income, wealth, capital formation and industrialisation. These theories also claim that the various structural problems are particular to each under-developed economy. This precludes a common remedy or policy for economic development. As a result, the one common recommendation which may apply is that a government or central authority should undertake the role of 'clearing' the various markets at prices and in quantities that are 'desirable' to attain long-term growth. One sector of the economy over which there has been great controversy about the desirability and role of government intervention is the financial sector.

Within this controversy there are two sets of directly opposing arguments. The first is the so-called 'institutional' view. According to this, the financial structure of markets in developing economies allows a exploitative landlord-tenant relationship to develop, in which borrowers' surplus is extracted through 'usurious' interest rates. One solution is for a government to replace the functions of the credit institutions that give rise to the problem.

The other set, deriving from the traditional neoclassical model, postulates that it is government intervention which creates problems within financial systems. If the operation of market forces were uninterrupted[1], the market would be able to allocate optimally funds among the different categories of borrowers.

Let us first describe the general macroeconomic framework that gives rise to such different arguments and policy recommendations. In many (non-centrally planned) liberal

economies, there is a belief that, given low income levels, excess money supply, excess demand for savings, and foreign exchange shortages are structural, a consequence of the savings and the foreign exchange gaps. These gaps are the result of rigidities which are also structural; i.e. the marginal propensity to save at low income levels is constant, and cannot be affected by changes in the relative price i.e. the real deposit rate, as far as the real sector is concerned nor by broadening the tax base.

Moreover, in these liberal economies, there is a constant excess demand for imported inputs which is unaffected by changes in the ratios of labor to capital cost, prices of imported to domestic goods, or prices of exportables relative to domestic imputs. Under these circumstances flexible exchange rates or market-determined deposit rates are ineffective; indeed they may instead prevent economic development since they could result in accelerated inflation and equilibrium at those levels of interest rates that are too high to allow for increases in the rates of investment. When the financial sector of an economy exhibits such structural problems, regulation and intervention by the monetary authorities is more likely to occur to ensure that the allocation of funds favours capital investment.

When the economy in question is small and dependent on foreign trade, these policies are often accompanied by protective barriers against competition from abroad. Thus developing economies are often characterised by low rates of interest, cheap imports of capital goods, tax concessions for investment, and tariff protection for capital-intensive production.

Somewhat different theories - and hence policies are presented by the 'liberalisation' or 'financial deepening' schools of thought. According to these"... some development theory seems to be designed for a barter world. In other models finance is passively adaptive, and its deepening is a by-product of growth in 'real' things. There is a doctrine that ranks financial

development among obstacles to development and recommends financial repression". (2) These financial theories criticise in particular the subsidising of investment by maintaining an artificially low mean level of interest rates and by the rationing of loanable funds on which there is a government guarantee or an assurance of rediscountability. Such measures, it is claimed, create serious distortions. Not only are savings discouraged due to the (often negative) real deposit rate; the fact that the price of a scarce productive factor (credit) is used as the vehicle for a subsidy also conveys a false message about the relative availability of productive factors. Furthermore, since credit flows are fungible, the subsidy does not reach the final product for which it is intended. Such interventions also result in banking systems that extract oligopoly profits as a result of the wide margin between the low real loan rate and the even lower deposit rate. Such banking systems eventually discriminate against risky projects and confine themselves to servicing traditional borrowers who are able to fulfil collateral requirements. Within the public sector, deficits are financed by a growth in the nominal money supply which, given the low level of real demand for money, exerts inflationary pressures.

The policies proposed by financial deepening theories require an exogeneity of money to the real sectors of the economy (i.e. independent central banking). Under these circumstances, growth in demand for real money is pursued by allowing scarcity prices for savings which in turn increase the rate of saving and improve its allocation. Once the growth in real money demand is known, an inflation rate can be chosen. Such a targeted level of inflation is achieved by minimising the deviation of nominal money from the demand for real money, using bank reserves (nominal variable) and the reserve-deposit rate (relative price) as control instruments. Instead of a subsidy on loan rates (thereby taxing savers and workers), direct subsidies from government tax revenues are used and distortions in relative prices (other than interest rates) that affect investments profitability are removed. In the foreign

exchange markets, a free spot rate with full convertibility allows forward contract quotations that neutralise differences in nominal interest rates. Savers and investors in any country are thus guided by differences that reflect spreads in real rates of return to capital.

A substantial literature supports somewhat less radical views than either those of total government intervention or complete liberalisation. As far as monetary policy is concerned, it is generally recognised that the abolition of interest rate ceilings, and the liberalisation of rates to reflect realistically the high cost of capital, is essential for monetisation and growth in demand for real money. However, arguments continue on the subject of how to sustain rises in the nominal stock of money to satisfy increased demand for money when growth in real output is unrestricted. Under a rigid exchange rate regime, domestic money stock cannot be independent of the balance of payments - which gives rise to the argument of deflationary bias (3). A floating exchange rate system (advocated by the theories of liberalisation) is inappropriate for developing countries since their foreign exchange markets do not provide a sufficient volume of spot and forward transactions (4). Although the importance of financial deepening is recognised, systems of discretionary (5) (rather than automatic) currency creation and exchange rate variation are recommended, to avoid rigid exchange rate systems which result in inflationary domestic credit expansion.

As far as credit policy is concerned, the theories of liberalisation and unification of the credit markets argue that artificially low rates of interest may lead a cartel-like organised banking to rationing and discrimination in the official sector, while the high rates of the parallel sector represent the scarcity price of capital. Integration (of financial markets), in such a case, may be expected to increase the rates charged in the official and decrease the rates charged in the parallel sector. However, unification and complete freedom(6), although necessary to overcome

fragmentation, are not sufficient. The argument put forward is not on an 'imperfection' of the capital market, but rather focuses either on the high cost of information[7] or, alternatively, considers the fragmentation in the capital market the result of the fragmentation in the market for information[8].

The opposing views on the desirability - or not - of central authority intervention and regulation, stem from different views on the power of conventional monetary policy in under-developed financial systems. Another equally important issue is that of market efficiency and optimality. Intervention would be justified where there are a) imperfections in the credit market and in the distribution of gains between borrowers and lenders; b) imperfections in other markets which necessitate intervention in the credit market; and c) questions of equality and divergence between social and private optimality. Even where developed financial systems exist, the debate continues on the extent to which a financial system should be regulated. The differing views arise not from doubts about the potency of monetary policy, but rather about the way it operates [9]. The issues are: a) the length of time that a given policy may take to produce its results, and its effect on interest rates; b) the desirability of an independent control of bank credit and money supply; and c) the incidence of monetary policy; i.e. the effect on the composition of aggregate demand. The first two issues give rise to policies that aim to control directly the level of bank credit and the third to what is generally known as selective credit policies.

These policies may produce effects that are difficult to examine even in developed financial systems, where the size of the so-called black markets is small relative to the large size of the 'official' sector. There are several reasons for these difficulties:

1) The continuous innovation and sophistication of financial instruments has eroded the boundaries between different

financial markets. Recent discussions suggest a move towards an integration of capital, money and foreign exchange markets. Therefore it would be difficult to impose effective regulation, and to measure the effect on a particular segment of the financial sector while ignoring the high probability of spill-over effects to other financial markets.

2) The old argument on the fungibility of financial flows (not difficult in innovative and fast-moving financial markets). Financial agents, when faced with limitations and controls on their activities, devise techniques and instruments that enable them to circumvent these regulations. It is difficult, if not impossible, to examine the exact extent to which credit flows escape the attention of the regulators.

3) Finally, when the effects of selective credit policies on the demand for real expenditure are examined, the question that arises is that of choosing the appropriate variable (determined in the financial sector) that influences this demand; i.e. is it the level of interest rates (relative price), or is credit rationed by a non-price variable? Are credit flows themselves the appropriate variable?

Thus, the question of a regulated and closely controlled financial sector is an issue that concerns not only an under-developed economy, but which may also be relevant when discussing monetary and credit policy in more developed economic systems. Financial systems in most countries have historically used controls on deposit and loan rates, applied by setting legal limits or enforced by using indirect methods such as discount policies. Subsidising loan rates for different categories of borrowers, and for different maturities of loans have also been common, as has the imposition of credit ceilings or minimum requirements for different types of credit. In developing countries, controls on deposit rates, often accused of being the source of negative real rates and insufficient savings, have also been widely used. As far as loans

are concerned, subsidies for export credit and measures aimed at increasing the proportion of long-term loans and reducing short-term ones, with low rates charged on the former, are usually part of the effort by governments to increase activity in priority sectors and stimulate investment. Suspicious of an association between short-term loans and speculation, governments often impose ceilings; when they feel that insufficient credit is being diverted to sectors such as agriculture, handicraft or small-scale enterprises, they frequently impose minimum lending requirements, combined with the setting of maximum loan rates to be charged.

Although there are great differences in how savings are mobilised, or how foreign aid funds can be allocated efficiently in a third world country, and how a deposit rate ceiling might affect aggregate expenditure in the U.S., the same question can be asked: Is it effective and efficient to impose exogenous restrictions on a financial sector to influence the real sector of an economy? And even if it is, what would be the possible side effects?

No one single answer would apply. However it is useful to examine and compare evidence from economic systems that are at opposite ends of the development continuum. This would at least allow us to draw some conclusions about: a) Which characteristics of a financial system increase the likelihood of these controls being effective, or b) under what circumstances would these interventions have more distortive results. There are, however, several problems. In backward economies, income levels are usually so low, and the financial system so primitive, as to make any quantitive analysis extremely difficult. The problem with developed economies has already been mentioned: More developed financial systems appear more integrated and financial flows may be more fungible; for this reason selective credit policies are often considered as more of a temporary policy measure. This prevents financial agents from adjusting their behaviour and finding ways to avoid the controls in question.

The Greek economy post-1950 appears to offer an environment in which an attempt can be made to answer some of the questions outlined above.

During this period, monetary and credit policy-makers in Greece made extensive (often exclusive) use of selective credit controls. These controls, although not always of a uniform character and often revised or altered, were used to encourage long-term investment and export-oriented production, and to impose limitations on import-trade and 'excessive' domestic consumption. (The exact nature of these controls is discussed in detail in a subsequent chapter.) However, it is not only the length of the period during which these controls were applied that prompts this research. The Greek economy during that period also moved from being an unstable, low income-scarce savings economy to one of relative stability, high growth rates and an increased inflow of funds into the banking system. Thus, although the Greek financial system is not highly developed, (in terms of available funds), it is of considerable size [10]. (A necessary detailed discussion of the financial system and the nature of monetary and credit policies will follow in subsequent chapters.)

I propose to examine the effects of selective credit policies in Greece. The advantage of doing so is that the research can concentrate on the flows of funds in and out of the banking system. In an economy where the capital market is under-developed [11] or of negligible size, the funds used to finance capital investment will depend directly on the availability of funds in the banking system. The advantage this presents for research purposes is that there is a single channel of funds from lending to borrowing units of the economy. The effectiveness of selective credit controls will thus depend solely on their validity as a policy tool and not on the possibility of funds being obtained directly from the capital market, as would be the case in more developed economies.

From 1955-60, a period of relative stability, a re-establishment of public confidence in the national currency and a policy of high deposit rates created a spectacular increase in the available funds in the banking system. The monetary authority attempted to influence the distribution of the outflow of these funds from the banking system to borrowers, using selective credit controls: a) Credit ceilings for loans to activities considered non-productive; b) minimum lending requirements for activities that needed encouragement and c) an interest rate policy by which long-term loan rates for 'growth-promoting' investment were kept at low levels.

Observers of the Greek economy agree that these policies did not succeed in achieving their main purpose, namely that of accelerating capital formation by 'growth-promoting' investment. However the reasons given for this failure differ, reflecting the varying views of the theories of development finance. Professor Zolotas (1965) observes that "the demand for credit for productive purposes as a rule fell short of available funds"; and "the phenomenon of the limited demand for funds to realise productive investment ... supports our basic hypothesis ... namely that the major obstacle to rapid growth is the lack of entrepreneurial initiative, organising ability and a skilled labour force" is a view that seems to reflect the theories of structural problems of under-developed economies. D. Psilos (1964) attributes the failure to the 'oligopolistic structure' of the banking system and its 'excess capacity': "There is an excess supply of funds but there is also low demand for them, due to the high cost of capital. The high cost of capital is due to the excess capacity of institutional lenders or, simply, to the great availability of funds placed in the hands of these institutions". In a view that appears to subscribe to the theory of 'financial deepening', J. Papadakis observes that "the insistence on low interest rates that would not adjust to the rate of price changes ... did not ensure higher inflow of funds. It rather contributed to transmitting the price instability to the real return of money with the result of

disturbing the stability of money demand and the average propensity to save", and that "the rate of investment in Greece appears to be determined from the availability of funds from the banking sector and less from the cost of those funds".

It appears then that low interest rates do not affect the outflow of funds for the following reasons: a) Inelastic demand for funds due to structural problems; b) loan rates not reflecting the true cost of capital; c) unavailability of funds or; d) credit rationed by means other than interest rates. As will be explained in Chapter 5, this study will make use of this point and will not use the interest rate as an explanatory variable for demand for real expenditure. Instead, for reasons given later, it will assume that credit is rationed, and credit flows will be used to explain real expenditure.

However, although the main purpose of the selective credit controls policies was to stimulate 'growth-promoting' investment, their effects were widespread, involving a whole spectrum of regulations, and impacting on several markets. In an attempt to analyse the behaviour of a market subject to selective credit policies, this study will construct a theoretical model to explain the influence of these policies on a particular market. More specifically, it will examine their effects on domestic production and supply, imports and consumer demand. The market chosen is that of consumer durables, and in particular household electrical appliances.

Several considerations have influenced the choice of consumer durables for this study. Firstly, the purchase of these goods - given the high cost involved - is traditionally financed by credit; secondly, the international literature which examines the effectiveness of credit controls has often used their impact on the demand for consumer durables. This means that comparisons can be made with findings of other studies. But probably the most important reason is that expenditure for consumer durables

represents a considerable part of total consumption. An analysis of the impact of selective credit policies on these markets may to a large extent reflect the influence of these policies on the level of economic activity. For this reason, the study of the demand for consumer durables - particularly during the 1960s and 1970s - takes up a large part of this research. The demand for durable goods was of great importance in Friedman's theory on consumption. Their acquisition as assets was distinguished from their use, which was treated as consumption of services. Expenditure on consumer durables is further considered one of the most relevant macro-economic indicators.

This study will also use empirical investigation to examine the effects of selective credit policies on durables' demand. The problem with the econometric evidence presented to date in other studies, lies more with the theoretical assumptions used in each model rather than the econometric techniques used. The most crucial assumption involved in the formulation of the models is whether credit flows themselves, or the relative interest rates, should be used to explain demand for expenditure. Recent theory has come to the conclusion that credit flows may validly be used only in the case where credit is rationed by a means other than price (i.e. interest rates). As will be shown in the relevant chapter, in Greece, the indications are that consumer credit has been rationed, and consequently credit flows may be used directly as an explanatory variable for real expenditure.

As in other studies, demand for stock and demand for new purchases will be separated by assuming a certain depreciation pattern and rate. The model that will be used is a traditional compound lag model that assumes a partial adjustment of desired to actual stock and an adaptive expectations mechanism of expected to actual income. Although the main purpose of the exercise is to find out whether credit flows are significant in explaining demand for a particular durable, and whether credit shortages have, in fact, restricted this demand, various other useful

estimates may be obtained. More specifically, the model will allow us to estimate income and price elasticity of the demand for electrical appliances, and obtain estimates of the time lag needed for a given change in these variables to have a complete effect on demand.

This thesis is not an econometric one, nor does it hope to exhaust the subject concerning the debate between theories of financial deepening or central planning. However, the empirical findings, in conjunction with the detailed analysis of the Greek financial system and the selective credit policies used, and the systematic presentation of the previous findings on the subject, will - it is believed - bring to light important evidence on the effect of a widely used method of development finance.

FOOTNOTES

(1) See, for example, McKinnon (1973)

(2) Shaw (1972)

(3) This argument is based on the identity MV=PT; with a constant velocity of circulation and prices inflexible downwards, growth in domestic money supply under a rigid currency system is only possible through growth in external reserves either by a trade surplus or by capital inflow. In order for the money supply to accommodate the continuous growth of the demand for real money a continuous balance of payments surplus would be necessary (see Drake 1980).

(4) Johnson, 1972: "In a banana republic, for example, the currency will be more useful if it is stable in terms of command over foreign goods than if it is stable in terms of command over bananas; and exchange rate flexibility would give little scope for an autonomous domestic policy."

(5) Drake (1980)

(6) As in McKinnon (1973)

(7) Stigler (1968)

(8) Virmani (1982)

(9) Davis (1979)

(10) G. Petrochilos (1985): "The savings gap declined in importance, from the beginning of the '60s, and the dominant constraint on the development of the Greek economy because of the foreign exchange gap."

(11) See Maniatis (1971), Bitros (1981). See also Drake (1980).

CHAPTER 2

THE CONTEMPORARY GREEK FINANCIAL SYSTEM

2.1 POLICY DECISIONS

2.1.1 The Greek Currency Committee and The Economic Committee

The absence of any legal framework limiting monetary action (such as reserve requirements, ceilings on government borrowing etc [1]) coupled with the belief that the twin targets of accelerating development and maintaining monetary stability require close co-operation between the government and the monetary authority, led to the creation of the Greek Currency Committee in 1946.

The Currency Committee was institutionally reorganised in 1951 as the supreme body responsible for monetary policy. Its members were the Ministers of Co-ordination, Finance, Agriculture, Trade and Industry, and the Governor of the Bank of Greece.

Until 1982 the Currency Committee had to adhere to the terms of reference laid down by the Economic Committee which had been setting overall economic policy guidelines since 1976. The functions of the Currency Committee include establishing monetary, credit and balance of payments policy, as well as the control of circulation of bank notes. The implementation of monetary policy, as well as the control of circulation of bank notes, was a responsibility of the Bank of Greece. It is argued that this separation between two bodies of policy decisions and actions led to delays and lack of flexibility in the active financial system. The Bank Loans Supervisory Service reported to the Currency Committee. The members of this sub-committee were the directors of the Bank of Greece. Their task was to collect data on the outstanding debt of private firms to each bank, and put them at the disposal of the commercial banks.

The BLSS examined plans concerning monetary and credit policy and submitted them to the Currency Committee. Because of its specialisd character, the BLSS had the power to influence important

decisions and often undertook many responsibilities of the Currency Committee. The Currency Committee was abolished in 1982, and most of its functions were directly undertaken by the Central Bank.

2.1.2 The Bank of Greece

The Bank of Greece operates as a société anonyme whose shares are held either by public institutions or the private sector. However, the Bank is under state control since the Governor and the two assistant Governors are appointed by the Government. The Bank's profits - after the creation of the necesary reserves and the payment of dividends to the shareholders - belong to the state.

The Bank has a monopoly on the production of bank notes (although the control of their circulation belongs to the Currency Committee). The Bank had been responsible for carrying out the decisions of the Currency Committee concerning monetary policy and the functioning of the financial system. However, its role had not been a passive one, since most important monetary and credit policy decisions were formulated in the Bank and the Currency Committee only had to approve them. Since 1982 most of the responsibilities of the Currency Committee were assumed from the Bank of Greece.

The operations of the Bank of Greece are described below.

(a) Since all banks hold sight deposits by the Bank of Greece, it acts as the 'bank's banker'. The Central Bank preserves the liquidity of the banking system either by allowing overdrafts to the accounts of other banks, or by offering the facility of discount of their portfolio (2). At the same time the Bank, by imposing limits on overdrafts and/or the discount rate, influences credit expansion in accordance with monetary targets. However, these instruments are not particularly effective since:

(i) institutionally the Bank is allowed to discount only the short-term portfolio of the comercial banks (3 months);

(ii) the high liquidity of the banking systems reduces the effectiveness of discount rate policies. Even in times of low liquidity, preserving high interest rates requires an extremely high discount rate for policies to be effective.

(b) The Bank also acts as 'the Banker of the Public sector'. Advance payments for the budget are provided by the Central Bank through the 'Account of Public Revenue and Expenditure'. The amount of credit that the Bank supplies to this account is subject to a limit which is established by law. The Bank's participation in government expenditure is in the main within the so-called 'Account of Supplies of Consumer Goods' which is used for the accummulation of imported or agricultural products (to support their prices and ensure the farmers' income).

Other forms of credit to the Public sector are usually arranged by special agreements between the Bank and the State.

(c) Management of the Public Debt. The Bank of Greece is responsible for placement of Public debt. All the proceeds of new issues are deposited by the Bank, and the withdrawals take place according to the provisions of the law 2854/1954. The Bank executes orders for securities transactions on behalf of all legal entities of public law, who have to invest up to 15% of their total funds in government securities.

The Bank also engages in Open Market Operations (OMO). To support outstanding debt, the Bank purchases old securities whenever a new issue is contemplated, to prevent wide

fluctuations in the prices of old bonds. Although the issue of short or long-term government securities takes place irregularly according to the fixed needs of the government, the Bank can affect the conditions prevailing in the securities market and possibly the course of interest rates. It does this either by purchase or liquidation of short-term government debt, which affects directly the current short-term rates, and indirectly the expected short-term rates and the expected short-term rate if present policies are expected to persist, or by influencing the maturity composition of private portfolios. However, OMO are not usually used as a means of monetary policy because of their limited effectiveness, due to the under-developed nature of the money and capital market.

(d) The Bank controls the funds of public specialised credit institutions, and is responsible for the reallocation of funds from the commercial banks to these institutions (section 2, below). The Bank also participates in the activities of specialised financial institutions, either directly by being represented on the Board of Directors (e.g. HIDB (3)) or indirectly, by being empowered, on behalf of the Currency Committee, to conduct inspections (e.g. in insurance companies).

(e) The Bank maintains the country's currency reserves, and is responsible for foreign currency transactions. The commercial banks and some other financial institutions buy and sell foreign currency but not on behalf of the Bank of Greece. The commercial banks hold foreign currency on their own behalf, but within limits which are set by the Central Bank to ensure the normal execution of foreign trade transactions.

Although the institutional structure assigns the larger part of the decision-making process of the economic system to the

Economic and Currency Committees, the role of the Bank of Greece and its power to influence monetary policy is very important.

The Currency Committee usually restricted itself to accepting the propositions and decisions of the Bank related to the conduct of monetary and credit policy. The majority of specialised credit institutions also depend to a considerable degree on the funds of the Central Bank. This has two main drawbacks:

(i) The decision-making process is bureaucratic and subject to delays, since it passes through the Bank to the Currency Committee and back to the Bank again, resulting in an inflexible monetary system.

(ii) Few Central Banks in the world engage in such a wide range of activities. The Bank of Greece could - until the beginning of the 1960's - directly supply funds to private firms. This practice has now ceased, but the Bank continues to have a considerable network of branches around the country.

2.2 FINANCIAL INSTITUTIONS

2.2.1 Commercial Banks

The importance of commercial banks within the financial system, as well as the complicated character of Greek commercial banking, suggest that we should focus not only on the banks' activities but on those of the entire financial industry.

a. The Growth of the Banking Industry

The volume and structure of banking reflects its comparative competitiveness when compared to the

alternative outlets for savings. The adequacy of banking facilities (see below) and the percentage of private savings in the form of deposits held by the commercial banks, are both useful indicators of their participation in the inflow of funds into the financial system.

The adequacy of banking facilities is both difficult to measure or define. However, the number of commercial banks and the distribution of banking offices can be a guide. There are 10 Greek commercial and 17 foreign banks of varying size. In Greece as a whole there is one commercial bank office for every 10,000 persons in the population, which would indicate the need for more banking facilities. The degree of concentration of banking offices is very high: one-fourth of all banking offices are in the Athens area (4).

Commercial banks enjoyed a considerable increase in the inflow of funds between 1955-65 (all new commercial banks' time and savings deposits represented on average 70% of total new deposits into the financial system for this period). After the beginning of the 1970's they experienced a considerable decline. Private savings in the form of deposits with the commercial banks fell to 47% of the total in 1980. Two reasons for this are:

(i) The increase in deposits during 1955-65 (especially in the form of savings and time deposits) was due to the public's growing confidence in assets of constant drachma value, and to the absence of an alternative placing for the private sector's savings.

(ii) The greater preference after 1965 attached by depositors to deposits with special financial institutions such as the Agricultural Bank and the Postal Savings Bank (5) (see section 2c below). Although the

commercial banking sector in Greece is active, compared to the other financial sectors, it is still limited when compared with those in countries at a similar stage of development (e.g. Spain).

b. Structural Characteristics of the Banking Industry

The banking industry in Greece is characterised by a high degree of concentration of financial power. The two larger banks, the National Bank of Greece and the Commercial Bank of Greece, control 80% of the total deposits of the commercial banking system; and the third largest bank, the Ionian and Popular Bank, is controlled by the Commercial Bank of Greece. This monopolistic character of the commercial banking system stems from certain privileges that the Greek state has granted over the years to the largest commercial banks. Its consequences, however, are important not only for the banking industry itself, but for the financial system and the economy as a whole:

(i) Foreign banks are hesitant to explore the Greek banking market because they are afraid of the pressure that the large banks might exercise over the authorities to impose limits on their activities. For this reason their customers are usually limited to the few foreign firms operating in the country. This further stimulates the monopolistic nature of the industry.

(ii) The large banks compete with other specialist financial institutions (e.g. investment banks, insurance companies) and have expanded their activities into new areas (e.g. long-term finance). This results in peculiarities in Greek commercial banking which - in certain aspects - resemble the German banking system of the 19th century (6).

(iii) To the extent that commercial banks have special relations with large industrial firms and in turn favour their important customers, the oligopolistic character of the banking system creates oligopolistic conditions in the industrial sectors as well, negatively affecting the already existing income distribution.

c. Commercial Banks' Activities

The peculiarities of the Greek commercial banking system can be seen if one focuses on the structure of banks' balance sheets. (The peculiar nature of bank activities owes its origins partly to the fact that the banking and financial system in Greece developed in the 1950s, and partly to the restrictive and complex character of the monetary and credit policies. (7)

Four major financial activities play no part in Greek commercial banking:

(i) Consumer credit
(ii) Mortgage lending
(iii) Credit for agriculture, and
(iv) Foreign exchange.

Since these activities are performed by special institutions, (8) various aspects of contemporary banking are practically unknown in Greece (e.g. leasing, factoring, mortgage banking, direct debiting, foreign exchange dealing).

An examination of commercial banks' liabilities shows that about two-thirds of banks' deposits are savings deposits and one-third are time deposits. (In 1979, savings deposits were 268,290 million dra's, time deposits 134,280 million dra's, and sight deposits 62,740 million dra's). The high ratio of savings deposits to total deposits is a result of the limited

use of cheques in Greece, and of the high interest paid on them as part of the monetary authorities' policy to attract private savings into banking. A further result of this policy is the nature of savings deposits in Greece: they are withdrawn on demand at any time without prior notice. There are two different views concerning the banks' financial activities:

1) since the needs of the economy for short-term lending are limited, particularly if certain sectors which are considered to create balance of payments problems (e.g. import trade) or inflationary (e.g. consumer credit) are excluded, banks should expand their activities into the sphere of long-term lending. Otherwise a large part of funds of the private sectors savings will remain idle (9).

2) the banks' liquidity is not as inflationary as the increased public sector borrowing and the Central Bank activities; moreover, the structure of banks' liabilities involves a considerable solvency risk if bank loans are not of a self liquidating and temporary nature (10). Furthermore, the commercial banks' involvement in long-term lending would create unnecessary and unfair competition between them and the new issues market or the specialised institutions established for industrial development.

Commercial banks are involved in various activities. A large proportion of their work concerns loans to industry for working capital; because of credit ceilings imposed by the authorities (11) (12), loans for trade and consumption are a smaller proportion than demand would indicate. However, the excessive granting of bank loans for working capital has resulted in the use of these loans for long-term investment by the industrial firms

since it frees up the firm's own funds (e.g. non distributed profits). At the same time it has created the unusual situation of industrial firms financing trade from their own available funds.

The commercial banks are also directly involved in long-term financing. They act as private securities distributors and underwriters; and in addition to loan financing they assist private units directly by purchasing their common stock and corporate bonds. Studies of the Greek capital market (13) indicate that banks invest more in shares than bonds (including public utility bonds). Studies of their portfolios show that the number of shares of some private firms remained constant over a period of years. This investment in low-liquidity assets, combined with the fact that they participate directly or indirectly on the boards of directors of many large firms, would indicate that their participation in the industrial sector is far greater than orthodox banking theory would suggest.

On examining banks' holdings in Government securities, we see that banks put much of their investment in Treasury bills and Government bonds. However, this type of investment depends more on the occasional requirements imposed by the Currency Committee than on their own decision - as is suggested by the fact that the holdings of bonds and Treasury bills does not exceed the minimum requirements.

In other words, the banking system in Greece is somewhat self-contradictory. Although its oligopolistic character could become an excuse for excessive bank profitability, recent studies show that the profit/assets ratio is comparatively low (0.51%). The complicated credit control and interest rates policy are responsible for

this. Monetary and credit policy in recent years limits the banks' liquidity to a large extent, since it absorbs 38-40% of banks' available funds into compulsory deposits and placings. As a result, banks engage in activities of an unusual character, which might at times endanger the whole system if it destroyed public confidence. The capital/risk assets and capital/deposits ratios have been declining in recent years (although the precision and significance of these measures may be questioned). As a result, the members of the Currency Committee often feel uneasy, and react by taking decisions which oblige the commercial banks to increase their share capital.

2.2.2 Specialised Private Financial Institutions

An important factor contributing to the accumulation of private liquid assets in the form of savings and time deposits by the commercial banks has been the low degree of competition with the private long-term financial market. The specialised private financial institutions are the insurance companies, the private investment banks and the mortgage banks.

a. Insurance Companies

Although there is a large number of insurance companies of variable size operating in Greece, either under Greek or foreign ownership, the insurance sector is fairly concentrated. 70% of total assets are controlled by the largest six companies, of which the two biggest, which control 45% of the total assets, are owned by the largest commercial banks. The 'Ethniki' Insurance Company is owned by the National Bank and the 'Astir' Co. Inc. is owned by the Commercial Bank (14). An examination of the insurance business indicates that the great bulk of services is provided by companies controlled by the commercial banks (around 50% of the total business).

The growth of the sector, is considered by some to be self-impeded: it is not competitive, since commercial banks exert pressure on their clients to buy policies from companies controlled by them. (15) Another view suggests, however, that since the banks are unable (by law) to extend any terms of credit to insurance companies, the provision of insurance services by the commercial banking system is not the main reason for the absence of competition. The oligopolistic conditions are stimulated rather by the fact that four bank-insurance companies are family-owned enterprises which do not attract large inflows of savings, do not offer a large range of policies, and do not diversify risks to increase their profitability (16). This argument becomes more potent if one considers that in Greece, since 1941, there has been no price competition among insurance companies, and that competition is limited to the quality of services provided.

Another important characteristic of this sector is the structure of the insurance companies' portfolios. Most of the policies offered cover general insurance (Accident, Fire or Transportation). Life insurance policies are rare in Greece (20 years ago they were almost non-existent) and they are provided almost entirely (90%) by the bank-controlled companies. This is an important factor as far as credit policy is concerned. Life insurance gives rise to long-period contracts and therefore leads to the accumulation of funds which can be placed in long-term investment. However, in Greece, the insurance companies' investment tends to be directed towards property and loans to policy holders; only a small part is invested in securities (17) and in general long-term investment. This is a weakness for the insurance sector and the Greek capital market. Furthermore, lending to policy holders and investing in property may often offset monetary policies, particularly when these policies aim to

limit other channels of funds (e.g. commercial banks) for these 'undesirable' activities.

b. Mortgage Banking

Mortgage banking plays no part in commercial banking in Greece. However, a private specialised institution operates in the mortgage market. The National Mortgage Bank is a private bank which extends loans both to the housing sector (18) and to the industrial sector for the purchase of fixed capital. Although it is one of the few specialised institutions that has its own deposits (19), its financial capacity is limited and its activities are few. The reason is not only that commercial banks attract the main portion of private deposits, but its own lack of policies, such as time-deposit-schemes, and its reluctance to issue mortgage bonds. For this reason this institution depends mainly on the bank of Greece's funds and public funds. Its loans (20) come out of the annual programmes of the Currency Committee, which also imposes several restrictions (21) on the terms of loans. In addition the interest rate on loans granted from the Mortgage Bank's own funds is higher.

c. Private Investment Banks

Two private investment banks operate in Greece:

(i) The Investment Bank S.A., founded in 1962, in the form of a Societe Anonyme under the control of the Commercial Bank (76% of the initial capital) and with the participation of the Bank of America, Comptoir National (Paris), Banca Nazionale del Lavoro;

(ii) The National Investment Bank for Industrial Development founded in 1963, under the control of the National Bank (60%) with the participation of Chase Manhattan Bank

Mediobanca, Deutsche Bank, Manufacturers Trust Co., and others. Each of these banks founded a unit trust later, in which they participate with a part of their own portfolios.

The banks have the following objectives:

(i) to grant medium and long-term loans to industrial firms;
(ii) to provide technical and managerial assistance to enterprises financed by them;
(iii) to contribute towards the development of the capital market by underwriting and purchasing bonds and shares of newly established firms.

The NIBID has become involved in interests in the Middle East (exports, transportation) and the chemical industry in Greece; the IBSA has mainly concentrated on attracting foreign enterprises to establish themselves in Greece.

Their control by the commercial banks, the authorities' intervention (in the sourcing and use of their funds, and in the growth of their activities and profits), and the structure of interest rates prevents the two banks from increasing their profitability (22) and expanding their activities.

2.2.3 Specialised Public Financial Institutions

a. Agricultural Bank of Greece (ABG)

The ABG was founded by the state to grant loans with favourable terms to farmers and offer technical advice. Although supposedly an independent financial institution, the Board of Directors is appointed by the Government.

Its financial (23) activities are:

(i) short-term loans to farmers to cover the current costs of production;
(ii) short-term loans by product-pawning to support the prices of the products;
(iii) financing of trade and industrialisation by the farmers' associations; and
(iv) long-term loans to farmers for the purchase of machinery and cattle, or the financing of storage buildings.

Its medium and long-term loans are granted on the basis of annual programmes subject to the approval of the Currency Committee.

Although the agricultural bank had the second largest network (24) of branches spread all over the country, it failed - until 1976 - to develop as an independent financial institution since it depended to a large extent on the funds of the Central Bank. The level of the interest rates on its loans was set very low, and the bank was unwilling to attract private deposits, being unable to afford the high interest paid on them. Since 1976, however, its dependence on the Central Bank's funds is being gradually reduced. The Currency Committee is subsidising the interest rate, and the banks' deposits are increasing substantially.

b. Hellenic Industrial Development Bank (HIDB)

The HIDB was founded in 1964 as a result of the merger of two other public financial institutions - the Economic Development Finance Organisation (EDFO) and the Industrial Development Corporation (IDC). The HIDB is an entirely public financial institution (25) and has recently founded a portfolio management trust.

It draws its funds from three sources:

(i) the Bank of Greece (mainly from the reserves of insurance corporations and of the Postal Savings Bank);
(ii) the domestic capital market, by issuing bonds of annual duration, with a high interest rate subsidised from the monetary authorities; and
(iii) since 1975, the European Investment Bank and the Euromarket for funds in foreign currency (26).

The HIDB activities are twofold:

(i) long-term loans to industry; and
(ii) founding new enterprises, or participating in the share capital of already existing and developing enterprises. However the authorities' intervention and interest rates policies restrict both its profitability and any expansion of its activities.

C. Postal Savings Bank (PSB)

The PSB operates as an independent state institution. It offers savings-deposits schemes, and it has branches thoughout the country since it uses post offices. Between 1957-80 it attracted a substantial part of private sectors deposits, since the Currency Committee established a 0.5% higher interest rate paid on the deposits by the PSB than those with the commercial banks.

The funds of the PSB may not be diverted to the commercial banks (to avoid a further increase in their liquidity); instead, the Currency Committee is attempting to direct these funds to those sectors that previously depended on the funds of the Bank of Greece. For the present, most of its funds are directed to the ABG. At the same time the direct financing activities of the PSB are constantly increasing.

d. The Consignations and Loans Fund

The Consignations and Loans Fund accepts sight and savings deposits from the private sector. However, the main part of its liabilities consists of deposits from local councils. Its loans are granted (on the basis of six months plans, subject to the approval of the Currency Committee) to these local councils and other public organisations, and - until quite recently - to employees of the public sector (for housing) and to tourism.

2.3 THE FLOWS OF FUNDS

Financial inter-mediation performs an important function: it matches surplus units of the economy (potential lenders) and deficit units (potential borrowers). This matching is performed by attracting savings of the surplus units, thus building up a stock of liabilities, and by granting loans to deficit units, thus building up a stock of claims.

In a developing country, such as Greece, capital accumulation is a very important feature of the economy. Capital accumulation takes place through investment. The channeling of funds from saving to investing units is usually performed either directly through the capital market, or indirectly through the financial institutions. For historical reasons, and because of the lack of the appropriate institutional conditions, the capital market in Greece is under-developed; the indirect way is therefore the prevalent one. The question then is, how the financial system performs when changing the inflows of funds which consist of a stock of short-term liabilities to outflows of funds which consist of long-term claims.

In Greece commercial banking is the largest and most active part of the financial system. In most countries, long-term projects are not financed by commercial banks because they do not meet the private profitability criteria of marketability or collateral security. The inability of the financial system in Greece, however, to channel resources into desirable activities is supposed to be offset - apart from the creation of special institutions - by the introduction of administrative controls. This part of the chapter looks at the structure of fund flows into and out of the financial system, and at the system of credit controls and regulation of interest rates.

2.3.1 Structure of Fund Inflows

The inflow of funds into financial institutions is shown in Table 2.1 (for 1977). It can be seen from column 1 that it is unequally distributed. Commercial banks attracted 60.7% and the specialised credit institutions 28.7% of new resources in drachmas and foreign exchange. The share of the Bank of Greece (10.6%) derives mainly from financial management surpluses of public entities. The unequal distribution of the inflow of funds is more obvious within each group. The oligopolistic nature of the commercial banking system is shown by the fact that the National Bank and the Commercial Bank attracted 43.8% of the total inflow of funds, which represents the 72% of the group's total inflow. In the group of specialised credit institutions, 42% of the total inflow is accounted for by the PSB and most of the remainder by the ABG and the National Mortgage Bank in the form of deposits, and the balance by the investment banks in the form of bank bonds.

2.3.2 Reallocation of Resources

The peculiar concentration of the flow of savings in the commercial banks, together with the under-developed nature of the capital market does not ensure an outflow of adequate funds for the financing of government investment projects and other 'desirable' activities.

Under the present administrative arrangements, however, funds are drawn from the commercial banks (and the PSB), by the Bank of Greece (following the Currency Committee decisions) through interest-bearing Treasury bills and reserve requirements. This is shown in column 2 of Table 3. These funds are reallocated to the Government sector and to the specialised credit institutions. The structure of funds after the reallocation is shown in column 3 of Table 2.1.

The commercial banks' share has dropped to 35.2 per cent and that of specialised credit institutions has risen to 31.8 per cent. One-fourth of available resources is at the disposal of the State.

2.3.3 Credit Regulations and Interest Rates

Although this reallocation of resources has reduced the peculiarity of the structure of the inflow of funds, it does not ensure the structure of the outflow of funds which the authorities consider necessary for the economic development of the country. To secure the outflow of funds the authorities introduced credit controls and determine the interest rates.

Under the current system of credit controls, commercial banks have to earmark 15% of their total deposits for financing industrial investment and another 6% for loans to small scale industry (handicraft). If the funds earmarked for this purpose are not used to grant medium or long-term loans to industry to finance fixed investment, the bank concerned is obliged either to deposit them with the Bank of Greece at a 3% p.a. rate of interest or to invest it in Treasury Bills. Since this rate is not profitable for the banks, they make efforts to find long-term outlets for that portion of their funds.

There are considerable restrictions (e.g. credit ceilings) on the financing of import trade and domestic (particularly retail) trade. There are practically no restrictions on bank credit to manufacturing and export trade, within the framework of overall credit criteria. Furthermore, the authorities have allowed banks to supply industrial firms with medium or long-term loans covering up to 70% of fixed investment for a maximum period of ten years. If the firms are export-orientated, the interest rate charged to these

loans is reduced. Special credit regulations also apply to the amount and maturity of loans to other sectors of the economy.

The specialised credit institutions grant loans mainly to sectors involved in a 'productive' activity not financed by the commercial banks (e.g. agriculture, fishing, housing). The allocation of credit granted by specialised credit institutions is determined administratively within the framework of the annual monetary programme.

Interest rates on all categories of deposits and credit are determined by the authorities, the main consideration being to assist economic development. The chief characteristics of the structure of interest rates are:

(i) their maintenance at levels which are low when compared with inflation in recent years;
(ii) their differentiation by sector or activity;
(iii) their uniformity for all enterprises in the same sector and
(iv) the fact that long-term rates are lower than short-term ones. This adminstrative determination of interest rates does not contribute towards a balance between supply and demand for money and funds.

2.3.4 Structure of Fund Outflows

The structure of the outflow of funds from the financial system is shown in Table 2.2. In the first column is the total financing of the private and public sector per source of finance, and in columns 2 and 3 is the lending by commercial banks and by specialised credit institutions respectively to each sector of the economy. A considerable part of this outflow of funds is used to cover the deficits of the public sector. The funds for this are drawn by

issuing interest-bearing Treasury bills and by borrowing from the Central Bank. While this practice allows low-cost public financing, it leads to the creation of large deficits, the expansion of currency in circulation and, under the present structure of interest rates, entails indirect subsidising of the public sector by savers (27). As can be seen in Table 2, the public sector (i.e. central government, public entities and public enterprises) absorbed 38.9% of the total credit. The PSBR was met by commercial banks (42.2%), the Central Bank (32.1%) and the specialised credit institutions (2.7%). From this, public enterprises received approximately 8.3%, mainly from the PSB and the Central Bank.

TABLE 2.1

STRUCTURE OF INFLOWS AND REALLOCATION OF RESOURCES IN THE FINANCIAL SYSTEM IN 1977 (per cent)

INFLOW OF FUNDS AVAILABLE INTO THE FINANCIAL SYSTEM (1)	STRUCTURE OF AVAILABLE RESOURCES AFTER RESERVE REQUIREMENTS	AVAILABLE RESOURCES AFTER REALLOCATION
Other specialised credit institutions 16.7	Other specialised credit institutions 16.3	Other specialised credit institutions 31.8
Postal Savings Bank 12.0	Postal Savings Bank 5.8	Postal Savings Bank 5.8
Other commercial banks 16.9	Commercial banks 33.2	Commercial banks 35.2
Commercial Bank of Greece 11.7		
National Bank of Greece 32.1	Supplementary reserves (2) 26.2	Resources at the disposal of the State 26.2
	Reserve requirements 7.9	
Bank of Greece 10.6	Deposits by public entities, etc 10.6	Bank of Greece 1.0
Absolute total: Dr. 127,681 bn.	Absolute total: Dr. 127,681 bn.	Absolute total: Dr. 127,681 bn.

(1) Including deposits in foreign exchange

(2) In treasury bills by the commercial banks and the Postal Savings Bank

Source: Report of the committee for the working of the Greek finance system (Athens 1980)

TABLE 2.2

STRUCTURE OF THE OUTFLOW OF FUNDS FROM THE FINANCIAL SYSTEM IN 1977 (PER CENT)

TOTAL FINANCING OF PRIVATE AND PUBLIC SECTOR(1)	LENDING BY COMMERCIAL BANKS	LENDING BY SPECIALISED CREDIT INSTITUTIONS
Bank of Greece 12.5	Public enterprises 0.6	Public enterprises 7.3
Specialised credit institutions 10.0	Central government and public entities 32.3	Central government and public entities 20.0
Commercial banks 16.4	Tourism, other 4.2	Tourism, other 4.1
	Trade 15.0	Manufacturing and mining 9.3
Bank of Greece 0.9		
Specialised credit institutions 26.5		Housing 18.3
	Manufacturing and mining 47.9	
Commercial banks 33.7		Agriculture and fishing 41.0
Absolute total: Dr. 158,024 bn (2)	Absolute total: Dr. 79,173 bn.(3)	Absolute total: Dr. 57,641 bn.

(1) Including public enterprises

(2) The difference in absolute totals between Tables 1 and 2 is equal to currency in circulation (20,493 billion drachmas), plus loans in foreign exchange and banks' own funds.

(3) Including supplementary reserves in Treasury bills.

Source: Report of the Committee of the Working of the Greek System (Athens 1980).

FOOT-NOTES

(1) Rediscount or open market operations are not applicable in Greece as means of monetary policy because of the high liquidity of the banking system - see section 3.

(2) The commercial banks rarely used these facilities because of their increased liquidity which was caused by the increased inflow of deposits after the mid 1950s (see Chapter 3).

(3) Hellenic Industrial Development Bank (see section 2c).

(4) The fact that Greece became a member of the EEC in 1988, and the expected increase in the volume of banking transactions, would indicate the need for more banking facilities - as was indicated on the Report of the Committee on the Working of the Greek Financial System (1980).

(5) D. Psilos in 'Capital Market in Greece' (Centre of Economic Research 1964) pointed out that the competition between commercial banks and specialised institutions will mobilise voluntary private savings, and will channel funds into long-term investment, with due regard to diversification and profitability.

(6) For a discussion on the role of banks in the capital market, see D. Psilos: 'Capital Market in Greece' (Centre of Economic Research, 1964) and H.S. Ellis: 'Industrial Capital in the Development of Greek Economy' (Centre of Economic Research, 1965).

(7) See section 3c, and Chapter 2.

(8) J. Kostopoulos in the 'Report of the Committee on the Working of the Greek Financial System' (1980), suggested that in

addition to the specialised institutions, these activities are performed in an indirect way by sectors outside the financial market. This results in an excessive cost on loans.

(9) For example. D. Chalikias 'Problems of Credit Policy in Greece' (Athens 1976), and D. Galanis: 'Sources and Methods of Financing Investment in Greek Industry' (Athens 1963) support this view.

(10) The Report of the Committee on the Workings of the Greek Financial System (1980), and D. Psilos seems to support this view.

(11) For the system of credit controls see section 3 and Chapter 2.

(12) The loans of banks in different sectors are shown in Table 1.

(13) For a discussion of commercial bank involvement in capital market activities, see D. Psilos.

(14) The oligopolistic character of the insurance sector is indicated by the fact that only these two companies are registered on the Stock Exchange and they have few shareholders.

(15) This is the view supported by D. Psilos.

(16) This view, supported by the Committee for the Working of the Financial System, is further supported by the fact that between 1970-76 the largest companies quadrupled their capital whereas the smallest increased theirs by 25 times. At the same time the price index increased by 2.2.

(17) "This may be partly explained by the inadequate volume and range of industrial and government securities, as well as by income differential and liquidity of the assets available within the Greek economy". D. Psilos.

(18) It has been mentioned in some reports (by J Grain and by B P Jenks) conducted by the Bank that in the housing sector in Greece a personal market takes the place of the institutional finance. That is, the financing of a construction takes place by exchange agreements between the construction company and the owner of the site, who agrees to permit the erection of a building in exchange for some apartments depending on the value of the site.

(19) The Postal Savings Bank, the Agricultural Bank and the Mortgage Bank, are all licensed to take deposits.

(20) Some housing loans are also granted by the Postal Savings Bank, the Consignation and Loans Fund and the Bank of Greece.

(21) Housing was considered a 'non-productive' activity. This is why the rate for loans on housing - special cases apart - was high. But the increase in the value of estate absorbed the interest rate differential.

(22) The law establishes that from the annual profits of the investment banks an amount equal to 2% of their loans and investments should be used for the creation of reserves, since the risks their loans involve are higher than those of the commercial banks.

(23) Its non-financial activities include: the control of farmers associations, the purchase of machinery (tractors) and the distribution of fertilisers.

(24) The largest network belonged to the Postal Savings Bank with Post Offices around the country.

(25) Before the merger, the consignations and loans fund, the commercial banks and the private sector withdrew their funds from the IDC.

(26) With the help of an interest rate rebate mechanism these funds are diverted as foreign currency funds to the industrial enterprises.

(27) This is the view in the 'Report of the Committee on the Working of the Greek Financial System' (1980).

CHAPTER 3

AN EXAMINATION OF THE ECONOMIC CONDITIONS AND POLICIES IN GREECE (1946 - 1980)

This chapter examines the various economic policies that have been introduced in Greece since the Second World War. Since the purpose of the study is the examination of the effects of credit controls, it is felt that three periods can be distinguished, namely: 1946-55, 1955-63, 1963 onwards.

The characteristic of the first period was the financing of the banking system by issue money and foreign aid (counterpart funds) after the post-war hyper-inflation had eliminated the funds of the banking system. As a result, there was tight control of bank credit, and the Currency Committee had sole discretion over loans.

The stabilisation policies introduced at the end of this first period, and the increase in interest rates paid on deposits by the commercial banks (from 7% to 10% in 1956) attracted private sector funds into the banking system. The main characteristic of this second period was the increased liquidity of the commercial banks. Combined with the belief that control of bank credit is an important means of accelerating economic development, this resulted in a complex system of selective credit controls.

The third period was characterised by an effort to simplify the existing credit controls. Furthermore, a system of reserve requirements was applied, aimed at equalising the nominal yield of the different types of bank loans, to ensure that interest rate policies (applied during the two previous periods would not distort the effects of credit controls policies (see the last section of this chapter).

I 1946-55

The end of World War II found Greece in great political and economic turmoil. The war was followed by a period of guerilla activity and Civil War. The political instability created intense hyper-inflation which eliminated the savings of the private sector and hence funds available for the banking system.

Capital equipment, destroyed during the war, had to be replaced by the use of either the Central Bank's funds (issue money) or by the use of foreign aid (counterpart funds), since private sector savings was practically non-existent in the decade 1940-50. The Currency Committee was established in 1946 and given responsibility for deciding on the issue of new notes, handling the foreign aid funds and co-ordinating the stabilisation policies necessary to re-establish public confidence in the national currency.

The policies of monetary stabilisation initiated at the beginning of the 1950s concentrated on:

(a) The gradual reduction of the budget deficit.
(b) Severe credit controls to prohibit speculative activities and to enhance development-conducive activities.
(c) The progressive elimination of excessive profits from imports by the application of differential exchange rates.

These policies constituted the necessary groundwork for the devaluation of April 1953 which was based on doubling the exchange rate and the abolition of all import restrictions. The 100% increase in the exchange rate was reflected in price increases, believed to be of a corrective nature until 1955.[1]

Private deposits by the commercial banks remained low. Competition among banks to attract depositors by offering higher interest rates on private deposits, was abandoned at the beginning of 1955, when the rate of interest paid on private deposits was administratively reduced to 7%. (This was done to suppress the cost of bank loans, but it probably further delayed the inflow of deposits into the banking system).

Rising prices throughout the period generated inflationary expectations and, therefore, any demand for bank credit was for the finance of speculative activities.

The allocation of credit was under the strict control of the authorities. Any bank loan required authorisation by the Currency Committee and the Loans Supervisory Committee. Commercial bank activities were even more restricted by the fact that:

(a) the Bank of Greece was directly involved in financing private enterprises; and
(b) the reserve requirements of the commercial banks were 22% of the deposits of public institutions and 10% of private demand and savings deposits; this meant that a large proportion of available funds was at the disposal of the authorities.

Strict credit controls were applied throughout the 1946-55 period. From 1952-55, efforts were made to encourage activities that would accelerate development. Commercial banks were allowed to withdraw funds from the Central Bank to satisfy their entire demand for loans for export trade activities and up to 50% of loans to private enterprises for the purchase of capital equipment. By contrast, loans for working capital were financed by the banks' own funds and were restricted by the limited ability of commercial banks to attract deposits. Financing of other sectors or activities was allowed only within limits set by the authorities.

The Central Bank was the source for finance for long-term investment and export trade which enabled the authorities to set interest rate policies. Interest rates for loans for export trade and handicraft were therefore set at lower levels than those for domestic trade or for working capital finance.

II 1955-63

The stabilisation programme of 1952-54 reduced the strong inflationary pressures of the early 1950s. Monetary equilibrium was combined with a comparatively high rate of growth: the annual rate of increase in GNP for the years 1955-60 was 5.9%

whereas the annual rate of increase in gross fixed capital formation was much higher (13.1%). This implies a rise in the ratio of gross fixed capital formation to gross domestic product, i.e. a rise from about 12% in 1952 and 13.7% in 1953, to 22% in 1960 (remaining close to that level in 1961-62). This ratio is similar to that found in highly developed countries such as Sweden or Germany. Other Southern European, under-developed countries also experienced high ratios (e.g. Spain 17%-19%, Turkey 19%). However, if we exclude housing from gross fixed capital formation, these results are poorer for all Southern European countries, including Greece.

During these years invisible earnings in Greece were high, due mainly to immigrant labour and the shipping industry. To assess the relative importance of the external sector it is interesting to examine and compare changes in gross fixed capital formation and foreign currency receipts. For the period 1955-60, foreign currency receipts increased by 33%, of which only 10% was the change in export earnings (which increased for the period 1955-58, but remained stagnant the following years) and 23% was the change in invisible earnings (rising constantly during this period). The change in gross fixed capital formation was 68%, of which 40% was due to public investment and 28% due to private investment, mainly in housing.

During the same period the money supply showed a marked increase of two and a half times. The rising payments for imports (higher than the increase in GNP) were accompanied by an increase in foreign currency receipts. The public sector was mainly responsible for the monetary expansion, as a result of central government investment in transportation and support for its agricultural pricing.

The effects of the public sector expansion were partly restrained by the considerable rise in private deposits (see Table 1). This was primarily due to the stabilisation polices of the early 1950s[2], which re-established public confidence in assets of constant drachma value. It was reflected in the

decline of the income velocity of circulation (from 9 in 1955 to 6 in 1960 as measured by the ratio of the gross domestic product to the money supply) which indicated the increased willingness of the population to hold money. The Currency Committee further encouraged this rise in deposits by increasing the interest rate of private savings and time deposits from 7% to 10%.

Since the largest part of the private sector's deposits found their way to the commercial banks, the banking system's increased liquidity was the main characteristic of the financial sector for this period. This increased liquidity reduced the commercial banks' dependence on Central Bank funds. (Those were used to finance the agricultural sector). The abolition of certain quantitative restrictions followed the increase in commercial banks' available funds. However, the main view of the authorities during this period was that the control of credit could be used as an important policy instrument to accelerate development [3]. Thus selective credit controls were introduced, to finance structural investment.

The abolition in 1956 of the facility of commercial banks to use funds from the Bank of Greece to finance certain loans to 'productive' sectors heralded an important change in credit policy. Commercial banks ceased to act as 'agents' and had to use their own funds. At the same time, the liquidity of commercial banks was preserved by the use of facilities such as rediscount of their short-term portfolio (up to 3 months) or the allowing of overdrafts by the Central Bank. While the high discount rate (11%) and the rate on overdrafts (12%) made the use of the facilities unprofitable, their actual existence guaranteed the liquidity of the commercial banks at a time of short-term fluctuations in their deposits.

The fact that commercial banks no longer depended on Central Bank funds led the Currency Committee to relax some of the more bureaucratic procedures of the previous period (when its approval was needed for all commercial bank decisions). However, the control of credit remained strict and complicated.

(a) The banks were now allowed to discount promissory notes (with a maturity of maximum 3 months) and to grant loans for up to six months for suppliers' credit (to finance the trade of industrial products only). Banks could allow overdrafts to industrial enterprises to an amount not exceeding 5% of the annual revenue of each company. The credit ceilings for short-term loans were set higher from 1957 thus allowing the banks to choose (up to a certain extent) the amounts of their loans.

(b) Export trade was encouraged by lifting all restrictions concerning its finance, while import and domestic trade continued to be subject to strict controls. To influence the structure of the commercial banks' long-term industrial investment the Currency Committee obliged them to earmark a percentage (10% in 1957, 15% in 1959) of their total deposits for medium and long-term finance to industry. Any earmarked funds not used for this purpose were limited to interest-bearing (only 3%) accounts by the Central Bank. To stimulate capital market activities, banks were allowed to invest up to 5% of their deposits in shares of industrial or mining companies (1960) and up to 3% in Government bonds or bonds of the Public Power Company. Banks were also obliged to invest 24% of their private deposits in Treasury bills to finance the annual programme of Public investment.

(c) The Central Bank continued to subsidise the interest rate for loans to handicraft (from 2 to 3 percentage units). To direct private deposits towards special financial institutions (e.g. the Agricultural Bank of Greece and the Postal Savings Bank) the interest rate for private savings deposits in these institutions was set 2 to 3 percentage units higher. (The increase in the percentage of private deposits by these institutions is shown in Table 3).

III 1963 ONWARDS

Political events in Greece (The military regime in 1967-74, intense political relations and fear of military conflict with Turkey) as well as developments in the international economic environment (oil price and basic product prices increases), created unstable conditions in the country, which resulted in a lack of increased private investment to satisfy the development needs of the country. For this reason, again in this period the Public sector had to undertake the major part of the development process. This fact, together with the worsening Trade deficit (due to increases in import prices) resulted in large budget deficits (especially for the periods 1963-67 and 1973-78). The increased deficit for the period 1963-67 was due mainly to increased government expenditure which was not accompanied by an increase in taxation. The expansionary effect of the deficit was not inflationary though for this period, because supply increases satisfied the increased demand.

From the end of the 1960s the accelerated increase in government expenditure and a reduction in the contribution of taxation to finance this expenditure increased the public sector borrowing. The main sources of finance to cover the deficit in the period 1967-73 were: borrowing from abroad (which contributed 27.6%) the issue of government bonds,[4] and Treasury Bills. The increased government spending from 1968-73 did not cause inflationary pressures because it was financed partly by borrowing from abroad that caused balance of payments problems instead, which became intense after 1976, and partly by government bonds that has a lower expansionary effect than other methods of internal borrowing.

After 1974 the large deficit was due to the increased expenditure on the defence budget. The continuous borrowing from abroad of the previous periods had created serious balance of payments problems which were further intensified by increases in import prices. The large deficits of 1974-78[5] were financed mainly by Treasury bills and increases in money

supply[6]. By 1974 the economy was approaching full employment, and the expansionary fiscal policy created an intense inflation which was further reinforced by an increase in prices of imports, and by inflationary expectations.

After 1970 the money supply continued to increase, which was the result of the expansion of the deficit and the finance of government expenditures by ways which directly or indirectly exert an augmentative influence on the money supply. It is characteristic that monetary targets were set by estimating the expected rise in the price level. It was the usual practice for the actual magnitudes of these variables to exceed their targets at the end of each period. Since the rate of increase of money supply was higher than the rate of increase in gross domestic product, there was no reduction in inflationary pressures.

Increasing the money supply could be justified[7] on the grounds that inflationary pressures in Greece were not caused by monetary expansion but by other factors (the budget deficit, imported inflation, cost-push inflation), and that stabilisation of the price level was not as important a policy target in the 1970s as it had been in the 1950s. A primary policy objective should have been economic development, which could not be pursued by policies of monetary restraint if the increased demand for money was taken into account. Such a policy would only have caused a slowdown of the savings-investment procedure[8].

The allocation of credit during this period remained under the supervision of the Currency Committee. However, quantitative credit restrictions to sectors such as industrial production and export trade were relaxed. Credit ceilings on other sectors were simply allowed to rise, apart from housing and import trade. However, credit controls remained complicated. An important step forward was the codification of credit controls in 1963 and 1966. Through this codification an equalisation was attempted of nominal yields from all categories of loans within the banking system without state intervention. The

administrative determination of interest rates could no longer distort the effects of credit controls. This equalisation of yields was achieved by altering the structure of commercial banks primary reserves (commercial banks were required to deposit by the Central Bank, a certain percentage of credits as primary reserves.) The system of credit controls is presented in detail below.

IV CREDIT CONTROLS AFTER OCTOBER 1966

After the codifcation of 1966 the system of credit controls consisted of: (a) differential reserve requirements on banks' liabilities and assets, (b) the fixing of interest rates paid on bank credit and deposits, (c) credit ceilings, and (d) arrangements on reserve requirements.

A Primary Reserves

The arrangements here refer to deposits that commercial banks hold with the Bank of Greece.

1) Since 1972, banks have been required to deposit with the Bank of Greece a percentage of their private savings, demand and term deposits as non-interest bearing primary reserves.

2) Since 1972, a percentage of private savings, time and term deposits is held as interest-bearing primary reserves[9].

3) Reserve requirements are imposed periodically on private savings and demand deposits as seasonal reserves.

Commercial banks are required to deposit with the Bank of Greece a percentage of their short-term credit extended to industry, domestic and import trade as non-interest bearing primary reserves. They are allowed to withdraw

part of these reserves to cover credit to export and tobacco trades, shipbuilding, medium and long-term credit for investment in plant and equipment, and credit to public enterprises.

These primary reserve requirements combined with the imposition of maximum limits (under B) on interest rates charged on the various types of loans are determined by the authorities in such a way that banks obtain the same nominal yield from all categories of loans.

Such a system can be criticised[10] on the grounds that banks acting rationally, discriminate against risky investment projects. Even if they are willing to finance a risky project with a relatively higher interest rate, equalisation of yields does not allow them to do so.

B Secondary Reserves

Secondary reserves relate to the compulsory investment of a percentage of the banks' private deposit liabilities as well as a percentage of certain types of bank credit in Treasury bills, government bonds and bonds of public enterprises.

1) Banks are required to invest a percentage of their total deposits in interest-bearing Treasury bills as secondary reserves.

2) Banks are also required to invest a percentage of their total private deposits (15%) as medium and long-term credit to industry for investment in plant and equipment, and a percentage (6%) to handicraft as part of their secondary reserve requirements.

3) The excess of these requirements over the credit extended, is either invested in Treasury bills (with the approval of the Bank of Greece) or is deposited

by the Bank of Greece in an interest-bearing (only 3%) account. What proportion (if any) of the above mentioned differential can be invested in Treasury bills, and what can be held as an interest account, is at the discretion of the authorities.

This structure of secondary reserves is criticised on certain grounds[11]. Firstly, that banks may choose to invest only part of their requirement for long-term credit to industry and handicraft and then switch to interest-bearing Treasury bills if their yield is higher. Secondly, on the implications the use of Treasury bills as secondary reserves has on the monetary base as policy variable and on the effectiveness of monetary policy. Since the Central Bank follows a price support policy for the portion of Treasury bills that satisfies reserve requirements against banks' private deposits, this portion of Treasury bills is considered as a perfect substitute for currency and must be included in the monetary base.

Furthermore, the portion of Treasury bills that cannot satisfy reserve requirements is not only substitutable for excess reserves,[12] but is also a substitute for base money. But, if Treasury bills are included in the monetary base, the base and the money supply respond to changes in Treasury bills. Thus the monetary base is dependent on budgetary policy and therefore money supply cannot be used effectively to affect aggregate demand.

TABLE 3.1

Composition of deposits in the Greek financial system (1953 - 1965) (million drachmas)

	1953	1956	1959	1962	1965
1 Private Deposits of Private Enterprises	2,049	4,757	14,340	24,857	39,012
a Demand deposits	1,409	1,954	3,076	4,095	5,803
b Savings "	141	1,757	8,543	15,526	25,320
c Time "	17	227	1,273	3,050	4,503
d Restricted "	425	660	1,099	1,801	2,703
e Other "	57	159	349	385	683
2 Public institutions	1,610	3,241	4,831	8,957	12,077
a Demand deposits	380	615	1,032	1,823	3,022
b Savings "	769	1,881	2,795	5,628	6,346
c Other "	461	746	1,004	1,506	2,709
3 Public Enterprises (Demand Deposits)	50	59	139	223	232
TOTAL	3,708	8,057	19,310	34,057	51,321

Source: Bank of Greece: Monthly Statistical Bulletin.

TABLE 3.2

Percentage of the composition of deposits in the Greek Financial System.

	1953	1956	1959	1962	1965
1 Private Deposits and Private Enterprises	55.3	59.1	74.3	73.0	76.0
a Demand deposits	38.0	24.3	15.9	12.0	11.3
b Savings "	3.8	21.8	44.2	45.6	49.3
c Time "	0.5	2.8	6.6	9.0	8.8
d Restricted "	11.5	8.2	5.6	5.3	5.3
e Other "	1.5	2.0	2.0	1.1	1.3
2 Public institutions	43.4	40.2	25.0	26.3	23.6
a Demand deposits	10.3	7.6	5.3	5.4	5.9
b Savings "	20.7	23.3	14.5	16.5	12.4
c Other "	12.4	9.3	5.2	4.4	5.3
3 Public Enterprises (Demand Deposits)	1.3	0.7	0.7	0.7	0.4
TOTAL	100.0	100.0	100.0	100.0	100.0

Source: Bank of Greece: Monthly Statistical Bulletin.

TABLE 3.3

Percentage Distribution of Private Deposits per Category of Financial Institution.

	1953	1956	1959	1962	1965
1 Commercial Banks	98.7	92.4	86.7	83.1	80.5
2 Postal Savings Bank	1.1	6.3	11.0	14.0	16.4
3 Agricultural Bank of Greece and National Mortgage Bank of Greece	0.2	1.3	2.3	2.9	3.1
TOTAL	100.0	100.0	100.0	100.0	100.0

Source: Bank of Greece: Monthly Statistical Bulletin

FOOTNOTES

(1) See J. Pesmazoglou: 'The relation between Monetary and Fiscal Policy' Athens 1966.

(2) The cost of living index rose by less than 20%, 1955-60.

(3) See Pesmazoglou, X. Zolotas.

(4) Increased financing of the deficit through government bonds and Treasury bills, and the obligation of commercial banks to hold a percentage of their deposits in these instruments, did produce a crowding-out effect caused by the competition of the public and private sector for the available funds. However, in Greece this crowding-out was not reflected in rising interest rates (since they are institutionally set). It simply meant that because of credit rationing, certain sectors and individual enterprises had to undertake the burden of credit restraint.

(5) Deficit as percentage of GNP: 1960-64: 3.4%, 1965-69: 2.59%, 1970-72: 3.28% and 1973-78: 6.04%.

(6) The increased part of indirect taxes in total taxes did not allow increases in taxation, since indirect taxes cause price increases by themselves. Furthermore, financing the deficit by government bonds was not possible because rising inflationary expectations required high nominal interest rates.

(7) See J. Papadakis: "Money and Economic Activity: The Greek Experience 1950-78". Athens 1979.

(8) See again J. Papadakis.

(9) Presently, the total of (1) and (2) accounts for the 7% of commercial banks total deposits.

(10) See G. Bitros "The fugibility factor in credit and the question of the efficiency of selective controls" O.E.P. November 1981.

(11) G. Demopoulos "Monetary policy in an open economy: the case of Greece" Athens 1981.

(12) If the bank buys and sells them at the announced price and if the transaction cost of selling these assets before maturity is negligible.

CHAPTER 4

REVIEW OF THE INTERNATIONAL LITERATURE ON SELECTIVE CREDIT CONTROLS

4.1 CREDIT CONTROLS POLICIES VS. CONVENTIONAL MONETARY POLICY (U.S.)

Credit controls are devices used to influence the total volume or distribution of bank credit throughout the various sectors of the economy. Controls over the total volume of bank credit are used when either: a) The conventional tools of monetary policy such as reserve requirements, open market operations and discount window operations cannot operate (often the case in under-developed financial systems) - or b) when the potency of monetary policy is not questioned, but there is some dissatisfaction with the way it operates (as has been the case in the U.S.). Controls which affect the distribution of bank credit and which are applied on its specific components, aim ultimately at reallocating resources. They are used either to encourage the flow of funds into sectors of national priority, or to achieve specific monetary policy objectives in a more balanced way, e.g. when certain sectors are believed to bear a greater burden of monetary restraints than others.

Objections to the way conventional monetary policy operates usually centre on the time lags involved before a given policy produces its results; in the case of a restrictive monetary policy, the upward pressure it exerts on interest rates is criticised. Proponents of direct controls over total bank credit usually argue that these policies are superior to traditional instruments such as controls over non-borrowed bank reserves because of the speed and accuracy with which they hit their target. Furthermore, if monetary authorities desire an independent control of both bank credit and money supply, they must have an instrument over and above a general reserve control. Such an instrument, however, does not have to be a direct quantitative credit quota since other devices such as Regulation Q (the interest rate ceiling of non-

demand deposit liabilities) can have similar effects by driving a wedge between money supply behaviour and bank credit behaviour.

Both direct controls over total bank credit and Regulation W operate through the commercial banks' balance sheet adjustments. In the case of credit controls, ceilings are imposed on bank credit and the banks are thus induced to lower offering rates on time deposits and other bearing liabilities. In the Regulation Q case, offering rates are reduced by fiat and banks are forced to cut supplies of loans and investment. Critics of direct total controls policies argue that their overall effect on aggregate demand control is ambiguous, the result depending on:

(a) Which liabilities and assets will be reduced;
(b) the elasticities of the demand for financial instruments with respect to the relevant interest rates; and
(c) the degree of substitutability between bank credit and non-bank channels of funds.

Proponents of Regulation Q policies point out that this device has the advantage that it can be 'fine tuned' to bear on particular classes of bank interest-bearing liabilities as desired, and can therefore influence the likely investment demand by former holders of these liabilities.

However, both of these policies, either by directly influencing the commercial banks' distribution or assets, of by indirectly preventing them from competing for deposits, are accused of causing an unequal burden of monetary restraint. It is argued that the imposition, in the U.S., of ceilings on savings deposit rates on commercial banks, mutual savings banks and loan associations may have curtailed the supply of funds for housing, by reducing the flow of funds towards all the institutions offering such deposits, including the intermediaries specialising in mortgage lending. There is extensive literature on this: The argument is that if credit controls are responsible for a shortage

of funds moving into housing, or if a general 'tight' monetary policy is 'neutral' or not, on the grounds that some sectors of the economy, such as housing and state and local government expenditure are the 'victims' of tight money whereas other sectors such as business investment are more 'immune' to a restrictive monetary policy. The argument is usually extended on the theoretical grounds of whether this neutrality is 'optimal' or not.

When the incidence rather than the overall efficacy of monetary policy is questioned, selective credit controls seem to be the issue. The advantage of controls on particular components of bank credit is that they can simultaneously depress certain activities, such as consumer spending (in the U.S.) whilst stimulating others, such as housing. However, the overall effect of such policies on the level and composition of aggregate demand will depend on the reaction of the banks. If the banks react to limitations on certain types of credit by diverting the available funds to other outlets, the effects of the policies will depend on the elasticities of demand and supply for credit of these outlets. Thus, the overall effect on aggregate demand is difficult to predict, but a shift in its composition is likely to occur. Only if the banks react to these limitations by reducing the outstanding interest-bearing liabilities on balance would such policies be, theoretically, successful in influencing the level of aggregate demand.

However, there are further theoretical objections to these policies. These include: a) The social costs involved in implementing and maintaining these policies; b) the possibility that these policies, by ruling marginal borrowers out of the market, discriminate against small participants while favouring larger firms; and c) whether or not these policies can have long-term effects; i.e. economic agents (borrowers and lenders), by being innovative, avoid these controls by relabelling contracts or by substituting unregulated instruments (often devised after the imposition of regulations) for regulated ones. (The notion of

'fungibility' of credit, i.e. funds borrowed to finance a specific economic activity being diverted to finance another restricted one, is relevant).

4.2 THE SELECTIVE CHARACTER OF CREDIT CONTROLS

It is relatively easy to distinguish between conventional monetary policy tools and credit control policies in an advanced financial system such as the U.S. This is not always the case when a distinction is required between credit policies that attempt to influence the overall level of economic activity, and policies that are aiming at influencing particular activities or markets, without necessarily having any aggregate short-term effects. For, even if it can be argued that controls that influence the level of economic activity are not neutral, the same argument can be applied to conventional monetary policy. For this reason, it would be useful to be able to point out the differences between credit control policies of a general character and those of a selective character.

The difference between the two types of policy is even more difficult to grasp in the case of a developing country such as Greece. As mentioned before, in Greece conventional monetary policy tools such as open market operations or changes in the Central Banks' re-discount rate do not work. For this reason, credit control policies in Greece attempt to influence both the volume and distribution of credit.

The definitions given in the economic literature do not give much help either. According to one definition, a credit control policy is one that attempts to influence general credit conditions by employing a policy tool, other than changes in the size of claims against the central bank (Hodgeman and Silber 1973). Rao and Karminow (1973) define as a selective credit policy the use of a policy tool to channel credit into a particular financial market, hence into a particular real market.

As Silber (1973) has indicated, the key issue is to distinguish between the aggregate effects and the differential or selective impact of a given policy. He proposes the use of a ratio of the aggregate effects of a partricular policy (say, changes in

GNP) to the redistribution effects, as the criterion on which a credit policy would be classified as general or selective. This ratio would vary between zero and infinity. The larger it is, the more general is the policy. The problem though, is that the selective impact of a policy is difficult to isolate. The question now becomes whether the objective of a selective policy is to affect the distribution of financial flows (only), or to redistribute real resources.

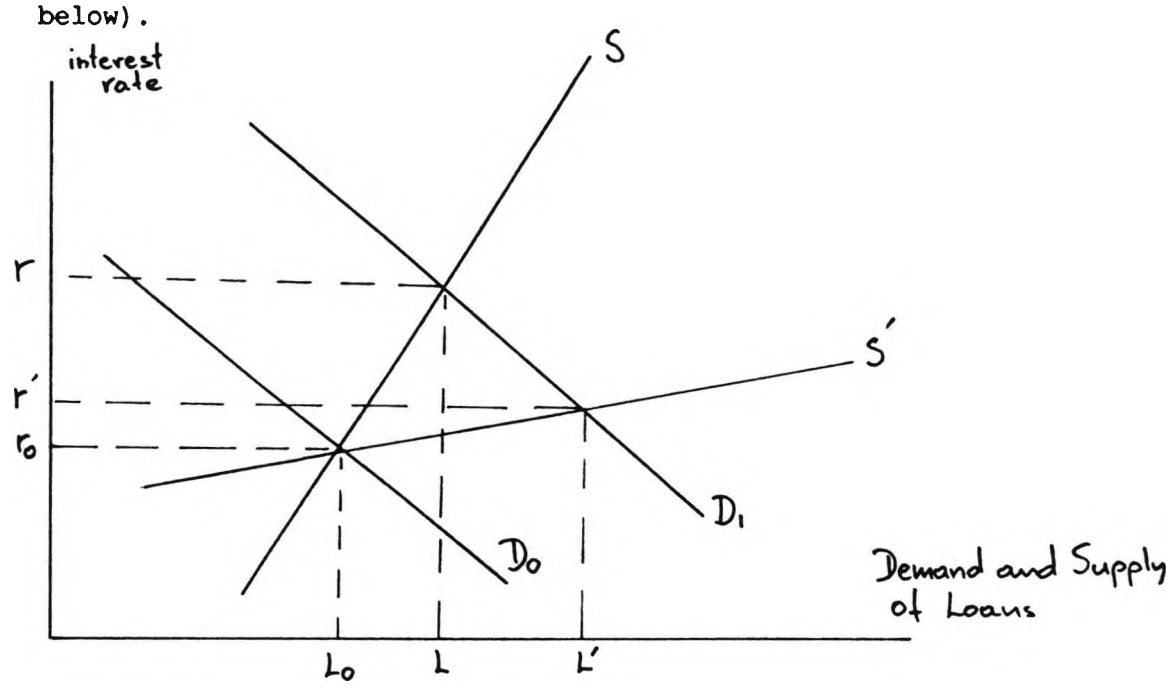
In the case of Greece, as annual reports of the Currency Committee and the Bank of Greece frequently point out, the ultimate objective of the majority of the so-called 'selective credit' policies has been the redistribution of real resources in favour of those sectors of the economy that are considered to be of national priority. For this reason, the policies with which this study will be mainly concerned are closer to Rao and Kaminow's definition or, in terms of Silber's ratio, with the smaller ratio of aggregate to selective impact. However, while the ultimate aim of these policies is to redistribute real resources rather than merely alter financial flows, this study sets out to measure whether they succeed in doing so.

The literature on the selective character of credit controls can be seen as falling into three categories. However, such a sub-division is not totally clear cut since most of the principles are similar, and the approaches differ mainly according to which market (financial or real) or which group of market participants' behaviour (borrowers or lenders) is under examination. The categories distinguish between approaches that mainly use models of the financial sector, e.g. Rao and Kaminow (1973), approaches that explain the portfolio behaviour of financial institutions, e.g. Davis (1971), and finally, models that use financial flows, e.g. Cohen (1968), or lenders' liabilities, e.g. Hamburger and Zwick (1977) to explain real resource utilisation.

As Silber (1973) mentions, the common characteristic of all these studies is that the effectiveness of a given selective credit policy depends on the degree of substitutability that borrowers and lenders perceive between the different financial market instruments. This - as we discussed earlier in this chapter - was the issue when a control of the total volume of credit, Regulation Q was discussed. It so happens that Regulation Q, is a control applied in the U.S. to a financial instrument - the interest rate on deposits. However, the same issues apply to controls with a selective character, applied directly to lenders or borrowers. When the controls are applied to lenders, for example in the form of differential reserve requirements or some other portfolio restriction, the success of the policy in reallocating financial flows relies on the poor substitutability between different securities in lenders' portfolios. However, although this poor substitutability might ensure that the policy has some impact on the relative interest rates, to have an impact on real resource allocation, it would require the additional condition of poor substitutability between types of credit for borrowers (i.e. credit should not be fungible from the point of view of borrowers). In addition, as Silber mentions, if the interest rate elasticities of various types of expenditures differ, the credit policy will not only have a selective impact, but will also alter the aggregate economic activity.

When controls are imposed on borrowers, the conditions are different. An interest subsidy, for example, is more effective in reallocating financial flows if there is a high degree of substitutability in lenders' portfolios (Penner and Silber 1973). This becomes apparent if we assume that the subsidy shifts the demand for the particular funds that are subsidised. Then, the high substitutability between securities for lenders ensures that the supply of loans is more elastic. As a result, a given shift in demand will cause a larger increase in the quantity supplied and a larger decline of the interest rate paid by the lender, the more

substitutable securities in lenders' portfolio (see the diagram below).



Schedule 4.1 The result of a shift in the demand for loans schedule

When the supply schedule is S' (elastic), the amount of loans provided is L'. However, even if the amount of loans extended is higher (by LoL') than the amount of loans that would have been extended if credit was not subsidised, it will not ensure a change in the use of real resources. If different types of loans are close substitutes in borrowers' portfolios, it is probable that borrowers will use the extra amount of credit to finance other expenditures (particularly if credit for the finance of these expenditures is restricted). This does not necessarily have to be done by directly using LoL', but it may be realised from borrowers' own resources which are now freed by the additional amount of credit available. So to ensure an increase in demand for a sector whose finances are subsidised (with no fungibility of funds), we still need the additional condition that different types of loans should be poor substitutes in borrowers' portfolios. This point demonstrates that, even if a given selective policy alters financial flows, it does not necessarily lead to a change in real expenditure, unless additional conditions are satisfied.

4.3 EMPIRICAL EVIDENCE OF THE EFFECTS OF CREDIT CONTROLS FOR THE U.S.

This study will attempt to explain whether the reallocation of financial flows that the monetary authorities in Greece have persistently pursued, has had any effects on real resource allocation. Because of the peculiarities of the selective policies applied in Greece, (presented in a subsequent part of this chapter), the method used at some stage, will have to be different from the 'common principles' mentioned in the previous part. The traditional approach basically states that if the ultimate objective of selective controls is to reallocate real resources, a prerequisite is to change financial flows, i.e. (before any effect of the real sector) to change the relative interest rates on the various financial instruments. Where there is perfect substitutability between instruments for borrowers and lenders, the relative interest rates will eventually return to their original levels.

In Greece, the interest rates on banks' securities portfolios are also determined by the authorities. For this reason, we believe that - when applied to Greece - models of the financial sector based on relative interest rate adjustments, or bank portfolio models comparing different positions of equilibrium of commercial banks before and after the imposition of the selective policies may be inappropriate, or may require important changes and constraints. Moreover, they will not always be sufficient to answer the question; what is the effect on real resources?

However, models that use financial flows to explain real resource utilisation are appropriate for a study of Greece, since no interest rate adjustment takes place and the loan markets are, in most cases, in disequilibrium. For this reason, although later in this chapter we refer to both bank portfolio models and models of the financial sector modified to account for the presence of continuous disequilibrium, our attention on the empirical evidence

in the international literature concentrates on models where financial flows or stocks of borrowers' liabilities enter the demand function for real expenditure.

Empirical discussions often focus on how investment in certain sectors of the economy is affected by the imposition of credit controls. (There are several studies on how investment in housing in the U.S. was affected by such controls). Other studies focus on how credit controls influence expenditure in certain sectors of the economy, and particularly expenditure on consumer durables.

Initial studies supported the advocates of selective credit control policies by showing correlations between particular expenditure flows and flows of credit typically used to finance these expenditures. A study by D. Humphrey (1957) examined the effect of instalment credit controls, and provided evidence that; a) there is a closer synchronization of the movements of instalment credit to the movements of durable expenditures than to the movements of income; and b) that the use of credit per dollar to finance durable expenditure is reduced when credit controls are introduced. Humphrey concludes that the volume of credit affects expenditures and that credit controls, by reducing the use of credit, reduce the level of expenditures.

A criticism of this view, by Hamburger and Zwick (H & Z) (1977) is based on the grounds that the evidence produced by Humphrey could be interpreted as meaning that expenditures affect the volume of credit, and that credit controls cause people to reduce their savings, or obtain alternative forms of credit to maintain their level of expenditures. If this is the case, the claim in favour of credit controls is dismissed. Alternatively, using Hamburger's (1967) stock-adjustment model of the demand for automobiles and other durables, and by examining the errors in prediction of these expenditures for the period 1948-52 (when for some quarters - 4th 1948, 2nd 1950 and 1st 1952 - instalment

credit controls were imposed) H & Z show that although the model made no allowance for credit controls, there is no tendency for it to overestimate expenditures when controls are operative. Nor do these controls impair the model's explanatory power. This evidence is interpreted by H & Z as indicating that when controls on the extension of instalment credit were imposed, consumers, in an attempt to maintain durable goods expenditures, either reduced their stock of savings or obtained alternative forms of credit.

H & Z further examined more recently (1979) the efficacy of selective credit controls policies by using Mishkin's model (1976) of consumer durables expenditures. Mishkin observes that most of the models of consumer durable expenditure fail to show the significance of interest rates as an explanatory variable (with the possible exception of Hamburger's (1967) attempt). Mishkin examines whether there are alternative channels of influence on these particular types of expenditures. Mishkin treats investment in consumer durables as part of consumers' overall portfolio decision process, as do other studies. However, because of the illiquid character of these goods, and assuming both that the market for durables is imperfect (since large sales in a short period are costly) and that consumers are risk averse, it follows that the desired stock and resulting purchases of durables should be positively related to the existing stock of financial (liquid) assets, and negatively related to consumers' indebtedness. Therefore, in Mishkin's study, household assets and liabilities are included as determinants of expenditure demand, together with the usual variables such as relative price, income and interest rate. H & Z, in their study, incorporate the same variables as Mishkin, but for the following reason: They assume that households not only seek to achieve desired stocks of durable goods; they also seek desired levels of financial assets and liabilities. Therefore, a higher level of consumer indebtedness would retard investment in durables, an effect similar to Mishkin's. H & Z further state that if there is no substitution between consumers' liabilities

(i.e. expenditure in durables can only be financed by instalment credit), then imbalances in the cumulated stocks of liabilities that finance a certain type of expenditure will have a greater effect on their associated expenditures than imbalances in other liabilities (i.e. the effect of instalment credit would be larger in absolute value than the effect of other liabilities). In this case, controls affecting instalment credit would be effective. However, if the effects of instalment credit and other liabilities are similar, it would indicate that consumers choose overall liabilities positions when planning purchases. Thus controls on a particular type of credit would be ineffective. The results of their estimates indicate that although total household liabilities have a large effect on durable goods expenditures, the distribution of these liabilities between the form of credit typically used to finance them and other liabilities has no effect. The advantage of the H & Z study over others is that it uses the beginning-of-period liability stocks and subsequent expenditures, thus showing the adjustment of expenditure patterns to disequilibria of household balance sheets generated by credit allocation programmes. However, there are some limitations of this study, as H & Z indicate:

A) Although it suggests that consumers seek to substitute other forms of credit for those that are restricted, it fails to give any evidence of whether consumers succeed in doing so; and

(b) the effect of actually imposing consumer (i.e. instalment) credit controls is not tested.

A more recent test by B. Maris (1981) examines the question of causality between consumer credit (CC) and expenditure in durables (DG). Maris uses the Sims test for causality (1972) which involves regressing consumer credit firstly on current and lagged values of durable expenditures, then on current, lagged and future values of DG, and finally repeating the process by reversing CC and DG. For this test to be valid, the regressions containing leading

values must be white noise, and CC_t and DG_t must have stationary covariance. Maris's results (coefficients of CC on DG and of DG on CC are both significant) show evidence of causation running both ways between CC and DG, ruling out the possibility that the correlation runs from expenditures to credit (as H & Z suggested in the 1977 study).They suggest instead that since changes in credit extension do affect durable expenditures, measures influencing the allocation of credit to consumers may affect the distribution of expenditures. However, there may be an alternative explanation for the effect of CC on DG. If total credit affects DG, and consumer credit acts as a proxy for total credit, the results cannot demonstrate the efficiency of credit allocation policies, nor can they rule out the substitution between instalment credits and other forms of credit suggested in H & Z (1979).

A criticism of both H & Z's and Maris's tests presented by L. Molho (1983) runs as follows. In Mishkin's model, household debt and financial assets are included in the expenditure function since the expected cost of holding an illiquid asset is positively related to the probability of making a distress sale, which will in turn take place if:

Consumption + Debt service > Income + (liquid) Financial assets.

Therefore, the opportunity cost of holding consumer durables is positively related to debt service and negatively related to financial assets holdings. Molho stresses at this stage that the single link in Mishkin's test between expenditures and household debt is <u>debt service</u>: he therefore questions H & Z's version of household debt being composed of two components. He states that there is no reason to expect debt service to be affected differently by different types of debt; there is therefore also no reason to expect the coefficients of the two debt variables to differ, nor to interpret their similarity as evidence that credit controls are ineffective. (Molho emphasises that it would be more useful to examine the impact of current credit flows on current

expenditures rather than debt accumulated in the past as the only channel through which credit flows affect expenditures).

In the same study, Maris's approach is also criticised. Molho argues that, in the absence of credit controls in Maris's sample period (1952 III - 1977 III),the innovations in the CC series reflect general monetary actions rather than selective policy. Thus, as Maris himself, acknowledges, CC acts as a proxy for total credit extended, and the effects of this variable rather than CC are captured by the estimates. Thus, Maris's results reflect the independent influence of monetary policy to expenditure, and cannot be used as support for the effectiveness of selective credit controls. However, these results are useful in ascertaining the validity of results of another study, namely that of J. Cohen (1968). In this study, equations with expenditures as dependent variables and credit flows as independent variables are estimated by using the O.L.S. method. Cohen interpreted his results as favouring the view that credit controls are effective. However, evidence from Maris's article on causality suggests that there is a simultaneous equation bias in Cohen's results (since there is bi-directional causality and O.L.S. is used), thereby casting doubt on their validity.

Cohen's model was constructed with the aim of integrating financial flows and real resource allocation. He states that modern expenditure theory, by introducing income as a source of funds (internal finance), breaks the link between external finance (borrowing) and investment expenditure which is negatively related to the rate of interest. In other words interest rate cannot be used as a proxy for external finance, since a higher interest rate might be caused by shifts in either the demand or the supply of credit, and would denote a higher or a lower finance by credit, respectively. Cohen's idea was for the interest rate and the financial flow to mutually determine each other. The flows from equilibrium solutions of financial markets can then enter

expenditure equations along with internal finance as explanatory variables.

Cohen extends these assumptions to evaluate the potential effectiveness of credit controls in the following way: If different categories of expenditures are better explained by particular types of financial flows (e.g. residential construction by mortgage lending, durables expenditures by consumer credit, and expenditure in corporate plant and equipment by corporate stock) than by aggregate financial flows, then a case for the efficacy of selective controls is made. The findings seemed to support selective credit controls for some types of expenditures. However expenditure on durables seemed to allow for substitution to take place between different types of financial flows. (Expenditure in durables was better explained by the interest rate in Cohen's principal test to compare the significance between interest rates' and financial flows' explanatory power). Cohen's tests were also criticised on theoretical grounds by Silber (1973). Silber argues that substitution between different types of flows to finance expenditures is better measured, theoretically, by comparing responses to relative interest rates rather than different financial flows, unless credit rationing is dominant and interest rates have no relevance. In addition a few variables which ought to be included in expenditure equations are not actually used in Cohen's test. The same applies to lagged variables to test for the existence of offsetting effects over time.

CHAPTER 5

CREDIT CONTROLS IN THE CASE OF GREECE

5.1 CREDIT CONTROLS IN THE GREEK FINANCIAL SYSTEM

The nature of the Greek financial system has already been discussed in previous chapters. It is now worth considering how some of its characteristics influence the conduct of research on the effects of selective credit policies. Some of these points have their origin in the fact that Greece has an under-developed financial sector, and as such they could be encountered in any study of selective policies in a developing country. Others, however, have to do more with the nature of these credit policies applied to the Greek financial system.

5.1.1 The absence of alternative sources of finance, other than bank credit.

The fact that the capital market in Greece is under-developed (e.g. in 1969 (the mid year of the period we are examining) only 12% of finance for industry was obtained directly through the capital market, as Bitros (1981) mentions), results in insignificant funds directly channelled to potential borrowers. This under-development, as already mentioned is partly caused a) by the reluctance of firms to market their securities because of the family character of these firms and the unwillingness of owners to dilute their stock, and partly b) by the low market activity and the dividend policies of these family firms which make their stocks unattractive as stores of value for an investor. Either way, equity finance appears undesirable both from the demand and the supply side of the market.

This financial under-development forces the deficit units of the economy to obtain their funds through the banking system, which is itself subject to selective credit controls. The absence of any alternative sources of finance favours the setting up of empirical research into the effectiveness of credit controls, since it restricts the range within which

financial agents are able to construct alternative financial instruments.

5.1.2 The permanent and continuous character of these policies.

In developed economies, with a sophisticated financial system, selective credit policies are usually imposed on a temporary basis. This is because it is believed that their impact is experienced immediately, but is gradually reduced in the long run. This view not only has a theoretical explanation, but also seems to be supported by empirical evidence. Theoretically, in the short-run, economic agents, by not being able to react because of institutional rigidities or transaction costs, have to comply with the policies: in the long-run they can adjust their portfolio and - by using innovative financial instruments and practices - circumvent the restrictions. As Silber mentions (1973), the free market responds to constraints imposed in one area by creating new instruments in another, to evade the restriction. Empirically, studies that examine the substitutability of securities in lenders' portfolios, find short-run cross-elasticities significantly smaller than long-run elasticities. This indicates that, in the short-run, lenders' portfolios are unable to react extensively to rate differentials. These studies, in the main, use stock adjustment models applied to portfolio behaviour, but as Silber (1973) observes, ignore the interrelations between the real and financial markets.

In the case of Greece though, the monetary authorities seemed to believe (as their actions indicate) that the implementation of these policies could and should be continuous. This could be prompted by a belief that, either these policies are the only effective ones for Greece, or that the absence of alternative channels of credit, and the continuous presence of rigidities and transaction costs which

constrain the behaviour of financial agents create a favourable environment for these policies.

5.1.3 The conditions under which loan markets are forced to operate.

As we shall see in the next section, the nature of the credit controls applied in Greece prevented interest rate adjustment and consequently, forced the loan markets to operate under conditions of permanent disequilibrium.

This was mainly the result of the policy of administering (maximum) interest rate ceilings. The situation was further complicated by the imposition of the minimum loan requirements and the reserve/withdrawal ratios with which banks had to comply. Although the detailed effects of these policies will be investigated later, it is worth discussing how they affect the framework of research into their effects.

The determination of interest rate ceilings by the monetary authorities causes demand functions for loans to be unidentifiable for the purposes and conduct of an empirical study. This may occur either because the market is in excess demand, in which case the observations reveal the supply of bank credit rather than demand; or, when the market is in excess supply, because of the practice of commercial banks not to lend to their customers at rates below the specified maximum limits. In this case, the observations tend to concentrate along the lines defining these limits.

The implication for the conduct of empirical research is significant. If it can be shown that a particular market is in excess demand, irrespective of whether the amount of loans extended is supply determined or not, credit rationing should take place continuously. In this instance, the use of a model similar to Cohen's (1968), incorporating financial

flows to explain real resources utilisation can be used satisfying Silber's (1973) criticism. The continuous rationing ensures that the relevant variable in, say, an investment expenditure equation, does not have to be the relative (interest) rate, but rather the financial flow itself.

When a model of the financial sector is used, the presence of continuous disequilibrium should also be taken into account. In this instance explaining changes in a bank's portfolio which requires degrees of 'substitutability between assets', as having been prompted by changes in interest rates for the various financial instruments, is not appropriate, since these rates are not free to adjust. In a recent study, Molho (1984) attempts to account for this disequilibrium by using the assumption that the amount of loans extended is determined either by notional demand or by notional supply, depending on the particular type of disequilibrium. However, even such a model should be used with caution, since the combination of predetermined loan rates policies with minimum loan requirements might force the market participants off their notional demand and supply schedules.

Finally, one of the peculiarities of the credit controls applied in the case of Greece results from the imposition of reserve/withdrawal ratios on banks' assets with the aim of equalising the return from the various categories of loans. Such a policy leads to circumstances where the rates paid by borrowers are different from the implicit returns to lenders for particular types of loans - a characteristic that should be taken into account when a particular loan market is examined.

5.2 SOME COMMENTS ON PREVIOUS RESEARCH

A model similar to the one just described has been constructed for the Greek case by G. Bitros (1981), where he tests the interactions between financial flows and resource utilisation. Investment functions in fixed and working capital are estimated by using a model similar to the one constructed by Dhrymes and Kurz (1967). Short and long-term credit are entered as explanatory variables in both of them, together with other variables such as suppliers' credit, current and lagged values of capital equipment, and loans from sources other than the banking system, (which satisfies another point of Silber's criticism). For credit controls to be effective, there has to be no fungibility, which in turn implies (assuming that banks comply with the regulations precisely) that long-term credit is used to finance fixed assets while short-term credit is used to finance working capital. For this reason, long-term credit is expected to enter with a positive and statistically significant sign in the investment equation and short-term credit in the inventory and accounts receivable equation. Credit controls would be ineffective if either none of the credit variables appeared significant in the equation, or only one appeared significant in all three equations (which would imply that the cheaper form of credit is used in both short and long-term activities). Where short and long-term credit are mildly substitutable, long-term credit should be more closely related to fixed asset investment than short-term, if credit controls are to be effective.

The equations are estimated by 2SLS by pooling from cross-section and time-series data (therefore, a point of Molho's (1983) criticism of Cohen's type of test is satisfied once the method used is not OLS). The first part of the test examines the endogeneity of short-term, long-term and suppliers' credit. It estimates the model for these variables treated first as exogenous, then as endogenous, and finally comparing these sets of coefficients with Haussman's criterion of simultaneity. The variables prove to be

endogenous whether they are entered into the equation singly or in pairs. The test seems to perform quite well, especially in establishing a significantly positive relationship between gross investment and external finance (since the coefficients of all the three relevant variables are significantly positive).

As far as the effects of credit controls are concerned, since the credit variables are found to be endogenous in the model, one concludes that the credit flows from the banking system vary according to the demand, which in turn depends on entrepreneurial decisions and not on the decisions of the authorities.

If, on the other hand, the system of equations is tested with the variables treated as exogenous, the test's performance weakens significantly (the explanatory power reduced by 10%). However, even if it is assumed that it gives estimates which are the true values of the parameters sought, the elasticities calculated give a long-term elasticity of investment in fixed assets with respect to long-term credit that is negative. This can be interpreted as meaning that even when the credit variables are exogenous, the credit controls applied are unsuitable for influencing the rate of gross fixed investment.

There are two points, however, that need some clarification. Firstly, if we accept the system of equations where the credit variables are treated as endogenous (since its performance is better), the ineffectiveness of credit policies is supported solely by the fact that the flow of funds to the financing of short and long-term investment depends on investor demand and not on the actions of the authorities. However, since interest rate policies were in effect during the same period (and since the long-term interest rate was administratively set below the short-term interest rate), to prove the ineffectiveness of government policies we need, additionally, to show that demand for particular types of credit was not affected by government policies (this point is not shown in Bitros' model)

Secondly, even if we accept that the demand for particular types of credit is unaffected by these policies we should be careful when using this as evidence against selective credit controls. The above test was used to assess the effectiveness of these policies in stimulating certain activities, namely long-term investment. If corporations were reluctant to undertake long-term investment because of the uncertainties and associated risks, these policies were destined to be unsuccessful before they were even applied. The majority of selective credit policies are designed to restrict (rather than stimulate) particular activities (e.g. in Greece: import trade, consumption expenditure). The effectiveness of credit controls will only emerge when we examine whether they succeed in this restriction.

The absence of any effect of the loan rates policies on the demand for loans and, subsequently, on the demand for real assets, implies that Bitros' evidence concentrates mainly on the authorities' attempt to increase the availability of credit by the imposition on commercial banks, of the minimum loan requirement for long-term investment loans. The effects of interest rate differentiation are discussed in a more recent paper by L. Molho (1984). Although the two papers, as discussed below, examine the effects of two different selective credit policies using drastically different models, they have a few important points of overlap. Bitros attempts to collect evidence on the question of credit being fungible (i.e. funds obtained for a certain purpose may be used for another); Molho has as a starting point that credit should be fungible, at least in the Greek context. This allows him to assume spillovers of excess supply or demand from one financial market to another. The second overlap refers to Bitros' conclusion that the amount of loan extended is determined by demand for loans; Molho's discussion is based on the assumption that the loan rates policy is aimed at influencing this demand, on the implicit assumption that borrowers are on their notional demand curve for loans.

However, the two models differ not only in their examination of different types of selective policy, but also in their context: Bitros uses a model of financial flows to explain resources utilisation, while Molho uses a beginning of the period (stock) model to examine the effects of financial markets disequilibria, maintaining a separation between the goods and asset markets.

Molho's paper extends the study of the effectiveness of selective controls policies from the context of general equilibrium models (Rao and Kaminow (1973) and Penner and Silber (1973)), to a context of disequilibrium on the basis that tight control of the banking system (as in Greece and in other developing countries) might prevent the interest rates adjustment necessary to clear the financial markets. This is a model of the beginning of the period (stock equilibrium). By allowing all existing assets to be on the market at any time, such a model allows a consideration of the financial sector of the economy independently of the goods sector - in disequilibrium as well as in equilibrium. Thus, any spillover effects from the financial sector to the goods sector (since the model examines disequilibrium situations) are avoided.

Molho assumes that wealth is held in the form of two physical assets, H and K, as well as in currency and deposits (liquid assets), bearing rates of return r_h, r_k, r_d and 0. There are two types of loan available, L_h and L_k, at interest rates r_i^h, r_i^k, to finance the purchases of H and K. Wealth owners are assumed to be free to use the funds as they like (i.e. credit can be fungible).

The impact of loan rates policies is analysed by studying their effects on the required rates of return of assets H and K. As Molho mentions, this implies that the marginal productivity of H and K are fixed. Thus a change in the required rate of return in the short-run will affect the profitability of the investment. The transmission mechanism of this approach is Tobin's: a change in the required rates of return will change the market valuations of

stocks H and K relative to replacement value, and affect the profitability of investment until equality between the rate of return and marginal productivity is reached again.

The asset and loan demand functions are assumed to be homogeneous of degree one in wealth (i.e. the level of wealth does not matter). Furthermore, the asset supplies are assumed to be predetermined. This allows the equilibrium condition of the assets markets to be expressed as equalities of the various asset demands, i.e.as functions of the spectrum of interest rates and returns with fractions of private wealth.

To enable him to focus only on policies which reallocate bank credit but do not influence its volume, Molho assumes that the authorities adjust the required reserve ratio to keep the amount of disposable funds fixed at a given level.

Finally, all assets and loans are mildly substitutable (as mentioned before). For lenders, different risks of default, and for borrowers fear of penalties for misuse of bank credit, prevent them from regarding the various types of loans as perfect substitutes (borrowers can shift funds across sectors, as long as increased credit availability in one sector will free their own resources).

With these assumptions Molho is able to simplify the model of the financial sector. After specifying the mathematical form of his model, he examines the effects of loan rate changes on the required rates of return on physical assets in each one of the following three situations.

5.2.1 Excess supply in both loan markets

Here, the policy works in general, on the principle that when r_i^h falls both r_h and r_k will fall but the effect on r_h would be larger

than the effect on r_k. (In other words investment will rise for both assets but more for the asset whose loan rate has fallen).

The solution shows that, although the required rates of return of the two assets will move in the same direction, this effect cannot be safely determined purely on the assumption that the demand for each asset is more closely related to the interest rate of the loan associated with this asset (a necessary but not sufficient condition). For the sufficient condition to be satisfied, and given that total demand for high-powered money depends on public demand for currency, and bank demand for required and excess reserves (the excess supply in the loan markets is assumed to be absorbed by banks as excess reserves), the substitutability between each asset and high-powered money becomes important.

The mathematical solution of the model indicates that the policy will not work when high-powered money is a much closer substitute to asset K than to asset H. This case is interpreted by Molho, with an example as follows: A rise in r_i^h causes excess supplies of H and K and excess demand for high-powered money. The excess supply of K might be exacerbated by the excess demand for money, to such an extent that r_k may rise more than r_h. This is an instance when a change in r_i^h will only affect r_h without affecting r_k, in which case the policy is effective irrespective of the substitutability between high powered money and asset K.

5.2.2 Excess supply in one loan market, excess demand in the other.

In this instance borrowers and lenders are assumed to react in such a way that the two types of disequilibria tend to mitigate each other: borrowers faced with rationing in the excess demand market (L_h) increase their demand for the other type of loans (L_k), thus reducing the excess supply there, thereby decreasing their demand for liquid assets. Lenders, constrained in the excess supply

market (L_k) add funds to the supply of the other market (L_h), thus reducing the excess demand there.

Although the initial effect of creating disequilibria in the two loan markets will reduce the effective supply of funds in both markets (effective supply equals demand in the excess supply market, and supply in the excess demand market), thus reducing effective demand for assets H and K from the levels of unconstrained demand, the policy effect does not stop there. The spill-over effects mentioned above (necessary condition) ensure that a rise in r_i^k decreases demand for L_k (and therefore effective supply), while effective supply of L_h rises as banks tend to dispose of their idle funds, thus raising effective demand for the physical assets. If, furthermore, some of the excess demand for L_h spills over into the market for liquid assets and each one of the two physical assets is more closely associated with their own type of loan (sufficient condition) the rise in r_i^k will ultimately stimulate investment in H and discourage investment in K.

Finally, the condition that excess demand in a loan market does not spill over exclusively to the other market is also a necessary and sufficient condition for stability in the system. Otherwise, an autonomous increase in demand for L_k will cause a rise in effective supply for L_k with a further rise in demand for L_k. While this process should continue until the disturbance is absorbed, if L_h and L_k are close substitutes the initial disturbance will cause such an increase in demand for L_k,that the excess supply in this market will be eliminated and the system will become one where there is excess demand in both loan markets (see below).

5.2.3 Excess demand in both loan markets

In the final instance, since there is excess demand in both loan markets, and since effective demand for loans is equal to the

supply of loans, the effective asset demand functions depend on loan supplies L_h^s, L_k^s and are independent of demand conditions.

On the assumption that demand for each asset is more sensitive to the supply of loans for that asset, the mathematical solution indicates that it is impossible, by changing r_i^k, to stimulate investment in H while discouraging or even leaving investment in K unchanged.

If we also take into account the fact that banks have loan supply schedules, with some interest elasticity, a rise in r_i^k (if no spill-over effect on currency and deposits are assumed) will change the composition of bank portfolios in favour of L_k^s while L_h^s will decrease.

Investment spending will then rise in the sector where credit has become more expensive.

The advantages and drawbacks of Molho's model depend on its main assumptions. The fact that he uses a beginning of the period model avoids the issue of Walras' law (which would hold between the goods and assets markets in a flow model) and, as mentioned before, allows the separation of financial and goods markets in conditions of disequilibrium.

The use of the Tobin and Brainard (1963) framework in disequilibrium situations, along with Tobin's transmission mechanism not only allows for a clear cut derivation of the effects of the loan rates policy in each one of the three disequilibrium situations, but it also allows the formalisation of conditions under which these results hold, with respect to different degrees of substitutability between the two physical assets and different degrees of spill-over between physical and liquid asset markets.

Since the model assumes that demand functions are homogeneous of degree one in wealth, changes in the level of wealth do not influence demand. This means that the assumption of predetermined asset supplies, if relaxed, will not change the results considerably. As Molho mentions, dropping this assumption would imply that supplies of assets, instead of being expressed as fractions of net private wealth, become functions of the required rate of return. In such a case, a fall in the required rate of return of capital, for example, will increase the market value of capital stock and, consequently, net private wealth. The signs of the various partials of Molho's mathematical approach will not change.

Another strong assumption is that to keep credit constant, the authorities will adjust the reserves requirement ratio continuously. If this assumption is relaxed, the policy target variable of the authorities becomes crucial : if high-powered money is the only target variable, then a rise in a loan rate would not only change loan demand and supply, but would also decrease deposits and total credit. Although this does not alter the model's results in the case of excess supply in both loan markets, it will increase the excess demand for loans in the other cases, making the results ambiguous. Alternatively, if total liquid assets (currency and deposits) are the policy target, changes in a loan rate, provided they do not alter the currency-deposits ratio, will not affect credit supply.

Molho's analysis offers a practical rule for the use of loan rates as a selective policy: to render this policy effective and to avoid any perverse results, the margin between the imposed rates must be so wide as to ensure that the market for loans to finance purchases of assets that are to be discouraged is in excess supply, while the market for loans to finance activities to be stimulated is in a state of excess demand. At the same time the condition necessary for stability, namely that there is less than a 100 per

cent spill-over from the excess demand to the excess supply market, has to be satisfied.

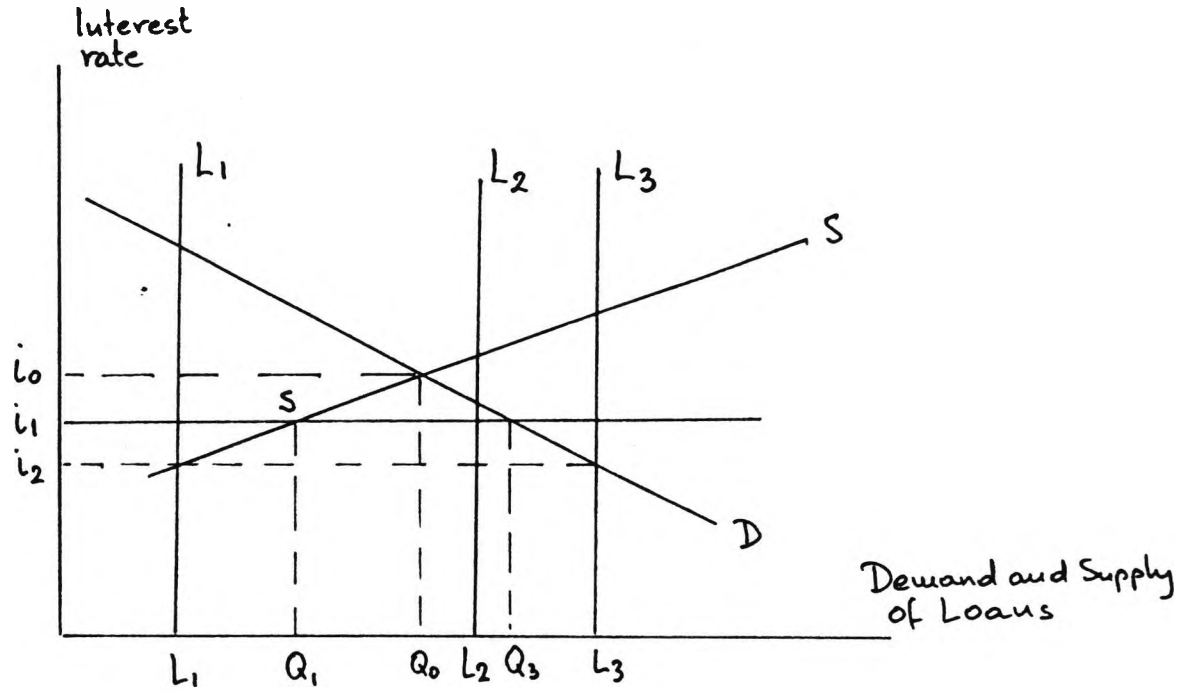
Molho then applies his theoretical implications to the case of Greece: the fact that existing loan rates have been low relative to the high inflation rate in recent years, indicates that loan markets were in excess demand and therefore the loan rates policy was ineffective. Molho argues that the monetary authorities have applied the asset reserve requirement scheme to avoid the possible perverse effects of this (under c. above). Extending his analysis, he observes that if, instead of ceteris paribus changes in loan rates, the asset reserve requirements and the supply of high-powered money are varied to offset the effects on the notional loan supply (and the demand for reserves), the loan rate changes will not alter the composition of real investment.

The important question is to examine how the implications of Molho's model compare with Bitros' (1981) empirical findings. Although the two approaches have differences in the exact subject and method, there are areas of overlap on which there should be agreement. If, for example, the situation in Greece is best described by the conditions under (c) of Molho's model, the amount of loans extended should be determined by the bank's loan supply schedule. However, one of Bitros' (1981) findings is that since in his model of investment in plant and equipment, and in inventories and credit to customers, the variables of banks' long and short-term credit were found to be endogenous, the amounts of funds that firms borrow from the banking system to finance these activities, "vary in association with the demands that arise for such funds from entrepreneurial decisions". If by these "demands" Bitros is actually implying the demand for the particular loans, then his results and Molho's model implications are contradictory.

Another point of Molho's model we need to examine when applying it to the Greek case, is the effect of the imposition of minimum loan requirements on commercial banks (such as earmarking 15 per cent of total deposits for long-term credit to industry) on his model's assumption that when the interest rate of a particular loan is

below equilibrium, effective demand equals supply. It seems that if a minimum reserve requirement is applied above the level of supply at the prevailing loan rate, and banks comply with it, it is the requirement that determines effective supply and borrowers are off their notional supply schedule. In fact Molho, in his paper, mentions the possibility of a simultaneous presence, in certain loan markets, of excess demand along with excess supply, where both groups of borrowers and lenders are off their notional schedules.

A recent criticism by Leite and Zadeh (1984) of Bitros' (1981) findings, along with his reply (1984), is pertinent since the discussion not only focuses on the possible effects of the imposition of a minimum loan requirement, but also brings a new consideration into these markets: i.e. the influence of banks' collateral requirements on borrowers' demand schedules.
Leite and Zadeh criticise Bitros' findings on both econometric grounds and his theoretical methodology. Their criticism basically refers to the conduct and inferences of his particular test of endogeneity of short and long-term credit in the investment function. Their objection to the empirical findings concentrates on the aggregation of various firms to build industry data for the estimation of the investment function. Leite and Zadeh claim that if the same test was applied at the individual firm level, some firms' long-term loans could be found to be endogenous, others exogenous, while the aggregate data might well indicate that the variable in question is endogenous.
Apart from this aggregation problem, Leite and Zadeh question Bitros' theoretical methodology: the exogeneity of long-term credit in firms' investment decisions is not a necessary condition for the effectiveness of credit controls. Selective credit policies can be effective even if the amount of loans is determined by demand. To prove this proposition they use the following diagramatical representation of the market for long-term loans:



Schedule 5.1: The effects of interest rate ceilings and MLR on the market for long-term credit.

If the loan rate is administratively set below its market clearing level (i_0) to, say, i_1 (which for Leite and Zadeh does not constitute a selective credit policy), the amount of loans is determined by supply; from the borrowers point of view, the amount of loans extended (Q_1) is exogenous. In this instance Leite and Zadeh claim that Bitros' test is not about the effectiveness of selective credit policies, but about the adequacy of the interest rate structure. However, as we have seen from Molho's article, this interest rate structure could very well be the result of a selective credit policy.

Leite and Zadeh assume next that a minimum loan requirement is imposed: if it is set at $L_1 < Q_1$ then the amount of loans is still determined by supply and is exogenous to borrowers' decisions. As a selective credit policy it is ineffective, since it does not actually increase the amount of long-term loans. Furthermore, Leite and Zadeh state that for the individual firms the amount of loan might be exogenous or endogenous depending on whether the firm is rationed out of the market or not.

If the MLR is set at $L_2 > Q_1$ but $L_2 < Q_3$ the policy becomes effective and the loans extended are exogenous to borrowers' decisions (borrowers are still off their demand schedule). However, at the individual firm level, the issue of exogeneity still depends on whether the particular firm is rationed out to the market.

Finally, in the most interesting case, the MLR is set at $L_3 > Q_3$. Now two things can happen: either the banks will extend loans up to Q_3 and (in the case of Greece) L_3-Q_3 will be deposited by the Bank of Greece as low yielding reserves, or the interest rate will be reduced to i_2 and the amount of long-term loans will be L_3. In both cases the MLR is effective as a selective credit policy, in the sense that it increases the amount of long-term loans extended to meet the borrowers' demand at the prevailing interest rate. Consequently, Leite and Zadeh claim the selective policy is effective while the amount of loans is determined by borrowers' decisions, making the exogeneity issue irrelevant. The only difference between the two cases is that when the amount of loans is L_3, the interest rate is endogenous.

Bitros (1984) in his reply does not accept the criticism of aggregation applied to his data on the grounds that it is "professional practice" for tests to be conducted at a macro-level on aggregate data without having to resort to a large number of tests on the individual level. However, he performs some additional tests at the individual firm level, particularly on small-sized firms which are the first ones most likely to be rationed out of the loan markets, and the credit variables are still found to be endogenous.

His reply to the criticism of his method focuses on the case where the MLR is set at L_3. He seems to accept that the availability of funds is increased, but he states that the amount of loans will be either Q_3 or L_3 only under the "grossly oversimplified" assumption of a bank's passive behaviour. At this point Bitros brings an

additional interesting argument into the discussion, that of collateral requirements.

Banks are now faced with the choice of either extending loans up to L_3 at a rate i_2, thus fully complying with the MLR or extending loans of Q_3 keeping the difference (L_3-Q_3) in low yielding reserves by the central bank. At this stage, Bitros claims that if the banks' behaviour is not passive, they will make use of another variable in their control to affect borrowers demand. If we assume that the position of a borrower's demand schedule depends on collateral requirements, then banks, by changing these requirements, can move the borrower's demand schedule in line with their interests. If banks find it in their interest to extend loans up to L_3, thus complying with the regulation, they can ease collateral requirements, thus shifting the D schedule to the right and extend these loans at a rate of interest i_1. Alternatively if the interest rate is administratively reduced to i_2, but banks find it in their interest to keep the amount L_3-Q_3 as low yielding reserves (once the differential between interest on loans and reserves is reduced) they could stiffen collateral requirements to push the demand schedule to (i_2, Q_3).

Note, that in the first case, when collateral requirements are eased, the amount of loans extended is successfully increased to L_3 after the imposition of the MLR, while the amount of loans extended is still endogenous to borrowers' decisions, given the new collateral requirements. Bitros mentions that throughout his sample period the relevant reserve account of the commercial banks with the Bank of Greece was in surplus, thus indicating that banks, irrespective of the interest rate, preferred not to lend all their funds earmarked for this purpose. Bitros then states that these observations, combined with his findings of elasticities of investment with respect to short and long-term credit, indicate that firms, due to easier collateral requirements associated with short-term credit, prefer to borrow short-term funds (although at a higher rate) and use them for long-term investment. This belief

seems to be shared in Greece by other researchers: for example, Tsoris (1984) considers this behaviour by firms to be the main cause of the increased number of 'problem' industries in the country.

It is also the opinion of executives in the commercial banks, and is reflected in the reports of the 'Committee of the Working of the Greek Financial System' (1981). They feel that the pressures exerted upon them to increase the financing of particular sectors by administratively setting low rates, while they create conditions of excess demand in those markets, prevent them from using conventional criteria, such as return of the relevant loans. Consequently unable to increase the return of their various credits, bank executives act rationally and use their only remaining criterion, which is lower risk, by requiring sound collateral.

In summary, this discussion raises the following points:

(a) Bitros' endogeneity test findings, aggregation problems apart, indicate that the amount of credit extended depends on demand. Thus the inference, as indicated by both Leite and Zadeh, and by Bitros' (1984) reply, is not that - if short and long-term credits are endogenous in the investment function - credit controls are ineffective, but rather that long and short-term credits are determined by the demand for these loans instead of the supply. In this instance Bitros' finding is not compatible with Molho's assumption that with below equilibrium interest rate levels the amount of loans is determined by supply.

(b) The discussion also indicates that the selective policies that impose a below equilibrium loans rate, and an MLR sufficiently high (as L_3) succeed in increasing the availability of credit in the sense that the amount of loans is determined by demand which is higher than supply. On the

other hand, the banks' behaviour might impair to a certain extent the success of this policy by stiffening collateral requirements (or equivalently by decreasing the length of the repayment period) thus shifting borrowers' demand to the left. The policy would not succeed in increasing the availability of credit except in the unlikely event that the banks find it profitable to impose such stiff collateral requirements that the demand schedule moves to pass through point S. Since this, in fact, would mean that banks prefer to keep the amount Q_1L_3 as low yielding reserves with the central bank, we can assume that the closer the banks are to this behaviour the smaller the differential between the low loan rate and the rate on reserves.

(c) The central point of the discussion, however, is still not answered: Can selective policies increase investment in plant and equipment?
Although we have seen that it might be possible to increase the availability of credit, we have the findings of Bitros' second test where the elasticities of short and long-term credit signal the opposite. This may be the result of treating these variables as exogenous in this part of Bitros' (1981) tests. On the other hand, we have to examine the possibility that stiff collateral rations out of the credit market the majority of firms, which leaves them with the only alternative of financing their long-term investment with short-term credit where collateral requirements are more relaxed.

(d) Molho's model seems to need modifications, particularly under case (c). It needs to include the constraint of the MLR imposed on lenders' behaviour: probably the assumption of non-borrowed funds being accumulated as unwanted excess reserves has to be relaxed, by including another bank's asset, namely the low yielding reserves with the Central Bank; and probably an additional variable should be included

in the loan demand functions, that of collateral requirements. At any rate, the preceeding discussion indicates that at below equilibrium loan rate levels the amount of loans is not always determined by supply.

5.3 CREDIT CONTROLS AND EXPENDITURE ON DURABLES

International literature which examines the effectiveness of credit controls tends to concentrate on their effects on consumer durables expenditure. This is because, in developed countries such as the U.S. - where the greater part of this research was conducted - credit controls have often been applied to restrict the volume of consumer credit. Such a policy is used for counter-cyclical purposes, since purchases of durables usually occur in periods of increased economic activity (towards the peak of the cycle), and since the purchase of these goods (on account of their high price) is usually financed by credits. The Greek case, however, is of particular interest in terms of the effects of credit controls on durables' expenditure, not only because of the peculiarities of the Greek financial system in general (as mentioned in parts 3 and 4), but also because of the peculiarities of the market for durables. Furthermore, such research offers further insights on the effectiveness of credit controls to restrict economic activity (a point missing in Bitros' study).

For the greater part of the post-war period, credit to consumers through the banking sector was restricted. When credit controls were codified in 1976, the following restrictions were applied:

Controls on credit for purchases of consumer durables

(a) Credit from suppliers to consumers:

The minimum cash payment from the consumer is to be 20% of the value of durables used for professional purposes, and 15% - 30% of the value of durables such as automobiles, electrical appliances and prefabricated constructions. The duration of the loan is 36 months for the former category and 24-96 months for the latter.

(b) Bank loans for purchases of durables (consumer credit):

Banks are allowed to finance consumers for puchases of domestically produced durables only. The amount of the loan should not exceed 80% of the value of the durable and the maximum duration of the loan is 24 months. Maximum limit for credit to each consumer is 40,000 drs.

(c) Loans with collateral securities:

With collateral of shares traded on the Athens Stock Exchange, and bonds of the Public Electricity Corporation and the Telecommunications Company, the amount of the loan is 50% of the exchange value of the securities with a maximum limit of 4 million drs. The duration of the loan is 6 - 9 months.

With collateral of government bonds, the amount of the loan is 70% of the exchange value of the securities, and the duration of the loan is again 6 - 9 months.

One main characteristic of these controls is that consumer credit is supplied only for the purpose of domestically produced durables. Credit from banks for the purchase of imported durables is restricted. Another control concerns the supply side of the market, i.e. the producers and importers of durables. To encourage domestic production, credit is supplied to domestic producers cheaply; to discourage imports, credit for importers is restricted, and importers have to deposit (as a form of reserves) a percentage of the total value of their imports. (An exception to the rule of cheap supply of credit to domestic production is the housing sector, where credit is usually restricted).

5.4 Effects of Credit Controls in the Market for Consumer Durables: A Theoretical Construction

It is useful to construct a model to explain simultaneously the effects of consumer credit restrictions and the credit-subsidy-restriction scheme in the market for consumer durables. To analyse the latter, two sets of assumptions are required.

The initial assumptions are, (a) there is perfect competition internationally, and (b) there is perfect substitutability between domestically produced and imported durables. These two assumptions imply that if there were no restrictions, the market for durables would be in equilibrium at a price level PE which would be equal to the world price (ePw). At this price level, any excess demand over domestic production would be satisfied by imports of durables.

The second set of assumptions is that a credit-subsidy-restriction scheme will have the same effect as a direct subsidy-tax scheme. This assumption is made since the credit subsidy will reduce the cost of producing each additional unit of the domestic producers. On the other hand, the importer will have to deposit in a non-interest bearing account a certain percentage of the value of his imports. Therefore, he will lose interest and so the cost of producing each additional unit will be increased.

This assumption will have the following implications:

(a) The foreign (international) supply of durables will decrease. Since world supply is perfectly elastic at the world price level, this will be equivalent to a shift of the horizontal world supply upwards to a price equal to ePw (1+drt) where:

d = percentage of import value that has to be deposited

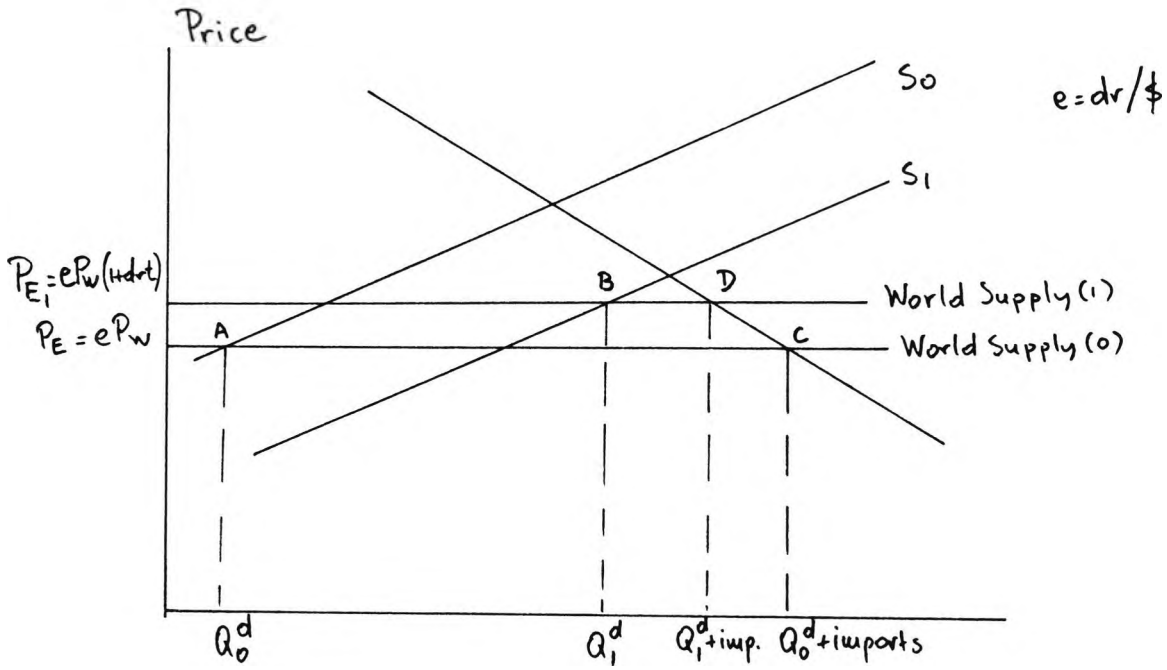
r = interest rate

t = time period of compulsory deposit

then ePwdrt = importers per unit cost in terms of interest foregone

(b) The domestic supply of durables will increase as it would have done in the case of a direct subsidy. In a demand-supply diagram this would be equivalent to a shift of supply downwards, by the amount of the subsidy.

So, the partial equilibrium effects would be a rise in the price of domestic and imported goods, a rise in domestic production and a fall in the quantity of imports. These effects can be represented in the following diagram:



Schedule 5.2: The effects of an import restriction scheme in the market for consumer durables.

a) Price rises from P_E to P_{E_1} by ePwdrt

b) Domestic supply rises from $0Q^d_0$ to $0Q^d_1$

c) Imports fall from AC to BD

These effects in the durables market may induce further general equilibrium effects:

1. The rise in the relative price of durables will probably have an effect on the general price level. This effect seems even more probable if credit restrictions are imposed on non-durable goods as well. (Assuming these markets are similar to the durables market).

2. Since credit to durables' producers is available under a subsidy scheme, and interest rates are pegged, another group of borrowers will be rationed out of the credit market. Consumers are the most likely group, since consumer credit is generally restricted. If this is the case, either consumption or savings must decrease (consumption + saving = income + borrowing). If consumers do not finance purchases of durables by dissaving, the demand for new purchases will have to be curtailed.

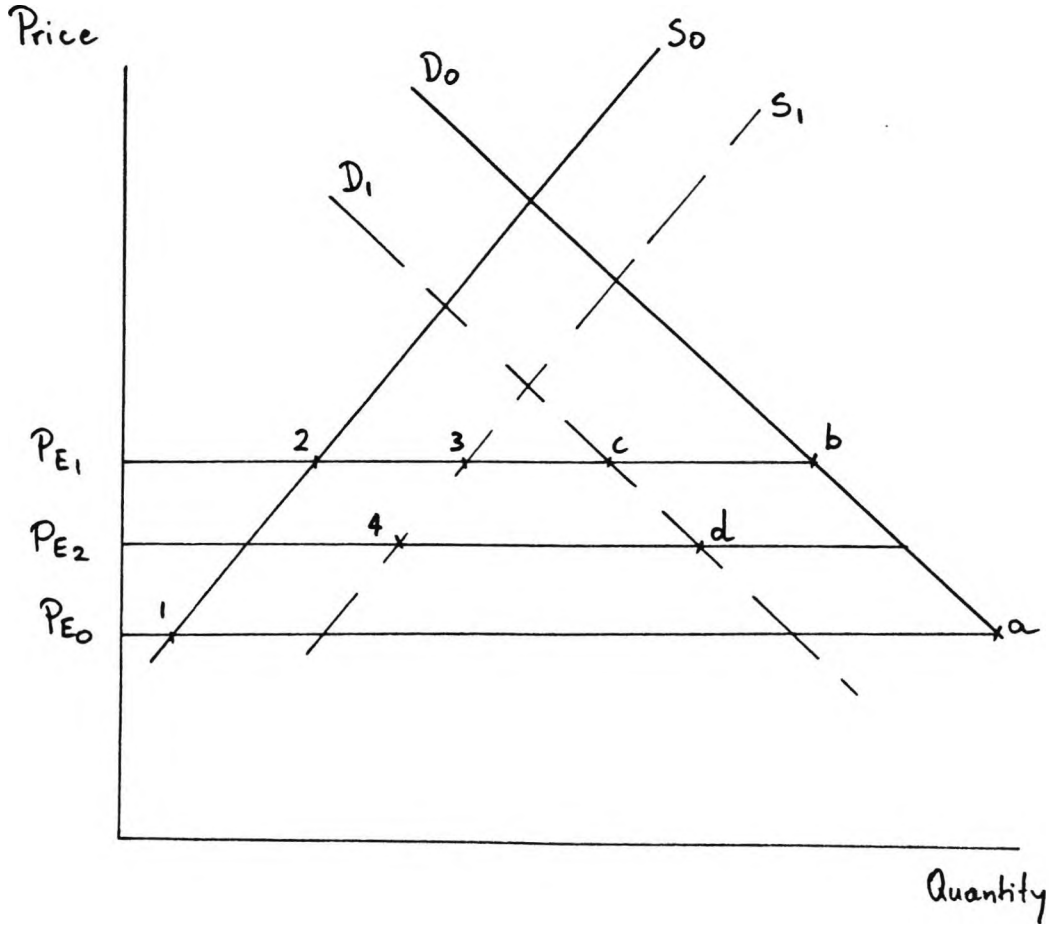
3. Exchange rate movements. These will depend on the source of finance for the subsidy and/or on the effect the subsidy has on productivity in the traded goods (durables) sector. For example, if the subsidy increases the productivity of capital and output in the traded goods sector, to have an external and internal balance, the relative price of traded goods should fall to clear the home goods market and to equate income with expenditure. This adjustment will be brought about by an exchange rate appreciation. These effects, however, require further assumptions about the proportion of traded goods represented by durables and about the capital efficiency of the durables industry. For this reason, they will be examined later in the study.

If we take into account these equilibrium effects on the durables market, we arrive at the following picture:

$$P_{E_0} = e_o P_w$$

$$P_{E_1} = e_o P_w (1+drt)$$

$$P_{E_2} = e_1 P_w (1+drt)$$



Schedule 5.3: The effects of production subsidies, import restriction scheme and exchange rate fluctuation in the market for consumer durables.

DOMESTIC SUPPLY	DEMAND
1-2: Import deposit scheme	a-b: Import deposit scheme
2-3: Credit subsidy to domestic producers	b-c: Reduced demand from crowding out consumers from domestic credit market
3-4: Exchange rate fluctuation (appreciation)	c-d: Exchange rate fluctuation

The question to be examined is: What variables do the policy makers control so that they can predict the effects of their policies? At first glance, although the amount that importers have to deposit will depend on the value of their imports, the authorities by being able to control the variables d,r and t, can determine $^{P}E_1$ given world prices and the exchange rate. If they know the price elasticity of supply they can predict the increase in domestic supply, implied by the movement 1-2 in our diagram.

The movement from 2-3, although it depends on the amount of the subsidy, also depends on how producers use the subsidy (e.g. whether to finance long-term or working capital). The authorities have stated clearly that the purpose of the subsidy is to finance long-term capital investment only. However, as findings in recent literature have shown, it is doubtful whether authorities can influence how producers use the subsidy.

On the demand side of the market, on the assumption that domestically produced and imported durables are perfect substitutes (or at least highly substitutable), any shift resulting from the 'crowding out' of consumers from the credit markets will tend to make the policy effective, since it will tend to reduce the quantity imported. It appears from the above theoretical model, once previous findings are taken into consideration, that the most obvious test for the effects of the selective credit control policies will be a straightforward test of their influence on demand. This is examined in the next chapter.

CHAPTER 6

EMPIRICAL EVIDENCE

6.1 THE DATA

6.1.1 The regression variables

I Quantity series

(a) Gross Purchases
(b) Depreciation Pattern
(c) Depreciation Rate

II Income series
III Price series
IV Credit series

6.1.2 Problems with the data - the presence of trend

6.2 SPECIFICATION

6.2.1 The alternative models and estimation methods
6.2.2 Selecting the appropriate model: The F-tests and the diagnostic tests

6.3 ESTIMATION

6.3.1 The demand for stock

I Estimation by the compound lag model
II Interpretation of the results
III Effects of credit on the demand for stock

6.3.2 Demand for net purchases

I Estimation of the demand for net purchases
II Effect of credit on the demand for net purchases

6.4 APPENDIX

INTRODUCTION

In this chapter we will estimate the demand for stock and net purchases of white goods (electrical refrigerators and cookers) for the period 1960-1980. We will then specifically examine whether consumer credit (either as stock or as flow) exerts any influence on that demand.

For the estimation we use time-series data. As in other studies of demand for consumer durables that use time-series (see Harberger, 1960) the main problems associated with the estimation are the construction of the regression variables and the theoretical specification of the econometric model to be used. A considerable part of this chapter has been devoted to a discussion of these problems and the analysis and comparison of various methods that have been used in other studies with the techniques used here.

Part 1 of this Chapter describes in detail the construction of the regression variables from the raw data series. The final regression series used are presented in the Appendix. Any estimation problems that may arise from the way the regression variables are constructed are discussed in detail. The methods to tackle these problems are presented at the end of this part.

In Part 2 we proceed with the theoretical specification of a demand for consumer durables equation. Various alternative specifications are presented from the simplest equation to more complex models that take into account concepts such as partial stock adjustment and expected income. Since a number of these models have actually been used in other studies, the theoretical and econometric implications of each alternative specification are discussed along with the alternative estimation technique that can be recommended in each case. Once the various reduced form equations resulting from each alternative model are defined, we conduct F-Tests (the results of which are presented on Table 1) to determine which models are supported by the statistical evidence.

The evidence seems to support the compound lag model, which also seems the more 'complete' from the theoretical point of view since both the 'partial adjustment' and 'expected income' process are explained within the model. Part C, therefore, proceeds with the estimation of the demand for stock and for net purchases by using the reduced form equation of this model.

In each case (electrical refrigerators or cookers) there are four sets of estimates: estimates of demand for stock and estimates of demand for net purchases, either with or without using credit as an explanatory variable. In each case, the best equation is identified and its results are interpreted in separate sections. As it will be noted while the results for the case of refrigerators are satisfactory, the behaviour of the estimates of demand for cookers does not allow for any useful conclusions to be derived. Never-theless, the estimates of the demand for stock and net purchases of cookers are presented, although they are not discussed in the analysis that follows.

This analysis focuses on 2 points: a) Estimation of short-term and long-term price and income (and credit in the relevant cases) elasticities of the demand for stock and net purchases and b) Testing the significance of credit as an explanatory variable of demand (by using F-tests to determine whether the inclusion of credit as an additional variable improves significantly the explanatory power of the equation).

The final part of this Chapter includes Table 1 with a concise presentation of the estimates of the above mentioned parameters and the test of significance of the credit variable. These results are then compared with the findings of previous studies.

6.1 THE DATA

6.1.1 THE REGRESSION VARIABLES

I QUANTITY SERIES

There are three crucial considerations when the quantity series are constructed: The definition and construction of gross purchases series, the assumption about the depreciation pattern and the choice of depreciation rate.

The problem of constructing these series is common in all demand for consumer durables studies. The stock, gross purchases and net purchases of a durable good have to be constructed in such a way that the series are homogenous (therefore theoretically defined since it would not be possible nor appropriate to base the study on a single brand of the same engineering specifications, constant through the years), and sensitive to the consumers' considerations that each study attempts to investigate. At the same time, the depreciation pattern and rate, particularly in the absence of data on rental or trade-in transactions, will have to be such that can be easily formalised for the calculations while they still represent consumers' considerations instead of manufacturers' specifications.

a) The Gross Purchases Series

Data for the period under examination exists in Greece in forms of number of machines domestically produced and sold as well as imported, by category of capacity and weight. For the purposes of the study, we chose the categories above 20kg and below 250kg, since these machines are recommended for domestic use. To convert the series of number of machines sold to value series we have used the series of drachma values of imported machines (gross of tarriffs and various import duties, since this should be in

accordance with the theoretical model presented in the previous chapter), divided by the number of machines to derive average price series. The obtained (average price x number of machines sold) series of value of gross purchases were then transformed to constant drachma series by the price index of expenditure in household appliances.

b) The Depreciation Pattern

Traditionally, in studies of demand for consumer durables two alternative assumptions are used, although it has been shown that the magnitude of the coefficient estimates is not considerably affected by the choice between these alternative patterns. According to these assumptions, the durable is either assumed to yield the same service during every year of its use until it stops when its engineering life is exhausted (straight line assumption), or alternatively, the durable yields less service every year, which is a certain proportion of its residual value (declining balance assumption). Under the last assumption the amount of depreciation is proportional to the value of the stock, whilst under the former it is not. Under the declining balance assumption the value of the stock would then be generated by the formula:

$$S_t = (1 - d)\, S_{t-1} + \text{Gross Purchases}$$

where d is the depreciation rate. Obviously, we would also have to define the value of the initial stock, in constant drachmas, for the period under examination. Once more, in previous studies(2), where a weighted sum of Gross Purchases of a number of previous periods was used, it was shown that the assumed value of initial stock did not significantly affect the estimates. In our case, because of limited observations we used the sum of the four years before the initial observation of the time series to be used. This assumption should not considerably underestimate the value of initial stock, since the stock of household electrical appliances before 1950, must have been minimal(3).

c) The Depreciation Rate

In either of the alternative patterns of depreciation, the appropriate rate will have to be defined in order to obtain the series of stock and net purchases. As in most studies of a similar kind, the absence of data on transactions of used appliances or rental transactions, makes the direct measurement of this rate impossible. What also has to be mentioned is that in the study of demand for Refrigeration in the US, Burstein has shown that the choice of alternative depreciation rates does not yield different parameter estimates.

However, as it will be shown later, the model that this study is going to use is more complicated than that used by Burstein, while the number of observations available is much smaller. The complexity of the model will require as much accuracy in our parameter estimates as possible. For this reason, even though Burstein has shown that for his study, the magnitude of the estimates did not change considerably when alternative depreciation rates were assumed, we will try to use the most appropriate rate, since, in our case, a small change in the estimates can be crucial for the possibility to calculate the various variables that affect demand.

At the same time, our assumption should not be the one that just gives a good fit; it should be based on the available evidence and on a theoretical justification. In another study that faced a similar depreciation rate problem, G. Chow found that the depreciation rate of 25% on a declining balance assumption gives the best fit for the US demand on cars [4]. Obviously the household electrical appliances are much more of a durable good than cars [5]. Therefore, the choice of a lower depreciation rate would seem appropriate. Similarly, Burstein's preference for a 10% rate also seems rather extreme. Such a rate would imply that after 15 years of the life of an electrical appliance like a Refrigerator the machine still embodies 20% of its acquisition value, which as

Burstein himself mentions, seems excessive for the engineering standards of a maximum life of 15 years.

For our particular case, we will take into account the findings of a marketing survey(6) of the market of household appliances in Greece, conducted by the Institute of Economic and Industrial Research (1984). This study claims that for the particular case of Refrigerators:

a) households change their appliances, on average, each 11 year period; and

b) the indications from a sample study in Greece is that around 90% of the households own a Refrigerator and the market is considered 'saturated'.

The first finding of this study indicates that the depreciation rate, under a declining balance assumption should be well above 10% and closer to 20%. But the fact that households decide to change their machines does not indicate that at the moment of change they have no 'scrap' value. Allowing for this 'scrapping' we should search for the appropriate rate between 12%-20%, the lower the assumed rate, the higher the 'scrap' rate. What is going to help our choice of the appropriate rate is the second finding: The assertion of a 'saturated' market, seems to be based, apart from the sampling research, on a decline of the number of imported machines since 1980 and on unsold stocks. Such a finding, would not of course have to imply that the gross purchases are zero (which would contradict our series) since replacement purchases would still take place, but certainly one has to expect the value of the stock not to increase around those years and the value of net purchases to be small, or slightly negative.

We applied the declining balance assumption with a whole range of alternative rates between 10% and 20% on the series of gross purchases expenditure. Depreciation rates below 15% gave a

continuously increasing value of stock for the years 1978-82, while rates from 17% and over gave a sharply declining value of the stock. Accordingly, we chose a rate of 15% for the purposes of this study. When the reduced form of demand for Refrigerators was estimated(7) we again tried various rates (changing 0.5% for each estimate), but 15% gave the smallest sum of squared residuals.

Probably, it is not pure coincidence that this rate gives estimates that satisfy the set of conditions imposed on our demand equation discussed later in this study.

II INCOME SERIES

For the income series we have used real per capita disposable income series obtained from the National Bureau of Statistics. These series were also used to calculate an estimate of permanent disposable income, by using Cagan's weights of expected income. Both series will be presented in the Appendix, while a discussion on expected income is presented on part 3 of this chapter.

III PRICE SERIES

For the price variable we used the series constructed under I. The implicit assumption has been discussed in the previous chapter: According to our theoretical construction of the market of consumer durables the price is exogenously determined, by the world price plus tariff duties, augmented by the fraction trd, where t is the time for which importers have to deposit an amount, d, of the value of their imports in the non-interest bearing account (interest rate = r). The domestic price is determined by world price and the exchange rate [ePw (1 + trd)] and is not affected by domestic demand fluctuations, Greece being a small country. If this assumption does not hold, then the price variable might be determined by both supply and demand considerations. In such a case, as it will be explained later, we will use an alternative variable as a instrument for price. This is going to

be a divisia price index of expenditure in domestic appliances, calculated from the data on this expenditure obtained from the National Bureau of Statistics in Greece.

IV CREDIT SERIES

As mentioned in the discussion of the theoretical construction, data on the stock of credit (i.e. outstanding consumers liabilities at the end of the period) exist for the entire period, while for the years between 1960-70 no new consumer loans for purchases of durables were extended. We have therefore used 2 series on credit for the econometric research: a series of the outstanding stock of credit for the entire sample period, and a series of new loans extended (flow of credit) only for the second half of the period. The latter series has been used to examine whether there is a significant shift of the function of demand after 1970 where consumer loans were extended.

However, as mentioned in the theoretical model, one of the secondary effects of credit controls might have been rationing in the credit markets, where marginal borrowers who can be either domestic producers or consumers are rationed out of the market. For this reason, supply considerations that influence producers demand for credit, might have influenced the amount of credit extended to consumers. Consequently a variable not affected by supply of durables considerations will also be used as an instrument for credit. The most readily available variable is the interest rate which is determined exogenously of the credit markets, by the monetary authorities.

6.1.2 PROBLEMS WITH THE DATA - THE PRESENCE OF TREND

Once the series of the regression variables are constructed, it becomes obvious that the strong influence of trend will be a problem for this study. Such a problem though should not be considered unusual for any study that uses time series data, whose fluctuations have further been smoothed by the way the regression variables are constructed. In fact, in Bursteins' study, for the time series data, trend alone is found to explain more than 98 per cent of the variation of the demand for stock, while its influence is still strong on the price and income variables.

For our case, we have run a number of simple autoregressive equations of the form S_t = Constant + bS_{t-1} + u_t, which gave R^2 of .90 for the case of Refrigerators and .99 for the case of Cookers. This implies that variations in stock can be explained by its past values without the need to resort to other explanatory variables. In addition, trend is found to have a similar influence on the price and income variables. As a consequence, as it is shown in regressions I and VI of our result section below, a naive instantaneous adjustment equation of demand for stock on income and price gives a R^2 = .897 for Refrigerators and R^2 = .964 for Cookers, with very large values of the constant term and very small magnitude of the coefficients of the dependent variables. When a simple time variable (T = 1,2,3,....) is included in the regression, R^2 becomes .96 for Refrigerators and .99 for the case of Cookers.

We will analyse the implications of these findings for our study. Firstly, the presence of trend in the dependent variable, might simply imply that there is an autonomous growth in the demand for stock, which is independent of price, income or credit movements. In such a case, the inclusion of a simple time variable (or, for that matter, the imposition of fitted trends), could capture this effect, which would be attributed to change of habits or standard of living etc. In other words,the coefficient of the

time variable will be taken to represent our ignorance of the extent to which forces other than income, prices or credit determine the growth of the demand for stock of electrical appliances. In fact, there seems to be support for this argument, if one observes the pattern of the residuals of regression I and VI which are presented in the Appendix. This pattern suggests, particularly for the case of Refrigerators, the presence of positive serial correlation for the years before 1970 and negative serial correlation for the remaining recent years of the sample period. Such serial correlation patterns, were also present in Bursteins' study (although in that case for a sample period 1930-55, the negative pattern was observed at the beginning of the period and the positive for the last years of the sample), and were attributed to factors influencing the demand for stock omitted from the regressions. In our case, these factors can be taken to be the influence of lagged variables as a consequence of non-instantaneous adjustment and will be taken into account by the more complex compound lag model used later in the study.

A more serious problem is the presence of trend in all of our regression variables, especially if one considers that there are reasons for some of these variables (as prices and credit) to be part of the supply function. Two important problems might arise in this case:

a) Shift of production or imports that are trend induced, may be correlated with those of the demand function. Once trend is not included in demand, a problem of identification might arise, i.e. our estimates, instead of showing the influence of independent variables on demand, give their relation with the various equilibrium positions determined by both demand and supply considerations. This problem, has almost always been faced by demand studies. Since the effect of such conditions on the coefficient estimates is bias operating in the same way as the bias attributed to errors in measurement (see Harbeger, 1960) the usual remedy is to estimate equations where prices are the dependent

variable and stock an independent variable. Whatever bias may be introduced in the original estimates (as long as supply has some positive slope), this bias operates in the opposite form in the alternative regressions, thus providing brackets for the 'true' elasticity estimates. In our case, this does not seem to be a problem for the price variable in particular, since it is taken to be determined exogenously by the level of World prices (i.e. the world supply is horizontal).

b) Since the influence of trend appears to be strong in all of our variables, we face a multicollinearity problem as the various effects of the independent variables on demand are difficult to disentangle, once all of them are correlated with trend. To avoid this issue we can use the following estimation techniques:

1. Estimate the demand for stock in first differences equations [8].
2. Use a compound lag model [9].
3. Instrumental variable estimation [10]

6.2 SPECIFICATION

The previous discussion attempted mainly to identify sources of estimation problems either because of data limitations or because of the nature of the series to be used in the regressions.

This part of the study will focus on the specification of the demand for stock equation and a discussion of estimation problems that arise from the nature of econometric models used.

We will start by defining the general form of the demand for stock function, by simply including the variables that are likely to influence consumers decisions. With the use of economic theory we will then formalise, in alternative models, the relationships between the variables that enter the function. The resulting reduced form equations would indicate the sets of restrictions to be imposed on an experimental regression of the demand for stock series on the various explanatory variables. The use of F-tests will then indicate which restrictions are to be accepted and therefore which model is the most appropriate.

6.2.1 THE ALTERNATIVE MODELS AND ESTIMATION METHODS

The general form of the demand for stock function will assume that demand for stock depends on the current and past levels of consumers personal disposable income, the current and past price of the durable in question, and from the way we defined this demand for stock variable, from the past levels of demand for stock. For simplicity, a credit variable will not be included at this stage. When we decide on the model to be used we will carry out additional tests, to verify that credit should enter as an additional explanatory variable, either in the form of stock (i.e. consumers indebtedness) or in the form of flow (i.e. new consumers loans extended).

In other words, the demand for stock function should be:

$$S_t = f(Y_t, Y_{t-1}, Y_{t-2}, P_t, P_{t-1}, P_{t-2}, [Cr_t, Cr_{t-1}, Cr_{t-2}], S_{t-1}, S_{t-2}) \quad (1)$$

An equation representing this function is going to be estimated by O.L.S., along with the restricted forms presented below. Then the validity of the restrictions will be tested by the ratio

$$F = \frac{\sum e_r^2 - \sum e^2/n \ldots . (\text{number of restrictions})}{\sum e^2/(n-k)}$$

being compared with F [number of restrictions, (n - k)].

Attention should be drawn to the fact that by no means have we assumed that O.L.S. is the most appropriate method to estimate (1) or the reduced forms that will be presented below. In fact, OLS is used only at this stage, to decide which is the most appropriate model to be estimated.

The initial specification to be used is that where the level of demand for stock depends only on the current levels of personal disposable income and price. It is based on the somewhat naive assumption of instantaneous adjustment of actual to desired stock. It is presented rather for comparisons with the more realistic assumptions discussed below. In fact, it can be considered a special case of the partial adjustment model, for which the adjustment coefficient is unity.

The linear (constant in the parameters) specification is:

$$S_t = a_o + b_1 Y_t + b_2 P_t + u_t \quad (4)$$

and the log-linear or constant elasticity specification is of the form:

$$S_t = a_o Y_t^{b_1} P_t^{b_2} (e)^{u_t}$$

or

$$\log S_t = \log a + b_1 \log Y_t + b_2 \log P_t + u_t \qquad (5)$$

If this assumption of instantaneous adjustment was correct the deterministic part of the equation would be accompanied, as it can be seen from (5), by a random error term that would satisfy the O.L.S. properties. If, however, we proceed with the estimation by O.L.S., without checking for the possibility of more complex model structures, we could run into a serious specification error, outlined below by an example:

Assume that a lagged price variable might influence, say, demand for stock. However, the influence is so small, that if we had included it in the equation, R^2 would have improved very little. If we do decide not to include it in the equation we are, in fact, assuming that its coefficient is zero. This (misspecification) is actually adding a certain term to the random error (e.g. $a_k P_{t-1}$, where a_k is the coefficient of the lagged price variable). This addition can have the following effects on our equations (especially when we consider that there might be trend influence in our price variable):

a) Correlation of the error term with one of the independent variables, thus violating one of the OLS assumptions and resulting in inconsistent parameter estimates, or b) Introduction of autocorrelation of the error term, and finally c) Increase of the variance of the error term resulting in inefficient estimates.

The assumption of instantaneous adjustment will now be relaxed to allow the influence of lagged variables. Actual stock

(the observed variable) is assumed to adjust only partially to the desired stock of the current period.

The linear and log-linear formulations, although based on the same partial adjustment principle, are presented separately, so that it will be clear what the coefficients represent in terms of economic meaning and what additional information on the demand for stock is offered by the new specification.

Equation (5) of the instantaneous adjustment model can be written as:

$$\log S_t - \log S_{t-1} = a_o + b_1 \log Y_t + b_2 \log P_t - \log S_{t-1} + u \qquad (6)$$

If the adjustment was not instantaneous, but only a fraction, b, of the logs adjusts within a period, (6) would have to be written as:

$$\log(S_t/S_{t-1}) = a + Bb_1 \log Y_t + Bb_2 \log Pt - B \log S_{t-1} + u, \quad 0<B<1 \qquad (7)$$

Notice that the fraction B of the adjustment of the log of the actual to the log of the desired stock within a period, should not be confused with the partial adjustment coefficient of a relationship expressed in arithmetic units (linear relationship). What the log linear equation describes is, if expressed in arithmetic units, the equation:

$$S_t/S_{t-1} = (S_t^* /S_{t-1})^B , \quad 0<B<1 \qquad (8)$$

Here B implies that the left hand side of (8) is closer to unity than the right hand side. In other words, the current actual stock would be closer to the actual stock of the previous period than the current desired stock, whether the stock is increasing or decreasing. (i.e. the partial adjustment equation in the log-linear case is:

$$\log S_t - \log S_{t-1} = B (\log S^*_t - \log S_{t-1})$$

whereas in the linear case it is

$$S_t - S_{t-1} = \gamma (S^*_t - S_{t-1})$$

as will be shown later).

Another point that should be noted, is that a regression estimating (7) would, in fact, attempt to explain the variance of the first differences of the logs of the dependent variable. This would be equivalent to an equation of the form:

$$\log S_t = a + Bb_1 \log Y_t + Bb_2 \log Pt + (1 - B) \log S_{t-1} + u_t \quad (9)$$

in which case, the variance of the dependent variable is explained (apart from income and price) from its lagged values. Although we should expect to get similar elasticity estimates by estimating these equations, the fact that the influence of trend is strong in our dependent variable would give a higher R^2 for equation (9) than for equation (7) where trend is removed from the dependent variable. (This is simply due to the fact that in (4), the sum of squared deviation of the dependent variable from its mean is higher).

The second type of specification involves the linear equation. The model will now be specified according to the partial adjustment principle. According to this specification, the desired stock is dependent upon the current values of income and price:

$$S^*_t = a' + b'_1 Y_t + b'_2 P_t + \varepsilon'_t \quad (10)$$

However, in any period the value of S_t may not adjust completely to this desired level, i.e.

$$S_t - S_{t-1} = \gamma (S^*_t - S_{t-1}) , \quad 0 < \gamma < 1 \quad (11)$$

Where γ is the 'adjustment coefficient'

Substituting for S^*_t and solving for S_t:

$$S_t = a'\gamma + b_1'\gamma Y_t + b_2'\gamma P_t + (1 - \gamma) S_{t-1} + \varepsilon_t' \qquad (12)$$

4. Equation (12) can be used for the estimation of the net purchases demand which is $S_t - S_{t-1}$ in which case (12) becomes:

$$\text{Net Purchase} = a'\gamma + b_1'\gamma Y_t + b_2'\gamma P_t - \gamma S_{t-1} + \gamma \varepsilon'_t \qquad (13)$$

Our model and the estimation techniques to be applied have already become more complicated once a partial adjustment process of actual to desired stock has been assumed. However, the way we have constructed the demand for stock variable and the way that the unobserved desired stock is perceived, would indicate that further adjustments of the 'naive' model are necessary.

Demand for stock has been defined in a way that takes into account the durability of the goods. If we consider that current personal disposable income is not the only 'income' consideration that consumers take into account when deciding on this stock of durables, we are led to decide on a different definition of the income variable that influences consumers decisions over the desired stock.

In Friedman's system, the demand for the stock of durables is treated as a form of consumption while their acquisition as assets as a form of saving. In such a system, consumers' decisions on the variations of stock are influenced by the level of permanent income rather than the level of current income. There are two ways to incorporate these assumptions in our model: We can either define an income variable which is a better approximation of consumers permanent income than the current income level, or we can incorporate in our model a mechanism that we assume to determine the consumers concept of permanent income.

In the first case, we are just changing an explanantory variable on the deterministic part of the equation while we still remain in a simple partial adjustment framework, whereas in the second case we are changing the structure of our model, by inserting an additional distributed lag mechanism. Let us describe the simple case first.

In this part, demand for desired stock is based on the use of expected per capita income rather than current personal disposable income per capita as an independent variable. Expected income is used as the empirical approximation of Friedman's permanent income concept. It is a weighted moving average of disposable income in which current income gets one third of the total weight and past incomes get weights which decline progressively (exponentially), income of nine years ago and earlier receiving zero weights. The weights, in fact, were provided by Professor Cagan and were found to explain a larger per cent of the variation of consumption than disposable income did, or any other of a large number of differently weighted averages. However, since these conclusions were based on U.S. data, caution is required when similar variables are used for the transformations of Greek data: a) The theoretical support for this variable for the U.S. comes from the assumption that the consumer's view of his permanent income position depends largely on his past experience and is revised only gradually when current income differs from the expected. (There is no important reason to believe that Greek consumers form their view differently). b) The empirical approximation, even if the theoretical support is still valid, might be wrong, since we have not in fact tried a number of alternative approximations to examine whether they do better in explaining variations in consumption. However, other Greek studies have used the same method.

The weights used are the following: Current income is weighted by the factor 0.33 and the remaining weights moving 'backward' are: 0.211, 0.148, 0.099, 0.067, 0.045, 0.030, 0.020,

0.013. In the Appendix, Expected Income is presented along with Personal Disposable Income.

This formulation, although it should be treated with caution for the reasons mentioned above, is a convenient one, since, by not changing the structure of the model, the error term of equation (12) remains the same. For this reason, the principles and the estimation method to be used remain the same as mentioned in the simple partial adjustment case.

Things are quite different when we change the model structure. The influence of past income levels on the decisions on desired stock becomes more formalised and we are no longer running the danger of using faulty weights to construct an expeced income variable. In fact these weights will now be estimated, since they become a part of the model's structure. However, this is done at the expense of a much more complex reduced form, with an error term that excludes the use of OLS in our estimation.

The model will be a compound lag one, since it involves two distributed lag procedures: A partial adjustment process of actual to desired stock generated by:

$$S_t - S_{t-1} = \gamma (S^*_t - S_{t-1}) \qquad \text{where } 1 > \gamma > 0$$

S^* = desired stock

S = actual stock

The model would also involve an adaptive expectations process of the form:

$$Y^*_t - Y^*_{t-1} = \lambda (Y_t - Y^*_{t-1}) \qquad \text{where } 1 > \lambda > 0$$

Y^*_t : expected income

Y_t : actual income.

For simplicity at this stage we will assume that desired stock is a function of expected income and price:

$$S^*_t = f \quad (Y^*_t, \; P_t)$$

If, at a later stage, other variables are included, these would enter the calculations exactly as the Price variable (not necessarily with the same sign) once no distributed lag process is to be assumed. We have then to estimate:

$$S^*_t = a + b_1 Y^*_t + b_2 P_t , \qquad b_1>0, \; b_2>0 \qquad (14)$$

where the unobservable S^*_t and Y^*_t are given by the (stochastic) procedures:

$$S_t - S_{t-1} = \gamma \quad (S^*_t - S_{t-1}) + U_t, \qquad 1 > \gamma > 0 \quad (15)$$

and

$$Y^*_t - Y^*_{t-1} = \lambda (Y_t - Y^*_{t-1}) + \varepsilon_t, \qquad 1 > \lambda > 0 \quad (16)$$

multiply (14) $* \gamma$: $\gamma S^*_t = a\gamma + b_1 \gamma Y^*_t + b_2 \gamma P_t$

from (15) : $\gamma S^*_t = S_t - (1 - \gamma) S_{t-1} - U_t \Rightarrow$

$\Rightarrow \quad a\gamma + b_1 \gamma Y_t^* + b_2 \gamma P_t = S_t - (1-\gamma) S_{t-1} - U_t$

Solve for Y_t^*..=>

$$- Y_t^* = \frac{-a\gamma}{b_1\gamma} + \frac{1}{b_1\gamma} S_t - \frac{b_2\gamma}{b_1\gamma} P_t - \frac{(1-\gamma)}{b_1\gamma} S_{t-1} - \frac{1}{b_1\gamma} U_t \qquad (17)$$

lag (17) once:

$$Y^*_{t-1} = \frac{-a\gamma}{b_1\gamma} + \frac{1}{b_1\gamma} S_{t-1} - \frac{b_2\gamma}{b_1\gamma} P_{t-1} - \frac{(1-\gamma)}{b_1\gamma} S_{t-2} - \frac{1}{b_1\gamma} U_{t-1} \qquad (18)$$

Substitute (17) and (18) into (16) to get rid of "expected" terms:

$$- \frac{a\gamma}{b_1\gamma} + \frac{1}{b_1\gamma} S_t - \frac{b_2\gamma}{b_1\gamma} P_t - \frac{(1-\gamma)}{b_1\gamma} S_{t-1} - \frac{1}{b_1\gamma} U_t +$$

$$+ \frac{a\gamma}{b_1} + \frac{1}{b_1\gamma} S_{t-1} - \frac{b_2\gamma}{b_1\gamma} P_{t-1} + \frac{(1-\gamma)}{b_1\gamma} S_{t-2} + \frac{1}{b_1\gamma} U_{t-1} =$$

$$= \lambda Y_t + \frac{\lambda a\gamma}{b_1\gamma} - \frac{\lambda}{b_1\gamma} S_{t-1} + \frac{\lambda b_2\gamma}{b_1\gamma} P_{t-1} + \frac{\lambda(1-\gamma)}{b_1\gamma} S_{t-2} - \frac{\lambda}{b_1} U_{t-1} +$$

$$+ \varepsilon_t \Rightarrow \frac{1}{b_1\gamma} S_t = \frac{\lambda a\gamma}{b_1\gamma} + \lambda Y_t + \frac{b_2\gamma}{b_1\gamma} P_t - \frac{(1-\lambda) b_2\gamma}{b_1\gamma} P_{t-1}$$

$$+ \frac{(1-\gamma)+(1-\gamma)}{b_1\gamma} S_{t-1} - \frac{(1-\gamma)(1-\gamma)}{b_1\gamma} S_{t-2} +$$

$$+ \frac{1}{b_1\gamma} U_t + \frac{(1-\lambda)}{b_1\gamma} U_{t-1} + \varepsilon_t \Rightarrow$$

$$\Rightarrow S_t = \lambda a\gamma + \lambda b_1\gamma Y_t + b_2\gamma P_t - b_2\gamma (1-\lambda) P_{t-1} +$$

$$+ [(1-\gamma) + (1-\lambda)] S_{t-1} - (1-\gamma)(1-\lambda) S_{t-2} +$$

$$+ U_t - (1-\lambda) U_{t-1} + b_1\gamma \varepsilon_t \qquad (19)$$

$$\underbrace{\qquad\qquad} v_t \underbrace{\qquad\qquad}$$

$$S_t = A_0 + A_1 Y_t + A_2 P_t + A_3 P_{t-1} + A_4 S_{t-1} + A_5 S_{t-2} \qquad (20)$$

The estimates of the A's will have to observe the following signs:

Since $b_1 > 0$ $\quad \lambda b_1\gamma = A_1 > 0$ (21)

$b_2 < 0$ $\quad b_2\gamma = A_2 < 0$ (22)

Then

$1 > \gamma > 0$ $\quad -b_2\gamma (1-\lambda) = A_3 > 0$ (23)

$1 > \lambda > 0$ $\quad (1-\gamma)(1-\lambda) = A_4 > 0$ (24)

and $-1 < -(1-\gamma)(1-\lambda) < 0$ $\quad -1 < A_5 < 0$ (25)

In order to calculate the values of γ, λ we observe from (24) and (25) that we have to find the roots of the quadratic

$$X^2 - [(1-\gamma) + (1-\lambda)] \quad x + (1-\gamma)(1-\lambda)$$

or

$$X^2 - A_4 X - A_5 \tag{26}$$

This quadratic will have real roots if:

$$A_4^2 > - 4 A_5 \tag{27}$$

and for the 2 roots to be between zero and unity we need

$$1 > \frac{A_4 +- \sqrt{A_4^2 + 4A_5}}{2} > 0 \tag{28}$$

From (27), (28) we have:

$$A_2 = b_2 \gamma \qquad b_2 = A_2 / \gamma$$

Then

$$A_3 = - b_2 \gamma (1-\lambda) \qquad b_2 = A_3 / \gamma (1-\lambda) \Rightarrow$$

$$\Rightarrow \frac{A_2}{\gamma} = -\frac{A_3}{\gamma(1-\lambda)} \Rightarrow \lambda - 1 = \frac{A_3}{A_2} \text{ or } 1-\lambda = -\frac{A_3}{A_2} \tag{29}$$

Since $1 > (1 - \lambda) > 0$ then we need $|A2| > |A3|$ (30)

There are two important observations to be made at this stage: Firstly the structure of our model allows us to calculate the exact magnitudes of γ, λ from (26), (29). If (29), derived from the fact that our reduced form contains both current and lagged price level, was absent we would not be able to distinguish between $(1-\lambda)$ and $(1-\gamma)$ since both are between zero and unity.

In addition from (29) we can calculate:

$$1 - \gamma = A4 + \frac{A3}{A2} \qquad (31)$$

Combining (31) with (25) we have the following equation that should hold between our coefficients:

$$A5 = -\left(\frac{A3}{A2} A4 + \frac{A3}{A2}\right) \qquad (32)$$

Form (32), (27) becomes:

$$A4^2 > -4A5 \;(=)\; A4^2 > -4\left(\frac{A3}{A2}\right)A4 - 4\left(\frac{A3}{A2}\right)^2 \;(=)$$

$$A4^2 + 4\left(\frac{A3}{A2}\right)A4 + 4\left(\frac{A3}{A2}\right)^2 > 0 \;(=)$$

$$(=)\left(A4 + 2\frac{A3}{A4}\right)^2 > 0 \qquad (33) \quad \text{which always holds}$$

The condition then that our estimates should satisfy can be reduced to (21) to (25), (29), (30) and (32). Notice also, that equation (19) can be modified to be used for the estimation of the net purchases:

$S_t - S_{t-1}$, as follows

$$S_t - S_{t-1} = \lambda a\gamma + \lambda b_1\gamma\, Y_t + b_2\gamma\, P_t - b_2\gamma(1-\lambda)P_{t-1} +$$

$$[(1-\gamma) + (1-\lambda) - 1]\, S_{t-1} - (1-\gamma)(1-\lambda)S_{t-2} + v_t \qquad (34)$$

6.2.2 SELECTING THE APPROPRIATE MODEL: THE F-TESTS

Having defined the alternative forms of the demand for stock equation, we will now conduct the F-test on the restrictions that each reduced form dictates on equation (1). As mentioned at the

beginning of this part of the study, for simplicity, since the test at this stage refers to the choice of the model, we will not include the credit variable. We should note that the choice has to be done between models that assume different adjustment patterns for certain of our variables. The fact that the price variable is present (which should enter the equation the same way as the credit variable would) ensures that the choice of reduced form will not be impaired at this stage by the absence of the credit variable from both the unrestricted and restricted forms.

Once we decide on the correct adjustment pattern we are going to carry out a second F-test. This time we are going to examine whether the chosen specification improves significantly by the inclusion of the additional credit variables. In fact, this method, involving two tests, would constitute a stronger trial for the significance of credit in the demand for stock, since it avoids the possibility of a type II error. That is, instead of accepting credit as an explanatory variable because a restricted equation that includes credit variables does not reduce significantly the explanatory power of the unrestricted equation, we will include credit, in the case of two tests, once there is evidence that its inclusion increases significantly the explanatory power of a restricted equation.

In order to decide on the correct reduced form we estimate by OLS the equation:

$$S_t = A_{00} + A_{01}Y_t + A_{02}Y_{t-1} + A_{03}Y_{t-2} + A_{04}P_t + A_{05}P_{t-1} + A_{06}P_{t-2} + A_{07}S_{t-1} + A_{08}S_{t-2} \quad (35)$$

along with equations

$$S_t = A_{10} + A_{11}Y_t + A_{14}P_t \quad (\text{Restrictions: } A_{02} = A_{03} = A_{05} = A_{06} = A_{07} = A_{08} = 0) \quad (36)$$

$$S_t = A_{20}+A_{21}\ Y_t+A_{24}\ P_t+A_{27}\ S_{t-1} \quad (\text{Restrictions } A_{02} = A_{03} = A_{05} = A_{06} = A_{08} = 0) \quad (37)$$

$$S_t = A_{30}+A_{31}\ Y^{e}_{t} + A_{34}\ P_t + A_{37} S_{t-1} \quad (\text{Restrictions: } A_{02} = A_{03} = A_{05} = A_{06} = A_{08} = 0) \quad (38)$$

$$S_t = A_{40} + A_{41}\ Y_t + A_{44}\ P_t + A_{45}\ P_{t-1} + A_{47}\ S_{t-1} + A_{48}\ S_{t-2}$$
(Restrictions: $A_2 = A_3 = A_6 = 0$) (39)

Equation (36) refers to the instantaneous adjustment model, and can be considered a particular case of (37) where the adjustment coefficient is 1. Equation (38) is based on the same partial adjustment principal as (37) with the difference that the income variable that influences consumers decisions is a weighted average of past income values determined exogenously. In estimation terms it is the same as (42). However, since permanent income is now assumed to be the explanatory variable, expected income is used as a better proxy for permanent income than current income. In other words the process that generates consumers expectations on their permanent income level, is assumed to take place outside our model. Equation (39) on the other hand includes the formation of consumers permanent income concept in the models' specification, by assuming an adaptive expectations process. This, as we saw before, results in the inclusion of the stock variable lagged twice and a lagged price variable in our reduced form.

The F-statistic to be used is given by the ratio:

$$F = \frac{\sum er^2 - \sum e^2 \ /\ \text{number of restrictions } (=T)}{\sum e^2 \ /\ (n-k)}$$

where $\sum e_r^2$: the sum of squared residuals of the restricted form.

$\sum e^2$: the sum of squared residuals of the unrestricted form.

This statistic will be compared with the F tabular (T,n-k) at 1% and 0.1% level. The restricted form will be accepted if:

$$F < F_{(T,n-k)}$$

in which case we accept the null hypothesis that all of the restrictions are true.

The estimates of equations (35) to (39) are:

A. Refrigerators

I $S = \text{Constant} + \underset{(1.225)}{0.019}\ Y_t + \underset{(1.347)}{0.019}\ Y_{t-1} + \underset{(0.963)}{0.001}\ Y_{t-2} -$

$\underset{(-3.469)}{0.142}\ P_t + \underset{(1.406)}{0.095}\ P_{t-1} + \underset{(0.193)}{0.012}\ P_{t-2} + \underset{(9.908)}{1.513}\ S_{t-1} +$

$\underset{(-4.61)}{0.675}\ S_{t-2} + u_t \quad \sum e^2 = 96933,\ R^2 = 0.995,\ D.W. = 1.481$

II $S = \text{Constant} + \underset{(4.742)}{0.0164}\ Y_t - \underset{(-0.161)}{0.0114}\ P_t + u_t$

$\sum e_r^2 = 3441470,\ R^2 = 0.897,\ D.W. = 0.995$

III $S_t = \text{Constant} + \underset{(1.866)}{0.0342}\ Y_t + \underset{(3.039)}{0.0863}\ P_t + \underset{(9.968)}{0.985}\ S_{t-1} + u_t$

$\sum e_r^2 = 451342,\ R^2 = 0.985,\ D.W. = 0.860$

IV S_t = Constant + 0.0288 Y_t -0.151 P_t + 0.128 P_{t-1} +
(2.809) (-3.90) (3.272)

1.60171 S_{t-1} - 0.728040 S_{t-2} + u_t
(13.3562) (-5.66114)

$\sum e_r^2$ = 117970, R^2 = 0.995, D.W. = 1.632

B. Cookers

V S_t = Constant -0.0033 Y_t + 0.009 Y_{t-1} + 0.029 Y_{t-2}
(-0.330) (1.058) (-0.321)

-0.0410 P_t + 0.0155 P_{t-2} + 0.0139 P_{t-2} + 1.157 S_{t-1}
(-0.964) (0.317) (0.3429) (2.613)

-0.136 S_{t-2} + u_t
(-0.381)

$\sum e_r^2$ = 35856.4, R^2 = 0.994, D.W. = 1.7406

VI S_t = Constant + 0.008 Y_t -0.13987 P_t + u_t
(0.971) (-7748)

$\sum e_r^2$ = 220628, R^2 = 0.964, D.W. = 1.267

VII S_t = Constant + 0.007 Y_t + 0.029 P_t + 1.162 S_{t-1} + u_t
(-1.767) (1.139) (7.041)

$\sum e_r^2$ = 51247.4, R^2 = 0.991, D.W. = 1.885

VIII S_t = Constant + 0.005 Y_t -0.066 P_t + 0.044 P_{t-1} +
(1.249) (-1.973) (1.720)

$$+ \underset{(5.197)}{1.461}\ S_{t-1} \underset{(-1.271)}{-0.340}\ S_{t-2} + u_t$$

$\sum e_r^2$ = 41146.4, R^2 = 0.991, D.W. = 2.051

THE F-TEST

Regression No	Standard Error	Sum of Squared Residuals	F-ratio	F-Tabular 0.01	F-Tabular 0.01
I	98.4546	96933			
II	463.78	3441470	57.706	5.39	9.93
III	173.463	451342	7.3124	5.64	10.48
IV	95.2609	117970	0.72342	6.55	12.55
V	59.8802	35856.4			
VI	117.428	220628	8.588	5.39	9.93
VII	48.4508	51247.4	0.8584	5.64	10.48
VIII	56.2593	41146.4	0.49177	6.55	12.55

Note: Regressions I - IV are for refrigerators stock, while V - VII for cookers. The F-tabular on the right hand side is presented first at 1% and then at 0.1% significance level.

It is immediately evident that the case of the naive instantaneous adjustment model has to be dismissed since the F-ratio clearly shows that the null hypothesis (i.e. all of the restrictions being implied from the form of (36) to hold) has to be rejected for both the cases of Refrigerators and Cookers. In fact, if we take into account the discussion under the section of trend influence in our variables, the lagged value of stock, would be a superior variable in explaining variations in stock (it would explain more than 95% of these variations), than the price and income variables together. The large magnitude of the constant term of estimates II and VI and a casual observation of their residuals pattern that shows strong serial correlation, indicates

that the lagged stock variable has to be included in the specification.

While for the case of refrigerators the compound lag model seems the appropriate one, the case is not clear for the demand of Cookers: The simpler partial adjustment model for demand for stock of electrical Cookers survives the F-test at both the 1% and 0.1% significance level.

Although naturally Refrigerators and Cookers are not the same goods there is no reason not to expect similar price and income considerations, along with similar adjustment patterns of actual to desired stock, to influence consumers decisions. It is the influence of trend that may be taken to account for this paradox. If one observes the series of the value of the stock presented in the appendix, it is clear that the influence of trend is much stronger in the case of Cookers than in the case of Refrigerators.

This influence of trend, once the lagged stock variable is included in VII, gives to the equation such an explanatory power, that the set of restrictions are accepted. Further support for this argument can be derived from the fact that while the income and price coefficient estimates are extremely small and insignificant, the coefficient of St-1 is very large. (Too large to satisfy the condition $0 < \gamma < 1$, although one should take into account a positive bias of the estimate of A_{27} in equation VI, once OLS is used). At any rate even if as the F-statistics indicates, the inclusion of S_{t-1} as an explanatory variable in VII is enough to derive an acceptable estimation of the demand for stock, it is a fact that the sum of squared residuals is further reduced once we also include the rest of the variables required for the compound lag model as indicated by the estimate of VIII.

At this stage though, it would be inappropriate to base any further inference on the estimates I to VIII, since OLS has been used and, as it has already been discussed, it is not the

appropriate estimation method. We will therefore limit our existing conclusions to the choice of the compound lag model for both the demand of Refrigerators and Cookers, while we will reserve a further examination of VII, to a method different to OLS and in the first differences so that the influence of trend is removed.

The estimation of the compound lag model equation is presented at Part C of this chapter. Before we proceed with the presentation of the results we will run a number of diagnostic tests to detect possible departures from the chosen specification. We will run tests for serial correlation, Heteroskedasticity, Normality and we will test for functional misspecification. All the tests that follow have been conducted on the compound lag model equation of the demand for Refrigerators, of which a 2-SLS estimate is presented at part C, equation XIII.

Description of Test Procedures

(1) Testing for General AR when the X matrix contains a lagged Dependent variable.

The above test is a Lagrange Multiplier test derived by Breusch (1978) and Godfrey (1978). Below we will present a modified version of this test as found in Harvey (1981).

We will test the null hypothesis that there is no serial correlation in the errors against the alternative of an AR(p) or MA(p) error process. Note that this test is the same for both alternative hypothesis.

1. Obtain the OLS residuals et, t = 1, ...n

2. Regress et on the X's (including of course the lagged dependent variable) and e_{t-1} ... e_{t-p}

3. From Step 2 obtain the R^2 and form nR^2, where n is the number of observations in the auxilliary regression then $nR^2 \sim X^2p$.

(2) The Breusch-Pagan test for heteroskedasticity.

Suppose that in the regression model we have that $\sigma_t^2 = h(Z_t'a)$. Here h(-) is some function independent of t and Z_t in Pxl vector of variables that affect σ_t^2, including a constant. Note that Z_t can be a part of the X_t's in our model. The test was proposed by Breusch and Pagan (1979). Below we will present a modified version of it, see Harvey (1981).

1. Obtain the OLS residuals et, t = 1 ...n.

2. Regress e_t^2 on Z_t's.

3. Obtain the R^2 from the auxilliary regression in Step 2 and form nR which is distributed as X^2_{p-1}. n is the number of observations in the auxilliary regression.

(3) Testing for Autoregressive Conditional Heteroskedasticity (ARCH)(11).

ARCH errors were first modelled by Engle (1982). Here the conditional variance is related to the size of past errors. For instance a simple ARCH model would have $\sigma_t^2 = \sigma^2 + \gamma U^2_{t-1}$.

One can test for the presence of ARCH effect by regression of squared OLS residuals e_t on a constant and e^2_{t-1}, (or possibly more lagged e_t^2's). The $nR^2 \sim X^2p$ where p is the number of lagged e_t^2's included in the auxilliary regression and n is in the number of observations.

(4) A test for Normality

Bera and Jarque (1981) using the Pearson family as the parametric alternative to the null of a normal distribution derived a Lagrange multiplier test based on the estimated skewness and kurtosis of the residuals.

Note that the standard normal variate has zero skewness and kurtosis 3.

(5) Tests for Functional misspecification (RESET)

The RESET test was developed by Ramsey (1974) and Ramsey and Schmidt (1976) as a means to detect functional misspecification. Powers of the fitted value from the regression are added as additional regressors and their joint significance is tested using the usual F-statistic or its asymptotic X^2 analog. The significance of these terms suggests functional misspecification.

Results of Diagnostic Tests

The specification of the equation was upheld by a number of diagnostic tests designed to detect departures from the chosen specification. The Breusch-Godfrey test statistic for first order serial correlation was 0.1814 well below the critical value of 3.84 at the 0.05 level of significance. The Bera-Jarque test of normality resulted in a test statistic of 0.842, whereas the critical value of the X with two degrees of freedom is 5.99. Similarly, the Breusch-Pagan test for heteroskedasticity revealed no traces of heteroskedasticity with the test statistic of 0.5727. Also, the RESET test in its F-form gave a statistic of 1.967 below the critical value of F (2, 14) of 2.73, 3.74 and 5.51 at the 0.10, 0.05 and 0.01 levels of significance respectively. Here, the squared and the cubed fitted value were added as additional regressors.

Finally, testing for ARCH(1) errors yielded a test statistic of 0.3825 below the critical value of 3.84.

To summarise, the estimated relationship seems to be fairly robust when subjected to various tests for possible misspecification in a number of different directions.

6.3 ESTIMATION

6.3.1 THE DEMAND FOR STOCK

I ESTIMATION BY THE COMPOUND LAG MODEL

The form of equation (19) suggests that OLS is not the appropriate estimation method. The presence of the lagged dependent variable on the right hand side, along with the theoretically specified serial correlation of the error term would cause the OLS estimates to be biased and inconsistent.

The alternative method, is a 2-SLS which involves an estimation of an equation for the demand for stock that does not contain the lagged values of the stock on the right hand side, and the subsequent use of the fitted values of this regression as instruments for the lagged stock in an instrumental variable estimation of the demand for stock. Such a technique avoids the problem of consistency of our estimates, since the instruments used do not have to be correlated with the error term.

We have used as instruments the fitted value of the estimates:

Refrigerators

IX $S_t = -7585.19 + 0.068377\ Y_t + 0.0513911\ Y_{t-1} + 0.10647\ Y_{t-2} +$

$+ 0.0695159 P_t + 0.035479 P_{t-1} + 0.0206065 P_{t-2}$ with $R^2 = 0.929949$

X Cookers

$S_t = 6350.75 - 0.220942\ Y_t + 0.016862\ Y_{t-1} + 0.0217352\ Y_{t-2}$
$- 0.105022\ P_t + 0.029618\ P_{t-1} - 0.0498585\ P_{t-2}$
with $R^2 = 0.973592$

We obtained the following instrumental variable estimates.

XI Refrigerators

$$S_t = \text{Constant} + \underset{(-0.608269)}{0.021654}\ Y_t - \underset{(1.61964)}{0.164399}\ P_t + \underset{(-3.46477)}{0.141827}\ P_{t-1} + \underset{(2.14205)}{}$$
$$+ \underset{(4.71104)}{1.71839}\ S_{t-1} - \underset{(-1.82074)}{0.802037}\ S_{t-2} \qquad \text{D.W.} = 1.47$$

XII Cookers

$$S_t = \text{Constant} + \underset{(0.441456)}{0.00771735}\ Y_t - \underset{(1.45072)}{0.217115}\ P_t + \underset{(-0.430520)}{0.0541392}\ P_{t-1} + \underset{(0.947840)}{}$$
$$+ \underset{(1.96795)}{1.69050}\ S_{t-1} - \underset{(-0.408570)}{0.334246}\ S_{t-2} \qquad \text{D.W. } 1.6974$$

Estimates XI and XII should be used for calculation of $\hat{b}_1$, $\hat{b}_2$, $\hat{\gamma}$ and $\hat{\lambda}$. However, they are not immediately very conclusive. Equation XII, gives estimates which at least in terms of sign and significance are acceptable. We will try to find out whether these estimates satisfy the rest of the conditions for the compound lag model described in a previous section. Equation XII unfortunately is rather disappointing, although the signs of coefficient estimates are correct and the coefficient estimates of lagged stock would straightaway give real values for γ, λ, since the only significant coefficient is that of lagged stock. It presents exactly the same problem as equation VII used in the choice of the correct model, and we will again take trend to account for this disappointing result, while we will base our calculations for the moment on the demand for stock of refrigerators.

a) Calculation of b_1, b_2 $\hat{\gamma}$, and $\hat{\lambda}$ from XI.

XI is an estimate of equation (25). It gives:

$A_1 = 0.021654$, $A_2 = -0.164399$, $A_3 = 0.141827$, $A_4 = 1.71839$, $A_5 = -0.802037$

The signs and size are correct to satisfy conditions (15) to (25) and (30). However, although $\hat{A}_4$ and $\hat{A}_5$ are of the acceptable magnitude, we would not be able to calculate $(1-\hat{\gamma})$ and $(1-\hat{\lambda})$ from the roots of the quadratic, since condition (27) would not be satisfied. However, when the specification of the compound lag model was discussed we saw that the relationships between the coefficients of (19) indicate that $\hat{A}_2$ and $\hat{A}_3$ contain enough information for the calculation of $\hat{\lambda}$ provided condition (32) is satisfied. Since this is the case we can use either $\hat{A}_4$ or $\hat{A}_5$ to calculate $\hat{\gamma}$. We choose $\hat{A}_4$ since there are doubts about the significance of $\hat{A}_5$. Our estimates will be accepted once they satisfy condition (32), in order to ensure that we obtain a unique $\hat{b}_2$ from $\hat{A}_2$ and $\hat{A}_3$ From (29) we derive $\hat{\lambda}$:

$$1-\hat{\lambda} = \frac{-\hat{A}_3}{\hat{A}_2} = \frac{0.141827}{0.164399} \quad 0.8626988, \text{ that is } \hat{\lambda} = 0.1373002$$

From the above and $\hat{A}_4$ we obtain:

$$1-\hat{\gamma} = 1.71839 - 0.8626988 = 0.8556902, \text{ that is } \hat{\gamma} = 0.1443908$$

from $\hat{A}_2$ and $\hat{\gamma}$ we can obtain:

$$\hat{b}_2 = 1.1392088$$

which we may verify by using $\hat{A}_3$ and:

$$\hat{b}_2 = \frac{\hat{A}_3}{(1-\hat{\lambda}) - \hat{\gamma}} = - \frac{(0.141827)}{(0.862698) \quad (0.1443908)} = 1.1392092$$

Since $\hat{A}_2$ and $\hat{A}_3$ give the same value of $\hat{b}$ our estimates are acceptable;

We can safely conclude that: $\hat{b}_2 = 1.13921$

From $\hat{A}_1$, $\hat{\gamma}$ and $\hat{\lambda}$ we obtain:

$$\hat{b}_1 = \frac{0.021654}{0.0198137} = 1.092881 \qquad \hat{b}_1 = 1.092881$$

The estimate XI gives the following estimate of the compound lag model of the the demand for stock of refrigerators:

$$S_t^* = \text{Constant} + 1.092881\, Y_t^* - 1.1392\, P_t$$

$$S_t - S_{t-1} = 0.1443908\ (S_t^* - S_{t-1})$$

$$Y_t^* - Y_{t-1} = 0.01373002\ (Y_t - Y_{t-1}^*)$$

with:

$$S_t^* = \text{Constant} + 0.021654\, Y_t - 0.164399\, P_t + 0.141827\, P_{t-1} + 1.71839\, S_{t-1} - 0.7382029\, S_{t-2}$$

Notice that the coefficient of S_{t-2} is different from that of XI. This difference would be attributed to bias. If the form of XI is assumed correct, we will have to accept that the estimate of demand for refrigerators is quite successful since it just fails to satisfy the total of the set of restrictions described in the previous part by just 0.1 overestimation of the coefficient of S_{t-2}.

Before we discuss the conclusions that can be derived from the above reduced form, we will present log-linear estimates obtained by 2-SLS.

XIII Refrigerators

S_t=Constant + 0.245379 Y_t-1.15419 P_t+1.05372 P_{t-1} + 1.54345 S_{t-1} -
(2.96743) (-3.275351) (2.80889) (16.0563)
- 0.708271 S_{t-2}
(-7.77336) D.W. 1.7120

XIV Cookers

S_t=Constant + 0.611132 Y_t-0.762554 P_t+0.829451 P_{t-1}+1.29484 S_{t-1} -
(0.807267) (-1.32367) (1.52325) (5.15082)
-0.355681 S_{t-2}
(-1.49381)

Since we get once more insignificant coefficients of XIV we are going to base our conclusions on XIII

b) Calculations based on the log-linear forms.

By using the same formulas as before we derive:

$1 \hat{-} \lambda = -\frac{\hat{A}_3}{\hat{A}_2} = 0.9129519$ Then $\hat{\lambda} = 0.087048$

From $\hat{A}_2$, $\hat{A}_3$ and $\hat{A}_4$:

$1 \hat{-} \gamma = 1.54345 - 0.9129519 = -0.63034981$ Then $\hat{\gamma} = 0.365019$

The values of $1 \hat{-} \gamma$, $1 \hat{-} \lambda$, $\hat{\gamma}$, $\hat{\lambda}$ give:

From $\hat{A}_2$: $\hat{b}_2 = -\frac{1.15419}{0.3695019} = 3.1236375$

Then $\hat{b}_2 = 3.12364$

Verified for $\hat{A}_3 = \hat{b}_2 = \frac{-1.05372}{0.3373374} = 3.1236382$

From $\hat{A}_1$: $\hat{b}_1 = \frac{0.245379}{0.321644} = 7.6289002$ Then $\hat{b}_1 = 7.6289002$

The difference between $\hat{\gamma}$, $\hat{\lambda}$ of the log-linear form from those of the linear form is not alarming, since their economic meaning refers to the ratios of desired to actual stock and expected to actual income. What may give us reason for concern is the extremely high magnitude of $\hat{b}_1$ and $\hat{b}_2$ which, since the log-linear form is used, actually represent the income and price elasticities of the demand for stock w.r.t. expected income and price. We will come back to this problem in the conclusion section which follows below.

II INTERPRETATION OF THE RESULTS

While the impact of a unit change in consumers notion of expected income on the desired stock is substantial as indicated by the estimate $\hat{b}_1 = 1.092881$, an observed unit change of actual income will have a much smaller effect on the actual stock of the current period as indicated by $\hat{A}_1 = 0.021654$. Similarly while a unit change in prices will have a substantial effect on desired stock ($\hat{b}_2 = 1.1372$) the observed effect in the current period will be much smaller ($\hat{A}_2 = -0.164399$. The sources of these small first period effects are the two distributed lag process that our model assumes:

a) Consumers notion of expected income, that actually influences the demand for desired stock is very slow to adapt to changes of actual disposable income. As our model indicates, consumers take into account in the first period only 13.7% ($\hat{\lambda} = 0.137002$) of the deviation of current income from its expected norm.

b) The second source of small first period impact of a unit change in income or prices is due to the slow adjustment of actual

to desired stock. Once consumers decide to change their demand for stock, because of rigidities, only 14.4% ($\hat{\gamma}$ = 0.1443908) of this new demand is going to be experienced in the first period.

This means that changes in prices and income in the current period will influence actual demand for stock in the future, while the adjustments of actual to expected income and of actual to desired stock continue. For this reason, by examining the reduced form of the compound lag model, we can argue that while the term $(1 - \gamma) S_{t-1}$ captures the effects of changes in the desired stock that were generated in the past but were not realised until the current period because of partial adjustment, the terms $b_1\gamma (1 - \lambda) P_{t-1}$, $(1 - \lambda) S_{t-1}$, $(1-\gamma)-(1-\lambda) S_{t-2}$ capture the effects of changes in past levels of actual income but affect current stock, because they form a part of consumers notion of expected income only in the current period.

Similar principles may apply to the estimates of the log-linear form. However, as mentioned before, the estimates of $\hat{\gamma}$ and $\hat{\lambda}$ now represent partial adjustment and adaptive expectations coefficients in the difference of the logarithms of actual and desired stock or expectd and actual income respectively. In arithmetic instead of logarithmic units these estimates give the size by which the ratio of current to past actual stock is smaller than the ratio of desired to past stock or the ratio of expected to past income is smaller than the ratio of current income to expected income of the previous period.

The estimate $\hat{A}_1$ = 0.245379 represents the short-run elasticity of demand for stock with respect of actual income, while $\hat{b}_1$ = 7.6289002 represents the long-run elasticity of demand for stock with respect to expected income. The size of $\hat{b}_1$ may not give reason for concern for the validity of our estimates, once we take into account that the expected income will rise by 1% in one period only if there is a more than tenfold rise of actual income

as the small size of $\hat{\lambda} = 0.0870481$, suggests. In fact for the case of price elasticity, since a change in price is subject only to one (habit persistence) adjustment delay, the difference between short-run ($\hat{A}_2 = -1.15419$) and long-run ($\hat{b}_2 = -3.12364$) elasticities is not so large.

III THE EFFECT OF CREDIT ON THE DEMAND FOR STOCK

As mentioned at a previous part, we will examine whether the stock of credit (or outstanding consumers liabilities) had any effect on the demand for stock, by testing whether there is any improvement in the explanatory power of extimates of the compound lag model when credit is included in the specification as an additional explanatory variable. For this test we are going to use the, estimated by OLS, equations IV for Refrigerators and VIII for Cookers along with OLS estimates of similar specification with credit included as an explanatory variable presented below:

a) Refrigerators

XV $$S_t = \text{Constant} + \underset{(2.53641)}{0.033072\ Y_t} - \underset{(-2.79875)}{0.129173\ P_t} + \underset{(2.18904)}{0.102122\ P_{t-1}} -$$

$$\underset{(-1.01627)}{- 0.275859\ (10^{-6})\ Cr_t} + \underset{(1.00661)}{0.210225\ (10^{-6})\ Cr_{t-1}} + \underset{(9.80357)}{1.57231\ S_{t-1}}$$

$$\underset{(4.29757)}{-0.701517\ S_{t-2}} + u_t$$

$$\sum Y^2 = 37508603, \sum e^2 = 101719, F_{(7,11)} = 579460, R^2 = 0.995574,$$

$$D.W. = 2.0713$$

b) Cookers

XVI S_t = Constant + 0.003894 Y_t - 0.061828 P_t + 0.0431309 P_{t-1} +

+ 0.1917 (10^{-7}) Cr_t - 0.1483 (10^{-6}) Cr_{t-1} + 1.44803 S_{t-1} -

0.386497 S_{t-2} + u_t

$\Sigma \hat{Y}^2 = 7039702, \Sigma e^2 = 34819.8,\ F_{(7,11)} = 317.704, R^{-2} = 0.991946,$

D.W. = 2.5752.

Although the F-ratios indicate that the overall significance of the above regressions is accepted, we have to test whether there is a significant improvement of equations IV and VIII. For this test, we use the ratio:

$$F = \frac{\Sigma \hat{\hat{Y}}^2 - \hat{Y}^2 / (K-M)}{\Sigma e^2 / (N-K)}$$

where $\Sigma \hat{\hat{Y}}^2$: explained squares of IV or VIII

$\Sigma \hat{Y}^2$: " " of XV or XVI

K = number of variables in XV or XVI

M = number of variables in IV or VIII

which we compare with $F_{(K-M,\ N-K)}$. We accept that there is overall significance if F calculated > F tabular.

For equation

XV $F_{(2,11)} = \frac{8256.5}{9247.1818} = 0.89 < F_{0.05,\ 2,\ 11} = 3.98$

and for:

XVI $F_{(2,11)} = \frac{6342.4/2}{34819.8/11} = \frac{3171.2}{3165.44} = 1.001 < F_{0.05\ 2,11} = 3.98$

Therefore, we do not accept that the stock of credit (or consumers indebtedness) increases the explanatory power of our model

significantly. At any rate, we have estimated by a similar method of instrumental variables used before, equations of demand for stock that includes credit as an explanatory variable, presented below:

a) Refrigerators

$$\text{XVII}\quad S_t = \underset{}{\text{Constant}} + \underset{(2.11822)}{0.0349466}\ Y_t - \underset{(-2.40329)}{0.130067}\ P_t + \underset{(-1.75101)}{0.10882}\ P_{t-1} - \underset{(0.783106)}{0.247174}$$

$$(10^{-6})Cr_t + \underset{(0.896111)}{0.218485}\ (10^{-6})Cr_{t-1} + \underset{(6.55282)}{1.60928}\ S_{t-1} - \underset{(-2.57439)}{0.767277}\ S_{t-2} + u_t$$

b) Cookers

$$\text{XVIII}\quad S_t = \underset{}{\text{Constant}} + \underset{(0.53531)}{0.036127}\ Y_t - \underset{(-1.30682)}{0.0744623}\ P + \underset{(0.20352)}{0.01093}\ P_{t-1} + \underset{(0.16423)}{0.3(10^{-7})}$$

$$Cr_t + \underset{(1.2376)}{0.1897}\ (10^{-6})\ Cr_{t-1} + \underset{(2.9918)}{1.21495}\ S_{t-1} + \underset{(0.213278)}{0.141552}\ S_{t-2}$$

Note, that the instruments used for lagged stock are in this case the fitted values of regressions containing the present and past (2 lags) values of income, price and credit, as opposed to just income and price used in the previous section.

6.3.2 DEMAND FOR NET PURCHASES

I ESTIMATION OF DEMAND FOR NET PURCHASES

We have also estimated equation (34) for the demand for net purchases by using again as instruments for the lagged dependent variables the OLS estimates IX and X of the previous section. We obtained the following results:

XIX Refrigerators

$$\text{Net Purchases} = \text{Constant} + \underset{(3.66929)}{0.046636\ Y_t} - \underset{(-3.3854}{0.163274\ P_t} + \underset{(2.77249)}{0.135196\ P_{t-1}} + \underset{(2.8578)}{0.424893\ S_{t-1}} - \underset{(-3.17489)}{0.50619\ S_{t-2}}$$

D.W. = 1.8741

Cookers

The results were unacceptable, since most of the coefficients were insignificant. For this reason we are going to base our presentation only on estimate XIX.

From equation (34) we have that the coefficient of S_{t-1} is equal to $(1 - \gamma) + (1 - \lambda) - 1$. From XIX we have that $(1 - \gamma) + (1 - \lambda) = A_4 = 1.424893$. The rest of the coefficients are given by equations (26) to 37). Basing again our calculations on condition (34) we have:

$$\hat{\lambda} = 0.1718686 \quad \text{and} \quad \hat{\gamma} = 0.4031384$$

(For all of the conditions to be satisfied we would require $(1-\gamma)(1-\lambda)$ to be equal to -0.494221 instead of -0.506197 that is given by XIX. However the difference is too small for such a small number of observations to give us reasons for concern).

Then from XIX since $\hat{A}_2 = 0.163274$ we have:

$$\hat{b}_2 = -\frac{0.163274}{0.4031384} = 0.4050073$$

$$\hat{b}_2 = -0.4050073$$

Verified by A_3 :

$$\hat{b}_2 = \frac{-0.135196}{0.3338112} = -0.4050073$$

And from $\hat{A}_1 = 0.046636$

$$\hat{b}_1 = \frac{0.046636}{0.0693271} = 0.672695 \qquad \hat{b}_1 = 0.672695$$

An important observation can be made at this point by comparing these results with those of equation XI. While both estimates are based on exactly the same theoretical model, and the short-run impact of unit changes in income or price are of a very similar range ($\hat{A}_1 = 0.04$ from XIX as opposed to 0.02 from XI and $\hat{A}_2 = .163$ from XIX as opposed to $-.164$ from XI), the estimates of long-run impacts for XIX are much smaller than those of XI. The obvious reason for this discrepancy is the difference in the estimates of $\hat{\gamma}$, the partial adjustment coefficient between the two regressions. While the estimate of $\hat{\lambda}$ from XI and XIX are of the same range, the partial adjustment coefficient of XIX is double the size of that in XI (although still not in an unrealistic range).

We can explain this difference in the estimate of $\hat{\gamma}$ in the different size of the estimated coefficients of lagged stock. The sum of $(1 - \gamma) + (1 - \lambda)$ from XI is 1.71839 while its calculated value from XIX is 1.42493. This is the only marked difference between the two regressions. It can be explained, by taking into account that regression XI explains variations in stock, while regression XIX explains variations of differences in demand for stock (net purchases). Even if, as mentioned before, the series of demand of refrigeration do not demonstrate a strong influence of trend, whatever influence is there, is removed in the net purchases regression. In fact, Griliches has shown that the presence of trend, causes the estimates of the lagged stock variable in models similar to ours to contain a certain positive bias. This bias results to smaller estimates of γ (since $1 - \hat{\gamma}$ is higher) in our demand for stock regression.

II INFLUENCE OF CREDIT ON THE DEMAND FOR NET PURCHASES

We have also estimated by OLS equations similar to XV and XVI for net purchases, including the stock of credit as an explanatory variable along with OLS estimates of equation (34). For the sake of space, and since the OLS estimates can not be used for presentation once they are invalid, we will only present the calculated F-ratios to test for the significance of credit in the demand for net purchases.

a) Refrigerators

$$F = \frac{\sum \hat{Y}^2 \sum y^2/2}{e^2/11} = \frac{44199.06/2}{12466.09/11} = 1.77265 \quad F_{0.05,\ 2,\ 11} = 3.98$$

b) Cookers

$$F = \frac{14874.59/2}{1533.6909/11} = 9.6985579 \quad F_{0.05,\ 2,\ 11} = 3.98$$

In this case there are indications (although for refrigerators F still less than F tabular) that credit might have an influence in the demand for net purchases. We have computed estimates of the demand for net purchases by using again as instruments fitted values of OLS estimates for the lagged values of stock. The results are:

XX Refrigerators

$$\text{Net Purchases} = \text{Constant} + \underset{(2.85811)}{0.0435 Y_t} - \underset{(-2.88841)}{0.153 P_t} + \underset{(2.15256)}{0.116 P_{t-1}} -$$

$$\underset{(0.53907)}{0.16861\ (10^{-6})\ Cr_t} + \underset{(1.88319)}{0.4534\ (10^{-6})\ Cr_{t-1}} + \underset{(2.75845)}{0.51 S_{t-1}} - \underset{(3.10936)}{0.59 S_{t-2}}$$

The result from Cookers is unacceptable, since all the coefficients are not significant and with signs that do not satisfy the specification.

ANALYSIS OF THE STATISTICAL EVIDENCE

In this chapter we have estimated the demand for stock and net purchases for household refrigerators and cookers in Greece, for the period 1960-1980 and we have examined whether consumer credit either as stock (outstanding consumers indebtedness) or as flow (net credits extended during the period) have any effect on this demand.

We have constructed regression variable series for demand for stock, net purchases and disposable income (per capita) as well as price series. The regression series appear at the appendix. The assumptions made for the quantity series are: a) the depreciation of stock pattern is that of a declining balance, b) the depreciation rate is 15%.

From the various theoretical specifications discussed in Part B, from the theoretical standpoint, the model that appears to be more complete is the compound lag one. This model assumes that both the 'partial adjustment' and 'adaptive expectations' mechanisms are endogenously determined.

The same model seems to receive the support of the statistical evidence. The critical test that determines the choice of the appropriate model has been presented in part B2. There, the F-tests, particularly for the case of refrigerators, clearly show that the compound lag model has significantly higher explanatory power than the other alternatives at the 10% and 1% significance levels. (For the case of cookers, both the compound lag and partial adjustment model survive the test). As a consequence, the equations used to estimate the demand for stock and net purchases are the reduced forms implied by the compound lag model.

We have also run a number of diagnostic tests to detect departures for the chosen specification. The chosen relationship seemed to be fairly robust when subjected to the tests described at part 6.2.2.

The appropriate estimation method, since, as described in Part 6.2.1, the right hand side of the equations includes lagged values of the dependent variable and a serially correlated error term, is a 2SLS, where the fitted values of OLS estimates of regression that do not include lagged dependent variables are used as instruments for the demand for stock (or the net purchases). We have estimated by using this method, the demand for stock for electrical refrigerators and cookers in linear and log-linear form. The results obtained from the estimation of the demand for electrical refrigerator stock are superior to the results obtained for the case of cookers. The best equations from this part of the study (Part 6.3.1 I) are equations XI and XIII. The results from these estimates are analysed in section 6.3.1 II.

The acceptable estimates in the case of net purchases are only those obtained by the 2SLS estimation, in the linear-form, for the case of refrigerators. We therefore base all our results of section 6.3.2 I on equation XIX.

In Sections 6.3.1 III and 6.3.2 II we have used F-tests to examine whether credit has had any effect on the demand for stock or on the demand for net purchases. Although in some cases the coefficient of the credit variable is significant and the overall significance of regression, including a credit variable, is accepted, the F-tests do not appear to support a significant rise in the explanatory power of the equations when this credit variable is included.

The following Table summarises the results of this chapter.

TABLE 6.1

DEMAND FOR REFRIGERATORS 1960-80

Dependent Variable / Independent Variables	Equation No	Y_t	P_t	P_{t-1}	S_{t-1}	S_{t-2}	Cr_t	Cr_{t-1}
Demand for Stock	XI	.0217	-.1644	.1418	1.7184	-.802	-	-
(D.W. = 1.47)		(1.62)	(-3.46)	(2.14)	(4.7)	(-1.8)		
Calculated Parameters: $\hat{\lambda}$ = .1373, $\hat{\gamma}$ = .1444, $\hat{b}_1$ = 1.093, $\hat{b}_2$ = 1.14								
Demand for Stock	XIII	.2454	-1.1452	1.0537	1.5435	-.7083	-	-
(D.W. = 1.712)		(.81)	(-1.323)	(1.52)	(5.2)	(-1.49)		
Calculated Parameters: λ = .087, $\hat{\gamma}$ = .365, $\hat{b}_1$ = 7.6289, $\hat{b}_2$ = 3.1236								
Demand for Stock	XVII	.0399	-.13	.1088	1.6092	-.7672	$-.2472(10^{-6})$	$.2185(10^{-6})$
(D.W. = 2.078)		(2.12)	(-2.4)	(1.75)	(6.55)	(-2.57)	(.78).	(.89)
Demand for Net Purchases	XIX	.0466	-.1633	.1352	.4249	-.5062	-	-
(D.W. = 1.87)		(3.67)	(-3.39)	(2.77)	(2.86)	(-3.17)		
Calculated Parameters: $\hat{\lambda}$ = .1719, $\hat{\gamma}$ = .4031, $\hat{b}_1$ = .6727, $\hat{b}_2$ = .4050								
Demand for Net Purchases	XX	.0435	-.153	.116	.51	-.59	$-.17(10-6)$	$.4534(10-6)$
(D.W. = 1.485)		(2.86)	(-2.88)	(2.15)	(2.76)	(-3.118)	(.54)	(1.88)

Note: Coefficient estimates rounded to the nearest fourth decimal place; t - statistics (in parenthesis) rounded to the nearest second decimal place.

TABLE 6.1

DEMAND FOR REFRIGERATORS 1960-80

Dependent Variable	Equation No / Independent Variables	Y_t	P_t	P_{t-1}	S_{t-1}	S_{t-2}	Cr_t	Cr_{t-1}
Demand for Stock	XI	.0217	-.1644	.1418	1.7184	-.802	-	-
	(D.W. = 1.47)	(1.62)	(-3.46)	(2.14)	(4.7)	(-1.8)		
	Calculated Parameters: $\hat{\lambda}$ = .1373, $\hat{\gamma}$ = .1444, $\hat{b}_1$ = 1.093, $\hat{b}_2$ = 1.14							
Demand for Stock	XIII	.2454	-1.1452	1.0537	1.5435	-.7083	-	-
	(D.W. = 1.712)	(.81)	(-1.323)	(1.52)	(5.2)	(-1.49)		
	Calculated Parameters: λ = .087, $\hat{\gamma}$ = .365, $\hat{b}_1$ = 7.6289, $\hat{b}_2$ = 3.1236							
Demand for Stock	XVII	.0399	-.13	.1088	1.6092	-.7672	$-.2472(10^{-6})$	$.2185(10^{-6})$
	(D.W. = 2.078)	(2.12)	(-2.4)	(1.75)	(6.55)	(-2.57)	(.78).	(.89)
Demand for Net Purchases	XIX	.0466	-.1633	.1352	.4249	-.5062	-	-
	(D.W. = 1.87)	(3.67)	(-3.39)	(2.77)	(2.86)	(-3.17)		
	Calculated Parameters: $\hat{\lambda}$ =.1719, $\hat{\gamma}$ = .4031, $\hat{b}_1$ = .6727, $\hat{b}_2$ = .4050							
Demand for Net Purchases	XX	.0435	-.153	.116	.51	-.59	-.17(10-6)	.4534(10-6)
	(D.W. = 1.485)	(2.86)	(-2.88)	(2.15)	(2.76)	(-3.118)	(.54)	(1.88)

Note: Coefficient estimates rounded to the nearest fourth decimal place; t - statistics (in parenthesis) rounded to the nearest second decimal place.

The statistical evidence of this table, yields the following concusions:

1. Partial Adjustment Coefficient (γ)

The partial adjustment coefficient of the compound lag model is estimated as $\hat{\gamma}$ = .1373 from the linear form (Eq. XI), and $\hat{\gamma}$ = .365 from the log linear model (Eq. XIII).

The linear model's estimate of γ indicates the fraction by which the difference between actual and previous stock is smaller than the difference between desired and previous stock. Our estimate tells us that only .14 of the difference between desired and actual stock is going to be translated within the first year to a change of actual stock.

The estimate of γ of the log-linear form gives the fraction by which the percentage of actual to previous stock is smaller than the percentage of desired to previous stock. Equation XIII indicates that only .365 of the ratio of the desired to previous stock is going to be experienced in the first year as a ratio of actual to previous stock.

2. Adaptive expectations coeffficient (λ)

The same logic applies to the estimate of the adaptive expectations coefficient $\hat{\lambda}$ = .1373 of the linear and $\hat{\lambda}$ = .087 of the log-linear form.

The evidence therefore is that both the adjustment mechanisms in our model i.e. the adjustment of actual to desired stock and the adjustment of expected to real income are quite slow, as far as the demand for stock is concerned. As a result,

there are substantial differences in the size between short-run and long-run elasticities of the demand for stock with respect to income and price.

3. Elasticity estimates

The short-run elasticity of the demand for stock with respect to actual income is less than unity (income coefficient of XIII is approximately .25) whereas the long-run elasticity is quite large ($\hat{b}_1 = 7.6$).

The short-run elasticity of demand for stock with respect to prices is greater than unity (-1.145), although still smaller than the long-run elasticity (3.12).

4. Results from the estimation of demand for net purchases

There is a small discrepancy between estimates derived for the demand for stock in equation XI and those derived from the demand for net purchases in Eq. XIX: Although our regression estimates of the short-run impacts of income and price are of similar range (notice the coefficients of Y_t and P_t on the previous Table) the long-run impacts, estimated after the calculations of $\hat{\gamma}$ and $\hat{\lambda}$ in XIX are smaller than those of XI. As it was explained in Section C2.I, this effect can be attributed to the influence of trends that causes the coefficients of lagged stock in XI to contain a certain positive bias. If this is indeed the case, this bias is removed in XIX, since this regression was specified to explain variations of the difference of the demand for stock (i.e. variations of net purchases). Under these conditions, the evidence produced in XIX indicates that while the short-run impact of changes in income and price is still small, the long-run impact of such changes is not as large as that suggested by equation XI. Furthermore, equation XIV suggests

that the adjustment of actual to desired stock, is about 2.7 times larger than that suggested by XI.

5. The influence of credit

The behaviour of the credit variable is somewhat inconclusive. Although the credit variable estimates have the correct sign they are not significant. As explained in sections 6.3.1 III and 6.3.2 II, although the explanatory power of the demand for stock and the demand for net purchases equations rises when the credit variable is included, the F-tests indicate that this improvement is not significant apart from the case of the demand for net purchases of cookers. Even in that case however, the 2SLS estimate of the demand for net purchases of cookers is of no conclusive use, since, that particular estimate does not satisfy the models theoretical specification.

The estimated F-ratios are produced in the Table below:

F-RATIOS TESTING WHETHER THE INCLUSION OF CREDIT SIGNIFICANTLY IMPROVES THE EXPLANATORY POWER OF ESTIMATES FOR:

		ESTIMATED F-RATIO		F-TABULAR
1	DEMAND FOR STOCK OF REFRIGERATORS	$F(2,11)$ = 0.89	<	3.98
2.	DEMAND FOR STOCK OF COOKERS	$F(2,11)$ = 1.001	<	3.98
3.	DEMAND FOR NET PURCHASES OF REFRIGERATORS	$F(2,11)$ = 1.773	<	3.98
4.	DEMAND FOR NET PURCHASES OF COOKERS	$F(2,11)$ = 9.7	>	3.98

Note: There is a significant improvement if F > Ftabular.
These tests are derived in sections 6.3.1 III and 6.3.2 II

Therefore, the conclusion derived, is that the compound lag model estimate indicates that the credit variable, either as a stock (consumer indebtedness in the case of demand for stock), or as a flow (net credits extended during the period), does not seem to have any effect on the demand for white goods. The implications of these findings for the analysis of this thesis will be discussed in the next chapter.

6 Comparison with other studies

The results from this chapter can now be compared with those of other studies. We have chosen Burstein's [1] study of the demand for refrigeration in the U.S., since its regression variables have been constructed in a way similar to the one discussed here; however, the theoretical formulation of the demand for stock is different. Some of the results can be compared with those of G. Chow [4] for the demand for automobiles in the US, or Muth's [1] for the demand for housing.

Burstein has estimated demand for stock, by both a simple instantaneous adjustment model and by a partial adjustment model. As far as the adjustment of expected income is concerned though he has assumed that either it is instantaneous, or that it is exogenous (i.e. by using a weighted average process, whose weights are determined outside the model). His results indicate that by the instantaneous adjustment model, for the US economy, the elasticity of the demand for stock with respect to income is found to between 1.0 and 2.0 and the elasticity with respect to prices between -1.0 and -2.0. The estimates of the partial adjustment model give short-term elasticities with respect to income and price of 0.88 and -0.68 respectively,

and long-term elasticities of 1.9 and -1.42 with a partial adjustment coefficient of .461. This partial adjustment coefficient finding, corresponds with those of Chow and Muth, in their studies for demand for consumer durables.

In our compound lag model estimation of the log linear form (see Eq. XIII) the partial adjustment coefficient is .365 (in Eq. XIX is .4) which is not significantly different. There are differences however in the estimates of short-term price elasticity which, in absolute terms, is higher than unity (-1.15), while our long-term elastiticities are significantly higher than those estimated by Burstein. As it was mentioned before, this high long-run elasticity estimate may well be the result of trend-induced negative bias of the coefficient of the lagged dependent variable that causes the estimate of λ to be very small. A small adaptive expectations coefficient coupled with a high depreciation rate, would imply a large long-run income and price elasticity, since, when the adjustment of, say, a change in income will be completed, a substantial part of the initial change in stock will have already depreciated and would need to be replaced. This problem would not exist in our estimates of demand for net purchases where, as mentioned before, the influence of trend is removed.

FOOTNOTES

(1) M.L. Burstein: The demand for household refrigeration in the U.S.

A.C. Harberger: The demand for durable goods. University of Chicago Press, 1960.

(2) M.L. Burstein.

(3) Electricity, in Greece, before World War II was available to few urban areas. The small existing stock before 1940 of electric household appliances, should not have risen during the occupation 1940-45 and the Civil War that followed 1945-48.

(4) G. Chow: The demand for automobiles in the U.S. Amsterdam, North-Holland Press 1957.

(5) M.L. Burstein in "The demand for durable goods", Harberger et al., 1960.

(6) Institute of Economic and Industrial research: "The industry of household electrical appliances in Greece" 1984.

(7) See Table 1 of the Appendix.

(8) The implicit assumption here is that the constant term of the first differences estimates is the coefficient of the autonomous growth in our variables. If we assume that the demand for stock is given by the instantaneous adjustment relationship:

$$S_t = ao + b_1Y_1 + B_2P_t + b_3T_{t-1} + U_t$$

On the assumptions that $Tt - T_{t-1} = 1$ (Constant growth rate):

$$\Delta S_t = b_3 + b_1 \Delta Y_t + B_2 \Delta P_t + U_t$$

We have estimated equations of the above form, with very poor results for the following reasons: (a) Errors in the measurement of our variables are much more pronounced in the case of the first differences regression; (b) Serial correlation, which is assumed to be present in the true disturbances will largely impair the explanatory power of our estimates (Nerlove has shown, that the larger the serial correlation in the true disturbances the smaller will be the correlation coefficient of the first differences form); (c) Finally, conceptual errors in the instantaneous adjustment form: If permanent income (or expected income) is the variable that influences demand, the deviations of current income from permanent income are much higher in the first differences than in the regressions of the original form.

(9) Some of these problems can be solved, once the compound lag model, presented later, is used. Firstly, this model takes into account serial correlation and the influences of permanent rather than current income on demand (by assuming an adaptive expectations process). As a consequence lagged variables are used in the regressions, capturing the effects of past fluctuations in stock, on demand. Secondly, the reduced form generated by the compound lag allows the estimation of equations that explain the variations of the first differences of the demand for stock, instead of variations in the variable for stock itself. Such an example is the estimate of net purchases (defined as $S_t - S_{t-1}$) presented in this chapter.

(10) The safest method to avoid both the issues of multicollinearity and identification, is to resort to instrumental variable estimation. For variables where there is suspicion of correlation with supply as income and price, we will use instruments that are not correlated with the supply function. The interest on consumer loans can be used as an instrument for credit (especially since it is not market determined in the case of Greece). Similarly, the price of imported machines instead of the price index can be used as a price variable.

(11) White's Test (1980) for Heteroskedasticity.

The test is obtained again as nR^2, where th R^2 comes from an auxillary regression of the squared OLS residuals et^2, on all the X's and their own products and a constant. The test statistic is distributed as $X^2_{(q-1)}$ where q is the number of variables in the auxillary regression. Note, that since q is much larger than p (the number of regressors) the above test faces a serious problem with degrees of freedom especially for relatively small data sets. For this reason we did not perform it.

6.4 APPENDIX

TABLE A.1

Stock of Refrigerators - Alternative depreciation rates.

a) Equation:

$$S_t = A_0 + A_1Y_t + A_2Y_{t-1} + A_3Y_{t-2} + A_4P_t + A_5P_{t-1} + A_6P_{t-2}$$

Depreciation rate	Sum of Sq. residuals	Standard error
10%	2076010	415.934
12%	1937520	401.820
13%	1874350	395.217
15%	1756410	382.580

b) Equation:

$$S_t = A_0 + A_1Y_t + A_2P_t + A_3P_{t-1} + A_4S_t + A_5S_{t-2}$$

Depreciation rate	Sum of Sq. residuals	Standard error
10%	163073	112.0000
12%	121771	96.7832
13%	120466	96.2634
15%	117970	95.2609

Note: Equation (a) is IX of the text and Equation (b) is IV of the text.

TABLE A.2

Year	Per Capita Stock Series (S_t) Refrigeration	Cookers	Per Capita Real Income Series (Y_t)
1960	1262.83	954.274	12939.8
1961	1213.09	922.936	14177.7
1962	1232.43	952.803	14944.0
1963	1280.96	1007.50	16281.4
1964	1422.46	1043.43	17991.9
1965	1665.61	1124.29	20051.0
1966	1982.11	1217.98	20842.1
1967	2390.09	1319.01	21831.9
1968	2899.23	1408.79	23153.1
1969	3220.86	1429.82	25193.1
1970	3467.97	1447.43	27297.7
1971	3717.65	1525.14	29917.3
1972	3956.91	1651.83	32350.3
1973	4312.42	1793.30	35996.2
1974	4947.83	2111.31	32846.8
1975	5132.19	2217.04	34504.6
1976	5044.57	2291.22	30845.8
1977	4997.64	2449.32	37309.9
1978	4982.91	2576.04	39273.5
1979	4852.64	2739.27	39581.3
1980	4747.66	2917.89	37628.0

TABLE A.3

OLS residuals of the demand for stock regressions

	Equation I	Equation V
1962	-54.5	-13.7
1963	7.16	36.5
1964	20.9	10.4
1965	36.5	49.2
1966	-11.3	24.3
1967	40.6	12.7
1968	113	-5.5
1969	-24.1	-52.6
1970	-82.8	-78.4
1971	-103	-49.4
1972	-95.1	-10.9
1973	-21	-7.86
1974	157	93.7
1975	-35.2	-38.2
1976	-24.1	-61.1
1977	112	58.8
1978	58.4	-1.89
1979	-7.84	94.3
1980	-86.9	-10.3

TABLE A.4

YEAR	Equation IX Actual Values	Equation IX Fitted Values	Equation XI Actual Values	Equation XI Fitted Values
1962	1232	1317	o	o
1963	1281	1470	o	o
1964	1422	1623	1422	1378
1965	1666	1878	1666	1603
1966	1982	2144	1982	1979
1967	2390	2416	2390	2354
1968	2899	2598	2899	2820
1969	3221	2822	3221	3299
1970	3468	3161	3468	3608
1971	3718	3638	3718	3892
1972	3957	4117	3957	4033
1973	4312	4704	4312	4303
1974	4948	4899	4948	4742
1975	5132	5064	5132	5205
1976	5045	4419	5045	5115
1977	4998	4723	4998	4973
1978	4983	4669	4983	4891
1979	4853	5295	4853	4795
1980	4748	5298	4748	4799
Standard Error		382.580		107.901
R^{-2} :		.9299		
D.W. :		0.8735		1.47

Note: The fitted values of IX have been used as instruments for S_{t-1}, S_{t-2} for the estimation of the demand for refrigerators stock, by XI.

TABLE A.5

YEAR	Equation X Actual Values	Equation X Fitted Values	Equation XII Actual Values	Equation XII Fitted Values
1962	952.8	805.7	o	o
1963	1007	931.3	o	o
1964	1043	1014	1043	1025
1965	1124	1155	1124	1088
1966	1218	1269	1218	1208
1967	1319	1370	1319	1306
1968	1409	1422	1409	1405
1969	1430	1531	1430	1485
1970	1447	1548	1447	1542
1971	1525	1620	1525	1581
1972	1652	1724	1652	1667
1973	1793	1792	1793	1826
1974	2111	1989	2111	1948
1975	2217	2253	2217	2211
1976	2291	2320	2291	2298
1977	2449	2311	2449	2427
1978	2576	2456	2576	2599
1979	2739	2807	2739	2716
1980	2918	2906	2918	2935
Standard Error:		101.975		65.1705
R^{-2} :		.9735		
D.W. :		1.09		1.6974

Note: The fitted values of X have been used as instruments for S_{t-1}, S_{t-2} for the estimation of the demand for refrigerators and the demand for cookers stock, by XII.

TABLE A.6

YEAR	Equation XIX Actual Values	Equation XIX Fitted Values	Equation XX Actual Values	Equation XX Fitted Values
1962	238.2	353.8	o	o
1963	338.8	329.5	o	o
1964	464.3	452.4	464.3	456.4
1965	581.0	555.2	581	553.7
1966	733.8	673.2	733.8	665.9
1967	875.7	733.2	875.7	724.7
1968	768.3	795.7	768.3	788.7
1969	738.2	786.6	738.2	786.0
1970	786.0	876.6	786.0	833.6
1971	822.7	951.4	822.7	864.2
1972	968.7	953.5	968.7	902.6
1973	1301	1076	1301	1203
1974	974.9	1043	974.9	1102
1975	749.5	883.1	749.5	827.9
1976	786.8	586.4	786.8	622.3
1977	799.9	768.8	799.9	716.1
1978	678.0	767.7	678.0	697.1
1979	669.8	678.4	669.8	695.7
1980	724.4	785.5	724.5	834.2
Standard Error:		181.101		111.470
D.W. :		1.8741		1.4853

TABLE A.7

YEAR	Equation XIII Actual Values	Equation XIII Fitted Values	Equation XIV Actual Values	Equation XIV Fitted Values
1962	7.117	7.114	6.859	6.846
1963	7.155	7.170	6.915	6.894
1964	7.260	7.250	6.950	6.970
1965	7.418	7.408	7.025	7.003
1966	7.592	7.597	7.105	7.098
1967	7.779	7.766	7.185	7.180
1968	7.972	7.945	7.250	7.259
1969	8.077	8.112	7.265	7.310
1970	8.151	8.179	7.278	7.328
1971	8.221	8.243	7.330	7.346
1972	8.283	8.301	7.410	7.403
1973	8.369	8.371	7.492	7.495
1974	8.507	8.454	7.655	7.580
1975	8.543	8.547	7.704	7.719
1976	8.526	8.515	7.737	7.749
1977	8.517	8.513	7.804	7.792
1978	8.514	8.501	7.854	7.858
1979	8.487	8.481	7.915	7.889
1980	8.465	8.488	7.979	7.993
Standard Error:		0.244422		0.32164
D.W. :		1.712		1.8212

TABLE A.8

YEAR	Equation XVII Actual Values	Equation XVII Fitted Values	Equation XVIII Actual Values	Equation XVIII Fitted Values
1964	1422	1407	1043	1085
1965	1666	1648	1124	1088
1966	1982	1999	1218	1173
1967	2390	2358	1319	1282
1968	2899	2809	1409	1400
1969	3221	3296	1430	1461
1970	3468	3588	1447	1508
1971	3718	3786	1525	1547
1972	3957	3970	1652	1659
1973	4312	4406	1793	1855
1974	4948	4742	2111	1992
1975	5132	5163	2217	2207
1976	5045	5039	2291	2363
1977	4998	4967	2449	2442
1978	4983	4888	2576	2582
1979	4853	4843	2739	2688
1980	4748	4833	2918	2932
Standard Error:		107.623		65.0671
D.W. :		2.0771		2.0971

CHAPTER 7

CONCLUSION

As mentioned in the opening chapter of this study, there exists one particular area of controversy between the theories on economic development; that is the argument on the liberalisation and development of the financial sector.

According to the 'institutional' view, the government assumes the function of the credit institutions to ensure that the financial markets operate under price and quantity conditions that are socially desirable. However, the theories of financial deepening state that it is this government intervention that causes rigidities and distortions in developing economies since it forces the financial markets to operate under conditions of permanent disequilibrium which results in the obstruction of the channels through which capital formation and high real growth rates can be achieved.

The policy that governments use in their attempt to influence the distribution of available funds is that of selective credit controls. These policies have been extensively used in Greece throughout the post-war period either in the form of ceilings on commercial banks loan rates or as direct controls on the amount of loans extended for particular economic activities.

In chapter 4 of the study there is a systematic presentation of the various categories of selective credit controls and the ways they are distinct from conventional monetary policy tools. Those that apply within the Greek framework, along with the ways in which previous literature has assessed their effectiveness and influence on the various sectors of economy, have been presented in Chapter 5.

The evidence from this chapter that the twin policy tools of loan rate ceilings and minimum lending requirements have resulted in continuous non-price credit rationing to take place in Greece

throughout the post-war period, has prompted the research on the effectiveness of credit controls to focus closely on the Greek case. Credit rationing within the Greek framework allows for models to be constructed that use the financial flows to link the real and financial sectors (See Cohen (1968), Silber (1973), Bitros (1981) and Molho (1984)). This research has attempted to examine whether the selective credit policies have been successful in stimulating the activities and sectors that they intended to promote, or whether there have been spillovers and substitutions of loanable funds between markets for different assets, in which case the selective credit policies have been unsuccessful and distortive.

The present study has attempted to examine whether the selective credit policies have been successful in restricting sectors whose excessive growth is considered undesirable by the economic and monetary authorities. The examination of selective credit policies in this context is particularly interesting since credit controls have been used for this same reason both in developing and developed economies. If they are found to be ineffective in a non-developed economy, there is an even stronger case for their ineffectiveness in developed systems, where various alternative sources of funds exist outside the banking sector.

One certain type of credit that has been restricted in Greece is consumer credit, which was totally restricted between 1960-1970, and was under severe ceilings and controls between 1970-1980. This study has examined the effects of the restrictions on this financial flow on the real sector of the economy and specifically on the demand for consumer durables.

In this context, the study has estimated empirically the demand for certain consumer durables in Greece between 1960-1980 and has examined a) the significance of consumer credit as an explanatory variable and b) whether the change in the pattern of consumer

credit restrictions has resulted in any significant shift in the demand for consumer durables.

Given the data limitations there is a number of estimates of demand for consumer durables equations with results that add to the previous research on the subject in the international literature (e.g. Harberger 1960). There is also a large collection of data and detailed analyses of estimation techniques and tests that will be useful for future studies on the demand of consumer durables in Greece. All these results have been presented in detail in the final section of Chapter 6.

As far as the significance of consumer credit is concerned the evidence appears to point out that although in certain cases consumer credit is a significant variable in the demand for consumer durables, the efficiency of selective credit policies and restrictive credit ceilings should be seriously questioned. There has been no signficant shift in the demand function of consumer durables examined in this study between the periods 1960-1970 and 1970-1980.

This finding would suggest that although credit controls could be effective in - temporarily - slowing down various sectors of the economy, the long term use of selective credit policies to influence the structure of the real sector of the economy is ineffective. Furthermore, in conjunction with the findings of other theoretical and empirical studies on the subject (presented in chapter 5), the fungibility of credit and the close interaction between various financial markets, could cause the use of such policies over a long period of time to produce undesirable - or at least difficult to detect and control - effects in the real sector of the economy.

In my opinion future research on the subject should focus on exactly those spillovers and distortions. Given that the indications so far are that selective credit policies are not

effective, one could examine how loanable funds (that presumably may be in excess suply in sectors whose growth is promoted by the government), are directed to markets where credit is restricted and loanable funds are in excess demand. If these relationships can be quantified then the long term effects of selective credit policies on the allocation of resources can be more accurately described.

Such a finding may shed considerable light on the controversy between the two schools of economic development theories, and point out whether the development of the financial markets should be pursued simultaneously with the growth of the real sector, or whether it should be restricted and controlled from a central planning authority (be it government or Central Bank) until the real sector attains high degrees of growth and capital formation.

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