MARKET CONCENTRATION, CREDIT INSTITUTIONS AND THE MACROECONOMY

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SUMMARY

Chapter one is a brief discussion of a few methodological premises.

The second chapter is meant to show (by means of a theoretical analysis) the effective macroeconomic relevance of oligopsony in the market for credit. This is done by using two models. In the first (simplified) model - where the behaviour of the supply function of bank credit to industrial firms is captured by a "Cobb-Douglas" reduced form - an exogenous decrease in the market power of the industrial firms on the credit market increases the effectiveness of monetary policy. In the second model, where the banking sector behaves consistently with the portfolio allocation theory, the results are weakened: it is still true that, apart from extreme cases, reductions in the market power of industrial firms in the credit markets increase the macroeconomic level of investment and affect the monetary policy multiplier, but the sign of the latter effect becomes ambiguous and depends on the analytical forms of the behavioural functions. Both models, however, show that modifications of the market structure in the banking sector have, in general, macroeconomic effects.

The third chapter suggests an interpretation of the phenomenon of "securitization" on the basis of Williamson's [1985] contractual framework. It is pointed out that in securitized financial systems substitutability between securities and intermediated credit is an empirically relevant phenomenon that makes the demand for bank credit to industry more unstable than the supply. For this purpose, a comparative econometric analysis has been performed with British and German data, because the two countries had (apart from the phenomenon of securitization) many similarities in their regulatory systems, as well as in the degree of concentration of their banking sectors and in the magnitude of the respective economies, at least until German Unification.

The analytical form of the bank credit supply function is based on the "credit view". This specific aspect of the behaviour of banks is analyzed in Chapter 4, which contains an empirical analysis (performed with Italian data) of the free liquidity ratio for commercial banks, interpreted on the basis of the recent literature on investment decisions under conditions of investments' irreversibility and uncertainty.

Chapters 5 and 6 examine the interactions between industrial firms and financial intermediaries in a "microeconomic" perspective. The focus is on the investment decision, and one of the main concerns is to perform a theoretical and empirical analysis on the connections between risk, cost of capital and investment decisions.

Chapter 5 contains an empirical analysis of the firms' investment decision based on a theoretical model where the decisions concerning investment and the firms' financial structure are taken simultaneously. The results are not conclusive, in part because of the complexity of the causal links among market structure, investment and financing decisions suggested by various contributions in finance as well as in industrial economics.

The study of such causal links is precisely the concern of Chapter 6, which contains an analysis of the implications of a few alternative hypotheses (based on precise results of the industrial economics literature) on the link existing between the cost of capital, the market structure and the profit margins.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

While the acknowledgments are reported separately for each single chapter of this thesis (since each chapter has involved different techniques and discussions with different people at the various stages of my work), I would like to thank here my supervisors Keith Cowling and Norman Ireland for their precious suggestions on the structure and the general organization of this work, briefly summarized here, and for their comments on a few methodological issues. Obviously none of them is responsible for any mistakes that might be found and for the views expressed here.

INTRODUCTION

1. The purpose of the analysis

Mainstream macroeconomic models do not usually take into account the macroeconomic implications of changes in the industrial structure of the financial or banking sectors. In addition, traditional macroeconomics is not, in general, particularly concerned with the analysis of institutions. This study attempts to investigate these two issues by means of a few theoretical and empirical analyses which are concerned with the interaction between industrial firms and financial intermediaries.

The analysis will have to deal, by definition, with aspects that would traditionally be included both in macroeconomics and in microeconomics. For this reason, and because particular attention will be dedicated to a controversial issue like the macroeconomic implications of different institutional environments, a brief discussion on the methodological premises of this study is needed, although a methodological analysis is well beyond the scope of this work. Such a brief discussion will be contained in the next section, while section 3 will briefly describe a few contributions on which the present study is based, and section 4 describes how the work will be organized in the various chapters.

2. A few methodological premises

Dealing with the interactions between banks and industrial firms, or with the macroeconomic effects of modifications in the market structure, requires a precise choice on the well-known problems of relations between micro and macro theory, of microfoundation and use (or not use) of the representative agent as an interpretative tool of individual rational behaviour.

Until the mid-1980s, the neoclassical macroeconomic literature regarded Modigliani and Miller's neutrality theorem as an acceptable simplifying hypothesis for macroeconomic modeling. Only heterodox and post-Keynesian macroeconomic literature regarded the financial structure of the firms as non-neutral, and argued that business fluctuations could originate from financial market perturbations. On the other hand, in finance, even mainstream contributions had regarded the optimal financial structure of the firm as a central issue, long before[1] such an assumption was incorporated in widely accepted micro-founded macroeconomic models (like, for instance, in Greenwald and Stiglitz [1988], Bernanke and Blinder [1988], Bernanke and Gertler [1989]). The different aims of economic and financial analysis did not justify *per se* such a relevant difference in the valuation of the firms' financial structure. Obviously the discrepancy was to be found in a different prior valuation of the relevance of market imperfections, but the suspicion that an a *priori* factor might have played a role in this regard, seems to be legitimate, as Gertler [1988] argued:

> "The methodological revolution in macroeconomics in the 1970s also helped shift away the attention from financial factors, in a less direct but probably more substantial way. The resulting emphasis on individual optimization posed an obstacle".
>
> (Gertler [1988], p.565)

Similar reservations to the mainstream methodology had been raised, even more explicitly, by Stiglitz [1991]:

1 See for example Jensen and Meckling [1976], Leland and Pyle [1977], Ross [1977], Myers [1984], Myers and Majluf [1984].

"Economics is, or is supposed to be, an empirical science: how could economists' views be so divergent? Were these so-called scientists studying the same economy? Were they - or should I say, are we - simply ideologues looking for justifications for our political biases, or, no less worse, technicians, taking the assumptions provided to us by our ideologue brethren, and exploring their consequences, trusting that the models we are analyzing bear some semblance to the world, because we have been told so by others!"

(Stiglitz [1991], p. 5)

"Economists have had two responses to such inexplicable phenomena. One is to suggest that because we cannot explain them, they do not exist. It is as if a biologist, finding it difficult to explain how blood can be pumped to the head of a giraffe, were to assume that it therefore must have a short neck".

(Stiglitz, [1991] p.21)

Stiglitz' strong criticism of the mainstream methodological approach is motivated by an objection on the use of "*first principles*", illustrated, by the way, with an example taken from financial economics:

"Not every piece of research has to begin at the beginning. We know that there are good reasons, based on problems of adverse selection and moral hazard, that equity markets may not function well. We also have ample empirical evidence that firms make limited use of equity markets, and event studies confirm that when they do raise additional capital through the issue of equities, stock prices are lowered significantly. It thus seems perfectly appropriate for macroeconomic studies to begin with the hypothesis that equity markets do not function efficiently. For some purposes, it may not matter what the precise source of this market failure is."

(Stiglitz [1991], p.10)

In connection with this point and in support of it, Stiglitz mentions the results of Debreu [1974], Mantel [1974] and Sonnenschein [1972], [1973], showing that *any set of market excess demand functions satisfying Walras' Law can be derived from utility maximizing individuals*, which means, in other words, that the rationality hypothesis does not put any relevant restriction on the observed behaviour[2].

Furthermore, Stiglitz argues that the use of representative agents' models seem to contain an intrinsic paradox, since, "when all individuals are identical there is no need for trade, and hence there are no consequences of the absence of markets" (Stiglitz [1991], p.11). In addition, representative agents' models are not suitable for describing problems arising from information asymmetries and coordination failures, unless "a particular kind of schizophrenia on the part of the representative agent" (ibid) is assumed. However, in spite of the wide acceptance of microfoundations and representative agents as rigourous bases for macromodels, a series of assumptions commonly accepted in the microfounded models are pointed out to be "ad hoc". One of them is *cash in advance,* which is "obviously not binding for most transactions" (Stiglitz [1991], p.19-20), while, for what concerns a well-known and common requirement for equilibrium to be reached, the objection is even more extreme: "What faith do we have that any propositions derived in the artificial economy in which individuals meet at most only once and there are no intervening financial institutions have any validity for our economy?" (ibid).

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2 We might briefly anticipate here that these points made by Stiglitz are relevant for the analysis of Chapter 6, on the basis of the empirical observations contained in Brioschi, Buzzacchi, Colombo [1990], Mayer [1989], [1992], [1993], showing that in the Italian financial markets hostile takeovers are extremely rare, not to say virtually absent, while the transactions concerning the control and the majority shares of a company are usually performed through private negotiations among the management of the parties interested in the transaction. For this reason it is assumed that the market for firms' control is not associated to the market for shares. The latter is regarded, in the models of Chapter 6, as a market where the firm raises external finance.

A more interesting point for its possible connections with other (although not explicitly mentioned) methodological approaches is made about "*inexplicable phenomena*", and mainly the "*widespread phenomena of individuals holding dominated assets*". There might not be, on the other hand, full agreement on Stiglitz' conclusion that "it is hard for any economic theory to explain why [...] cash management accounts, [a financial asset that should "*dominate*" all of the other liquid assets] [...] did not exist twenty years ago, and it is hard for any economic theory to explain why they are not even more widespread today" (ibid). In this regard, a very relevant interpretative contribution may be provided by Williamson's [1985] contractual framework, where the assumption of rationality is not eliminated, but substituted with the well-known assumption of "*bounded rationality*" or "*intended rationality*" , and the concept of asset specificity is regarded as the endogenous contractual outcome determined by all of the informationally relevant elements (such as timing, frequency of transaction, and many other details) affecting the decision process of the individuals[3].

" Confronted with the realities of bounded rationality, the costs of planning, adapting, and monitoring transactions need expressly to be considered. [...] Transactions that are subject to ex post opportunism will benefit if appropriate safeguards can be devised ex ante".

(Williamson [1985], pp. 46-48, also quoted in Chapter 3)

Williamson's [1985] approach, based on the relevance of transaction costs, suggests an interpretation of the behaviour of economic agents in terms of contractual relations: the relevance of

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3 On this point, see also Chapter 3, which contains a more detailed description and analysis of all the points just mentioned.

transaction costs is also implied by those interpretations of the Arrow-Debreu model that define commodities not only by physical, spatial and time characteristics, but also by those elements of environmental uncertainty referred to as the "*state of the world*". In Williamson's view, economies on transaction costs can be implemented by assigning transactions to governance structures chosen among different institutional alternatives: the "*classical market contracting*" at one extreme, a centralized hierarchical organization at the other, and mixed models of firms and market organization in between. In this context, bounded rationality contrasts with the traditional approach, which suppresses the role of institutions in favour of the interpretations of firms as "production functions", or "black boxes".

In this sense, the "Cash management accounts" mentioned by Stiglitz might have appeared only recently and still not have a wider diffusion, to the extent that they correspond to a specific contractual outcome, responding to precise safeguard needs, determined by means of a "*bounded rationality*" decision process where information, planning and calculations are not costless and timeless. To the extent that a "time dimension", or even an "historical dimension" of the economic processes and phenomena becomes possible, such an interpretation might explain the common-sense observation of historically-determined or institutionally-determined behaviour of individuals and economic systems.

These last points are relevant for the analysis of Chapter 3, which tries to interpret the phenomenon of securitization on the basis of Williamson's [1985] approach, and provides a comparative empirical analysis meant to show that some institutional factors (namely securitization), have relevant macroeconomic implications that should be taken into account in the standard macroeconomic studies.

3. Starting points and general assumptions

After mentioning all the (well-known) criticisms of mainstream methodology, it could be objected that "destroying is easier than constructing", or, in other words, that the formulation of even the best motivated objection certainly requires less effort than the construction of a "positive", consistent and complex methodological approach. Hence the need for a brief discussion of the methodological criteria that will be illustrated and discussed.

This work will follow, in general, the methodological approach described in Stiglitz [1991], and will interpret individual behaviour and the concept of individual rationality following - at least in spirit - Williamson [1985].

In general, this work will take Stiglitz' criticism on the use of *first principles*: "Hopefully our discipline is a *cumulative* science. Not every piece of research has to begin at the beginning" (Stiglitz [1991], p.10). Following this approach means, for our purpose, that some of the models presented in this work will contain assumptions that derive from previous results of the related literature. The relevant literature and the specific contributions that prove such results will be referred to, and briefly described, but the results themselves will be regarded as *starting points*, or *initial assumptions*, and, in this sense, will not need further demonstration, provided that the model founded on them does not explicitly violate the hypotheses of the models that proved such results. In other words, once a result has been acquired in the relevant literature, one should be allowed to investigate the implications of the introduction of such results in the hypotheses of related models.

Furthermore, when two or more contrasting assumptions are possible on the basis of different pieces of literature, an attempt will be made to qualitatively compare how the different kind of assumptions (and, possibly, the different kinds of functional links associated to them) affect the behaviour of the model being built and its results[4]. Obviously the validity of the conclusions of each model is limited by the prior assumptions contained in each formalization. However, to the extent that some kinds of standard models are widely accepted in the literature (whether or not their prior assumptions or their first principles correspond to an accurate description of reality), some informational contribution to the debate might be obtained by analyzing the effects of introducing some non standard assumptions in one of such "popular models". The analysis of Chapter 2 is conducted in this spirit: the macroeconomic effects of oligopsony in the market for credit are analyzed by introducing a simplified (but commonly employed) formalization of market concentration on (the demand side of) the market for credit, in a very standard banking model, where the behaviour of the industrial firms is microfounded. This is done by keeping well in mind the above-mentioned criticism. In fact such a strategy of analysis, is needed for its counterfactual value: while the effects of market power constitute one of the main concerns of industrial

4 In particular, such a procedure will be relevant for the analysis contained in Chapter 6.

economics and of some heterodox macroeconomic contributions, they tend to be considered irrelevant (or, in any case, are neglected) in mainstream macroeconomic analysis. The result of such a situation is the fact that macroeconomic irrelevance of modifications in the market structure and in the market concentration are regarded as a common modeling rule, and not as implicit assumptions, while the analysis of the macroeconomic effects of changes in the market structure is relegated to heterodox approaches. Therefore, a relevant informational contribution could be given by proving that even in a standard banking model, including the (microfounded) behaviour of industrial firms, changes in the market structure (in the case of Chapter 2, on the demand side of the market for credit) carry relevant macroeconomic implications.

In connection with these last points, a particular relevance is assumed by Stiglitz' [1991] point on dynamics and adjustment speeds.

> "Any short-run macroeconomic model can be viewed as 'cutting into a dynamic process', of saying that some variables adjust more rapidly than others. More particularly, it is assumed that the present value of certain variables adjusts fully to their 'equilibrium' values. [...] Other variables are assumed to adjust, but too slowly to worry about for short-run analysis. [...] It is, of course, not obvious that having two categories is an adequate simplification; one might want at least to consider three categories, in which case one would discuss 'short-short run equilibrium', 'short-run equilibrium' and 'long run equilibrium'. [...] What is clear, however, is that much of the macroeconomic theory of the past fifty years has made a set of particularly unpersuasive implicit assumptions concerning dynamics."
>
> (Stiglitz [1991], pp. 31-32)

Choosing what variables have to be assumed to adjust rapidly or slowly entails some prior assumptions. If, on the one hand, such prior assumptions can be well motivated, several examples can be made of cases where such prior choices do not depend on a precise observation or hypothesis on the timing of the economic process under analysis, but rather on the kind of literature, or on the kind of discipline one is dealing with. To give an example pertinent to this study (and that will be taken into account in the following chapters), there is no particular reason to assume that the financial structure is given and exogenous for the investment decision of the firm (as is usually assumed by the mainstream literature on investment), or that the level of investment is given for the choice of the firm's optimal financial structure. Indeed, only very few contributions (and only recently) have regarded the problems of firms' investment and financial structure as simultaneous. In the case of investment and financial structure, the choice of regarding some variables as fixed and other variables as adjusting, is not even a matter of speed, but a matter of prior assumptions. The same could be said by comparing the industrial economics literature on the "deep pocket argument" (Telser [1966], Poitervin [1989a]), and on the "limited liability effect" (Brander and Lewis [1986], Poitervin [1989b]) - which put into relation interactions between the financial structure decision with the market strategic interactions and suggests a precise causal link between financial decision and market structure - with the financial economics literature concerned with the minimization of the cost of capital which ignores any form of interaction with the market strategic interactions.

Relating some industrial economic results (which emphasize the relation between the financial decisions and the market power of the firms or its particular strategy) with the literature on firm's investment and financial structure will be a specific concern of this work, in chapters 5 and 6.

However, the matter becomes even more complicated if one takes Stiglitz' [1991] point on the fact that "the economy is always in the short run" and "never settles down to the mythical steady state", due to the possible presence of "sets of stochastic terms" that could constantly drive the economic system away from its (hypothetical) equilibrium. Also, if one accepts that the behavioural functions might be subject to discontinuous modifications in their characteristics, whether such modifications are better formalized by a set of stochastic terms or by assuming some "exogenous" or discontinuous changes in the analytical forms of the functions themselves, it might often be a matter of taste and personal preference. In this sense, the modifications of standard models by introducing some (non microfounded) specific assumptions based on the results of other studies should, in principle, be acceptable.

Given all these open problems, we take Stiglitz' point in arguing that the conformity of a theory to the basic *qualitative* facts of the economy should be regarded as a suitable method to evaluate a theory. This means also that if a theory "fails to meet the test, there is little to be gained from the sophisticated testing of one or two of its implications, for in the end [...] a theory must be judged by the consistency of all of its implications with the facts" (Stiglitz [1991], pp.71-72). In Stiglitz' view, the expression "all of the implications" (of a theory) means micro-predictions as well as macro-predictions, and if even only some of the predictions are falsified (in Popper's sense), then the whole theory should be "rejected or, at least, patched up" (ibid). Judging a theory on the basis of its ability to *qualitatively* explain some critical facts also means that econometric evidence based on the "goodness of fit" should not be regarded as a decisive test of a model. This point also takes into account the fact that a good empirical specification might be found to be consistent with two or more observationally equivalent theoretical explanations. Obviously this does not mean that empirical analyses are not important, but simply suggests that some healthy awareness of the intrinsic logical limitations of these kind of results (which, by the way, will constitute a relevant part of the present study) be maintained.

An example of a theoretical approach that does not make use of "*the representative agent*" and, instead of starting from *a priori* "first principles" starts from empirical observations, is given by Bernanke and Blinder's version of the "credit view". Such an approach starts form Bernanke's [1983] empirical analysis showing that the financial distress in 1929 amplified the effects of the great depression, whose intensity and persistence could not have been explained only by money market forces. In Bernanke's [1983] paper it is shown that in the period 1930-33, almost half of the existing American banks failed, and the remaining suffered very relevant losses, while the stock market crisis of "Black Friday" (which was the initial event of the crisis) determined an enormous increase in the debt burden of the firms. According to Bernanke, the banks' distress had an effect on real activity by suppressing the financial flows for some categories of firms that did not have direct access to spot financial markets and had to rely on financial intermediaries. In addition, the drastic increase in the debts of the industrial companies reduced their ability to obtain finance from the intermediaries, who would base their evaluations on the riskiness of the customers on indicators of the financial structure. According to Bernanke, and differently from what was argued by Friedman and Schwartz, the main role in the mechanism of propagation of the 1929 crisis would not have been played by perturbations in the banks' liabilities (i.e. in money), but rather in the banks' assets, and, in particular, by the elimination (or by the drastic reduction) of the channels by which finance was injected into the real economy. As evidence in support for his thesis, Bernanke shows that the liabilities of the failed banks and the spread between the interest rate on risky and riskless securities would significantly increase the explanatory power of the equations determining the level of output. Bernanke [1983] assumes obviously that the "perceived" riskiness of the firms borrowing from the banking system depends on the firms' financial structure. Such an assumption, which is often formalized by introducing a risk premium (defined as a function of the leverage ratio) in the interest rate on borrowing is contained in the models of investment decision of the firm in chapters 5 and 6 [5]. As mentioned earlier, Bernanke's [1983] is also one of the starting points of the well-known Bernanke and Blinder's [1988] modification of the IS-LM framework. This model differs from the traditional macroeconomic framework by, among other things, explicitly introducing the balance constraints of the banks.

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5 Such an assumption, as is well known, can actually be microfounded on the basis of an "incentive argument": loosely speaking, the higher the leverage ratio, the lower the cost of financial distress for the shareholders, and the smaller the incentive to avoid financial distress.

$$B^b + E + L^s = D(1-\tau) \qquad (1$$

where B^b is the quantity of public bonds held by the banks, E the free reserves, L^s the credit supplied by the firms, D the deposits, τ the reserve requirements. The deposits are determined by the liquid reserves and by the money multiplier according to the following relation:

$$D(\overset{-}{i},\overset{+}{y})=m(\overset{+}{i})R \qquad (2$$

Where "D" are the deposits, "y" the aggregate income, "i" the interest rate on public bonds, m(i) the money multiplier, "R" the liquid reserves. Bernanke and Blinder further assume that the portion of banks' assets invested as credit to the industrial firms depends positively on the interest rate on loans and negatively on the interest rate on public bonds, and is determined by the following relation

$$L^s = \theta(r,i)D(1-\tau) \qquad (3$$

Hence Bernanke and Blinder solve the equilibrium condition on the market for loans with respect to the interest rate on loans r, so that "r" is expressed as a function of the liquid reserves "R", of the income "y", and on the interest rate on public bonds "i". The resulting equation is

$$r = \Phi(i,y,R) \qquad (4$$

which, substituted into the IS curve, yields:

$$y = Y(i,\Phi(i,y,R)) \qquad (5$$

Equation 5 is a modification of the IS curve that contains the disturbances and the macroeconomic fluctuations determined by the attitude of the banks in their lending decisions. For example, a variation in the degree of riskiness attributed by the banks to the firms' investments, determines a shift in the "modified IS", which is defined by Bernanke and Blinder as the CC curve, i.e. the locus of simultaneous equilibrium points on the goods and credit market.

Such a macroeconomic model seems to be more consistent with the sort of "microfoundation" based on Williamson's [1985] contractual framework mentioned in the previous section because it allows for a larger degree of "asset specificity" by not aggregating all of the financial assets in a unique market (like the traditional IS-LM model does), which would cause a major loss by failing to capture the highly intrinsic contractual difference between the assets resulting from a monitoring activity (which contain safeguards against "opportunism", in Williamson's terminology) and the assets resulting from a spot market.

Being consistent with most of the theoretical foundations of the present analysis, Bernanke and Blinder [1988] play an important role in it. First of all, a supply of credit function analogous to the one of equation 3 will be used in the comparative empirical analysis of Chapter 3, meant to show the macroeconomic relevance of some institutional features, namely securitization. Secondly, a test for the reliability of the theoretical model by Bernanke and Blinder is made in Chapter 4, by empirically studying the behaviour of the free liquid reserves of commercial banks. In fact, the free liquid reserves (or the free liquidity ratio, as has been done in Chapter 4) can be interpreted as a "non investment" decision and, in this sense, is expected to react according to the willingness of banks to invest: in other words, the free liquid reserves are expected to increase when there is an increase in the degree of risk of the whole economy perceived by the banks that would reduce the willingness of banks to invest. An empirical analysis showing that the free liquid reserves (or the free liquidity ratio, which is the ratio of the free liquid reserves to the total banks' deposits) are positively correlated with some measure of "perceived risk" of the whole economy, would be consistent with Bernanke and Blinder's [1988] model, and, more generally, with the "credit view".

4. Structure of the work

The analysis of the second chapter is concerned with the macroeconomic effects of market concentration in the market for credit. The focus in this study is on oligopsony in the banking sector, an issue virtually ignored both by the microeconomic and the macroeconomic contributions on market power in the financial sector. The methodological approach of the second chapter constitutes an exception in this study, since it is based on a more standard banking model with optimizing industrial firms. The reasons for this exception in the methodological approach followed in this work have been given at the beginning of section 3, and will be recalled at the end of the present section.

Most of the existing literature on market power and strategic interactions in the (supply side of the) market for credit, deals with problems of signalling in a game theoretical framework, as in the literature concerned with the "deep pocket argument" (Telser

[1966], Benoît [1984], Poitervin [1989a]) and the literature concerned with the "limited liability effect" (Brander and Lewis [1986], Poitervin [1989b]). In the former it is assumed that "strong" firms can afford a long-lasting price war because they can rely on large financial resources. In the latter, a high level of debt is regarded as a pre-commitment for an aggressive policy on the goods market. The signalling game of entry deterrence yields as a result the optimal financial structure for the incumbent and for the entrant.

Even the rare contributions concerned with the macroeconomic effects of variations in the degree of concentration in the banking sector (like Vanhoose [1985]) look at the supply side of the credit market, i.e. at the effects of market power in the banking sector. In particular, Vanhoose [1985] looks at the central bank's ability to control monetary aggregates, under different monetary policy regimes and regulations (i.e. control of interest rate vs control of money supply and lagged reserves accounting vs contemporaneous reserves accounting).

The purpose of Chapter 2 is then to show that variations in the degree of oligopsony in the market for credit may affect the equilibrium level of investment and the monetary policy multiplier in a partial equilibrium model with banks and industrial firms. In particular, it will be shown that an increase in the degree of oligopsonistic power of the industrial firms reduces the effectiveness of monetary policy in a simplified model where the supply of credit to the industry is summarized by a Cobb-Douglas function. When the banking sector is described by a more detailed and elaborated model with three assets, behaving in accordance with the portfolio allocation theory, the results are weakened, and an exogenous increase in the oligopsonistic power of industrial firms will increase or reduce the monetary power multiplier depending on the analytical form of the various functions chosen, and on the different sensitivity of the agents to the interest rates of the different assets. The reason why an orthodox banking model with optimizing industrial firms has been chosen is very simple: it is meant to stress the fact that the implicit assumption of macroeconomic irrelevance of changes in the market structure on the (demand side of the) credit market - contained in the standard macroeconomic approach - might be questioned even by using a standard banking model with optimizing industrial firms. In other words, the purpose of the second chapter is to provide a framework that conceptually "isolates" the market power of industrial firms in the credit market and shows its macroeconomic relevance even by following the methodological approach of the macroeconomic models that normally ignore such issues.

Chapter 3 looks at the macroeconomic effects of securitization and suggests, at the same time, an interpretation of such an institutional phenomenon in the light of Williamson [1985]. The analysis is again focused on the "demand side" of the market for credit and the key point is an institutional aspect connected with the size and reputation of big firms operating in securitized financial systems: their ability to substitute intermediated credit with recourse to the spot credit market. It is argued that substitutability between intermediated credit and securities makes the demand for bank credit to industry more unstable than the relative supply function. This makes it possible to identify and estimate, in a monoequational framework, a supply function of bank credit to industry. Since instability of the demand for bank credit to industry is a consequence of securitization, the identification of a supply function is only possible in a securitized financial sector, where substitutability between intermediated credit and securities is an empirically relevant phenomenon. In this sense, the empirics contained in the third chapter suggest that securitization is macroeconomically relevant. Furthermore, the stability of a credit supply function might carry some economic policy implications, to the extent that stability of a macroeconomic function could be regarded as a "relevant" and "informative" property. The analytical form of the bank credit supply function is based on the theoretical part of the paper by Bernanke and Blinder [1988], which puts a strong emphasis on the macroeconomic effects of the attitude of banks and their willingness to lend money to the firms, affected by the degree of risk of the whole economy, such as perceived by the banking system. This specific aspect of the behaviour of banks is analyzed in Chapter 4, which contains an empirical analysis of the free liquidity ratio for commercial banks. The free liquid reserves of commercial banks are regarded as a liquid asset associated to the non-investing decision of the bank. Such a non-investing decision might be determined by an increase in the degree of risk of the whole economy perceived by the banks (which is the core of Bernanke and Blinder's [1988] model), and is interpreted on the basis of the recent literature on investment decisions under conditions of investments' irreversibility and uncertainty (for instance, Dixit [1992a], [1992b], Pindyck [1991]). This approach assumes the presence of sunk costs (in the specific case of the banks they might be due to "lemon problems" and to the monitoring costs), "on-going" uncertainty concerning the profitability of future investments (which can only be inferred by the agents on the basis of probability calculus and expectations, and, in this sense introduce some elements associable to the assumption of "bounded rationality"), "relevance of decision timing" (in other words, the investment can be delayed, allowing the bank to collect all the information affecting investment profitability, before committing its resources). The "relevance of decision timing", by putting emphasis on the material determination of the "intendedly best" procedure, introduces again an element associable to the assumption of "bounded rationality", because it describes the intended optimization as the choice of a behavioural procedure limited by (and relative to) the effective time of choice. Furthermore, the "relevance of decision timing" is assimilable to the expression "calculus procedure is costly" which is the basis of the assumption of bounded rationality. However, the conditions just mentioned imply that the investor (i.e., in this case, the bank) has to take into account the presence of a positive "value of waiting for new information" before investing. In other words, the traditional "net present value" rule could be transformed into a rule suggesting that *an investment should be undertaken if the net present value of its cash flow exceeds the purchase and installation cost by an amount at least equal to the value of keeping the option to invest the same resources elsewhere*. In the empirical analysis of Chapter 4, the "value of waiting" will be "captured" in the estimates by a proxy for the degree of risk of the whole economy such as perceived by the banks, introduced in a standard model of the free liquidity ratio for commercial banks. In this sense, the empirical analysis of Chapter 4 is meant to provide some evidence in favour of the connection between "risk perceived by the banks" and "banks' willingness to invest", which is highly relevant and, at the same time, exogenously assumed in Bernanke and Blinder [1988].

Having said that, the key feature of Bernanke and Blinder [1988] - as well as most of the contributions of the macroeconomic "credit view" - is the willingness of banks to lend (in general affected by the "perceived" degree of risk of the whole economy), what about the "microeconomic" level? How does risk affect the cost of capital and the investment decision? A fruitful way to approach such a problem is, in our opinion, the formalization of a model where the decisions concerning the financial structure and the investment of the firm are simultaneous. This is precisely the scope of Chapter 5, which contains an empirical analysis of the firms' investment decision founded on a theoretical model where the relevance of the financial structure - based on the assumption of asymmetric information - is summarized by the presence of a "risk premium" in the cost of borrowing, and other standard assumptions taken from models of finance with market imperfections. Although the formalization of the investment and financial structure choice as a simultaneous decision for the firm determines a significant informative contribution and puts the interactions between industrial firms and the financial sector in a more general light, it increases the degree of complexity of the models under consideration. As a consequence, some simplifying assumptions are often necessary, for the sake of tractability of the models, at the cost of some loss of information. Such losses of information are the main concern of Chapter 6, which contains an analysis of the implications of a few alternative hypotheses on the link existing between the cost of capital, the market structure and the profit margins. All of the alternative hypotheses taken into consideration are motivated by precise results of the industrial economics literature concerned with the connection between firms' strategic interaction and financial factors like the choice of the firm's financial structure and the determination of the cost of capital. In many parts the analysis is deliberately qualitative, in order to put into evidence the qualitative changes in the results determined by the different hypotheses.

Finally, Chapter 7 contains a few conclusive remarks and an attempt to assess the informative contributions given by the analyses contained in the different chapters.

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CHAPTER 2

MONETARY POLICY WITH OLIGOPSONY IN THE MARKET FOR CREDIT.

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MONETARY POLICY WITH OLIGOPSONY IN THE MARKET FOR CREDIT.

1. Introduction.

The purpose of this paper is to analyze the effects of the market power of industrial firms in their relationship with banks.

The role of banks is still a controversial theoretical issue: it has been explained as a response to the financial markets' imperfections and incompleteness (Diamond [1984]), which means that financial intermediaries would be unnecessary and irrelevant in a complete market system à la Arrow-Debreu.

Although information asymmetry is certainly a key feature in understanding the mechanisms of the market for credit, one cannot exclude that market power in itself also affects the cost and supply for bank credit.

The effects of the banks' market structure on monetary policy have been analyzed in an important contribution by VanHoose [1985], with respect to the effects of market power on the central bank's ability to control monetary aggregates, under different monetary policy regimes and regulation (i.e. control of interest rate vs control of money supply, and lagged reserves accounting vs contemporaneous reserves accounting).

This paper will analyze the effects of oligopsony on the credit market, and on the transmission mechanism of monetary policy. This will be done, first in a simplified framework, where the credit supply to the (oligopsonistic) industrial firms is described by a reduced form of the monetary sector. Secondly, a generalization of the analysis will be done by describing in greater detail the behaviour of the banking sector. For this purpose the effects of an exogenous modification in the market structure will be introduced in a model similar to the one by Hörngren [1985], which is basically a model of portfolio allocation à la Tobin and Brainard [1963].

Section 2 contains a simplified model of partial equilibrium where the industrial firms are oligopsonistic in the credit market. In this over-simplified model, the monetary sector is described by a constant elasticity credit supply function whose arguments are the (unique) interest rate, and a generic parameter describing monetary policy. Within this simplified framework an increase in the degree of concentration in the industrial sector (i.e. in our case an increase in the oligopsonistic power of industrial firms in the credit market) will reduce the effectiveness of monetary policy.

Section 3 contains a model of the banking sector, consistent with the portfolio choice theory. In this model, an increase in the degree of competition (a reduction in the degree of concentration) of the industrial sector on credit market, has an expansive effect, increasing the optimal level of the investments of the industrial firms. The same model is also employed to attempt an analysis of the results of the simplified case of section 2. Those results are no longer general because, in a more general framework, variations in the market power of industrial firms have an indirect effect on the "sensitivity" to the interest rate of the "optimal" level of investments of the industrial firms that might have an opposite sign to the one of the direct effects.

Since the attention is here focused on a very specific point (namely the oligopsonistic power of industrial firms on the market for bank credit), some simplifying assumptions will be made in order to "isolate" the interaction between banks and industrial firms from other forms of interactions involving the goods market. In particular, while assuming oligopsony on the market for bank credit, the goods market will be assumed to be perfectly competitive.

Such an assumption, apart from simplifying dramatically the structure of the model, might describe those institutional contexts (relatively frequent in continental Europe) where large industrial firms are exposed to international competition in the goods market while enjoying some market power in the internal market for credit. Such a situation might be determined by the regulatory limitations in the banking sectors, concerning investments in foreign assets.

2. Monetary policy in a simplified model with oligopsonistic industrial firms in the credit market.

In this model the labour market will not be considered. The analysis will be focused on the capital market.

Let us assume that in the market there are N equal enterprises producing a unique homogeneous good and using a production process whose characteristics may be described by a standard Cobb-Douglas production function

$$y = g(k) = Bk^{\alpha}; \qquad \text{with} \quad 0 < \alpha < 1$$

where y is output and k the capital (at constant prices) employed by the single representative enterprise. Let us assume that the enterprises are owned by n firms, each of the same dimension, so that N/n is the number of enterprises per firm. We will assume that N, the number of enterprises, is fixed, while "n", the number of firms, can vary. In this way, letting "n" vary, the scale of the economy will not be affected. Only the degree of concentration, or in other words the number of enterprises per firm N/n, will be affected.

Let us also assume that the life of physical capital be one period only, so that "k" is both the capital stock of each enterprise and the investment of each enterprise, and that the firms finance their investment only with borrowed money. We have then

$K = Nk$

where the aggregate stock of capital also corresponds to the aggregate level of investments.

Let us assume that the reduced form of the monetary sector of the economy may be described by the following constant elasticity credit supply function:

$$S(r, \theta) = Ar^{\beta}\theta$$

where "A" is a constant, "r" the interest rate on loans granted to the enterprises, "β" the interest rate elasticity of the supply function of loans, "θ" a generic parameter describing the monetary policy such that the higher θ, the more expansive the monetary policy.

In this simplified framework, the effect of the monetary policy on investments of industrial firms will be given by:

$$dK/d\theta = d(Nk)/d\theta.$$

In order to verify whether variations in the degree of concentration in the industrial sector exert any influence on the effectiveness of monetary policy, we have to see how dK/dθ varies when "n" varies. We have therefore to calculate the derivative of dK/dθ with respect to "n". Since N, the number of enterprises, is fixed, and the firms are identical, we can equivalently look at the multiplier

$$\frac{d(dk/d\theta)}{dn} .$$

If this multiplier is positive (given that the multiplier $dk/d\theta$ of the monetary policy is positive, as we will see below), then an increase in the degree of competition (decrease in the degree of concentration) in the industrial sector in the credit market will increase the effectiveness of monetary policy.

Let us now analyze the behaviour of the firms. Let us assume, on the basis of the scenario pictured in section 1, that the credit market can be described by an oligopsony à la Cournot, while the industrial firms operate on perfectly competitive goods markets. The problem of the representative firm can be described as:

$$\max \pi = \frac{N}{n} \cdot [g(k) - rk]$$

$$\text{s.t.} \quad \frac{N}{n} k + K' = S(r,\theta)$$

where π is the profit, and K' the capital of all the other firms. The constraint of the optimization problem of the firm can be rewritten as:

$$k = [S(r,\theta) - K']n/N \quad .$$

The following first order conditions can be obtained:

$$\frac{\delta\pi}{\delta r} = \frac{N}{n} \cdot \left[(\delta g(k)/\delta k - r) \frac{\delta S(.)}{\delta r} \frac{n}{N} - k \right] = 0$$

hence

$$\frac{\delta g(k)}{\delta k} = r + \frac{kN/n}{\delta S(.)/\delta r}$$

since in equilibrium we have

$S(r,\theta) = Nk,$

then we can write

$$\alpha B k^{\alpha-1} = r\left(1 + \frac{1}{n\beta}\right)$$

hence, solving for k:

$$k = \left[\frac{1}{B\alpha}(1 + 1/n\beta)r\right]^{1/(\alpha-1)} \quad . \qquad (1$$

from $S(r,\theta) = Ar^{\beta}\theta = Nk$

we get $r = (Nk/A\theta)^{1/\beta}$

substituting for r in (1:

$$k = \left[\frac{1}{B\alpha}\left(1 + \frac{1}{n\beta}\right)(Nk/A\theta)^{1/\beta}\right]^{1/(\alpha-1)}$$

which, solving for k, determines:

$$k = \left[\frac{1}{B\alpha}\left(1 + \frac{1}{n\beta}\right)(N/A)^{1/\beta}\right]^{\frac{\beta}{\beta(\alpha-1)-1}} \cdot \theta^{\frac{1}{1-\beta(\alpha-1)}} \qquad (2$$

At this point we are able to calculate the monetary policy multiplier and its derivative with respect to "n", which gives us information on the variation in the effectiveness of monetary policy determined by a variation in the degree of concentration in the industrial sector.

$$dk/d\theta = \frac{1}{1-\beta(\alpha-1)} \left[\frac{1}{B\alpha}[1+1/(n\beta)]\ (N/A)^{1/\beta}\right]^{\frac{\beta}{\beta(\alpha-1)-1}} \theta^{\frac{\beta(\alpha-1)}{1-\beta(\alpha-1)}} \qquad (3$$

$$\frac{d(dk/d\theta)}{dn} = \frac{-\beta}{[\beta(\alpha-1)-1]^2}\left[\frac{1}{B\alpha}[1+1/(n\beta)]\ (N/A)^{1/\beta}\right]^{\frac{\beta(2-\alpha)+1}{\beta(\alpha-1)-1}} \cdot$$

$$\cdot\ (1/B\alpha)(N/A)^{1/\beta}\ [-1/(n^2\beta)]\ \theta^{\frac{\beta(\alpha-1)}{1-\beta(\alpha-1)}} \qquad (4$$

From expressions 3 and 4 it is easy to verify that

$dk/d\theta > 0$ and $d(dk/d\theta)/dn > 0$.

The first inequality simply shows that an expansionary monetary policy (described by an increase in the value θ) increases the level of investments of the industrial firms. The second inequality shows that the multiplier of the monetary policy is an increasing function of "n". This means, in other words, that an increase in the degree of competition in the industrial sector will increase (in this simplified framework) the effectiveness of monetary policy.

This is due to the fact that an exogenous increase in the degree of competition in the industrial sector (in other words a reduction in the oligopsonistic power of the firms in the credit market), by reducing the difference existing between marginal productivity of capital and interest rate, implies, ceteris paribus, an increase in the optimal level of investments of the industrial firms. Such an expansionary effect also causes an increase in the absolute value of the monetary policy multiplier.

We can see from equation 4 that the result does not depend on the assumption of decreasing returns to scale in the production function, but, it rather depends on the analytical form of the credit supply function, although the use of a Cobb-Douglas is common in literature, even to describe e credit supply function.

However, the above result seems to be consistent with the empirical evidence supplied by a recent contribution by Gertler and Gilchrist [1991] where it is shown that monetary policy has much stronger and more significant effects on small firms than large firms.

On the other hand, removing some of the simplifying assumptions of the model weakens the results, as we will see in section 3.

3. *A generalization: banking sector and households.*

In this section we extend the framework described in section 2 by introducing a more elaborate banking sector.

The model contains a more detailed description of the monetary policy, no longer summarized by a generic shift parameter θ in the credit supply function.

The results obtained in the simplified model of the previous section will be weakened because an exogenous variation in the degree of competition in the industrial sector modifies the sensitivity (with respect to the interest rate) of the industrial firms' optimal level of investment. As in the previous section, we will assume that capital only lasts for one period, and corresponds to the level of investments.

The theoretical background for the behaviour of the banking sector in our model is provided (apart from a few relevant modifications that we are going to introduce) by Hörngren [1985]. As earlier mentioned, Hörngren's model is basically a model of banking and portfolio allocation à la Tobin and Brainard [1963].

The agents operating in the model are industrial firms, banks, monetary authorities and households (unlike in Hörngren [1985], the "non-bank" financial intermediaries are not consider here), and all variables are expressed in real terms. The industrial sector is constituted, as before, by symmetric enterprises, producing the same homogeneous good, with a strong market power with respect to the banking system. All the investments of the industrial enterprises are financed by loans obtained from banks. We consider a short run static partial equilibrium model, i.e. we do not consider the feedback from the non-financial variables to the financial sector. Following Hörngren [1985] (and most of the literature on banks' behaviour), we will assume, for what concerns the financial assets demand and supply functions, that the partial derivatives with respect to their own interest rates are greater, in absolute values, than the cross derivatives.

3.1 The Monetary Authority

In this model, given the level of public debt (which is assumed to be fixed and exogenous), the monetary authority implements open market operations by purchasing public bonds from households and banks. Apart from open market operations, the central bank could use another instrument of monetary policy, the level of reserve requirements, as in Hörngren. In what follows we will, for simplicity, consider only open market operations, since an analysis focused on the use of reserve requirements as an instrument of monetary policy would give similar results, and open market operations are more commonly employed as an instrument of monetary policy.

Let us assume that the characteristics of the economy are such that the payments are entirely performed using deposits. The money base of the economy is then given by bank reserves.

Considering that we are dealing with a partial equilibrium model, where we neglect the feedback between the real sector and wealth, if we neglect the foreign sector, the balance sheet of the central bank can be simplified as follows:

$B^C = R$ (5

where B^C is the amount of public bonds held by the central bank and R represents the reserves of the commercial banks. The reserves that the commercial banks hold at the central bank include reserve requirements and free reserves. The central bank, while varying the value of B^C, performs open market operations, and controls the money base. Therefore the money base, BM, will be equal to B^C. The balance sheet of the central bank can be regarded as a sort of budget constraint, which has to be satisfied ex post, given the behavioural relations of the model.

The public debt BT (exogenous) will be given by

$BT = B^P + B^b + B^C$ (6)

or, equivalently

$$BT = B^p + B^b + BM \qquad (6')$$

where B^b is the quantity of public bonds held by private banks.

3.2 Households

This model does not include labour[6], but only capital as a production factor, owned by households, which receive all the income produced. The private sector has a wealth endowment which enters the demand functions for financial assets. For simplicity, in the absence of the foreign sector, the financial wealth will be equal to the public sector debt, which is exogenous and fixed. We will limit our analysis to the impact of a variation in the degree of concentration in the industrial sector on the optimal level of investments, and on the monetary policy multiplier. The financial wealth is assumed to be constant.

Let us assume that households do not lend funds directly to industrial firms, but can only choose between investing in public bonds or bank deposits. This last assumption (which also appears in Hörngren [1985]) is theoretically justifiable by the fact that banks enjoy scale economies in collecting information, or by the fact that the size of negotiated loans may be large with respect to the financial wealth of the single individual). It may be considered as an extreme description of those institutional contexts (such as that of Japan and continental Europe), where financial funds are predominantly intermediated by the banking sector.

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6 We could make a "ceteris paribus" assumption, and imagine that the labour is included in the constant "B", which appears in the production function $y=Bk^{\alpha}$.

We can further assume that the demand for bank deposits of the public is given by a "fixed" component, which can be thought of as money transactions, and taken as exogenous, and a "variable" component which can be thought of as an increasing function of the interest rate on deposits and a decreasing function of the interest rate on public bonds. If we assume that one period of time passes between the moment when the industrial firms obtain the loans and the moment when the income determined by the production process is available for the households, we can express the "transactions" component of money demand as a function of Y_{t-1} [7]. Therefore, the households' demand for bank deposits can be described as follows:

$$D^P = \overline{C}(Y_{t-1}) + D^{VP}(r_B, r_D, r_L, W) \qquad (7$$

where $C(Y_{t-1})$ is the "fixed" component of the deposits, which we can assume to be exogenous and non-remunerated; $D^{VP}(r_B, r_D, W)$ is the "variable" component, function of the interest rates, D^P is the total amount of deposits, W the wealth, r_B the interest rates on public bonds, r_D the interest rate on bank deposits, and r_L on bank loans.

Consistently with the portfolio allocation theory (and with Tobin and Brainard [1963] model, in the version presented by Hörngren [1985]) we can now define the other demand functions for financial assets and liabilities by the public:

7 This last assumption is not strictly necessary, since, for the purposes of the present paper, it would be equivalent to assuming that the "transactionary" component of money demand is exogenous. However, it might be more convenient to keep the money demand function in this form, (by assuming that the transactionary component of the money demand is pre-determined rather than exogenous), in order to be aware of the potential extensions of the model, once we have taken into account the feedback between the real sector and the financial sector by making explicit the link between the real income and the process of wealth accumulation.

$$B^P = B^P(\overset{+}{r_B}, \overset{-}{r_D}, \overset{-}{r_L}, \overset{+}{W}) \quad \text{(demand for public bonds)} \quad (8$$

$$D^P = D^P(\overset{-}{r_B}, \overset{+}{r_D}, \overset{-}{r_L}, \overset{+}{W}) \quad \text{(demand for bank deposits)} \quad (9$$

$$L^d = L^d(\overset{+}{r_B}, \overset{-}{r_L}, \overset{+}{r_D}, \overset{+}{W}) \quad \text{(demand for banks' loans by the public)} \quad (10$$

The budget constraint of the public is:

$$W = B^P + D^P - L^d \qquad (11$$

as we have said, we will have $W = BT$

3.3 The Banking Sector

The banks finance themselves by issuing deposits. Let us assume that the total amount of deposits is given by the sum of (non remunerated) current account deposits and (remunerated) saving deposits. Let us also assume that the banks are willing to issue any quantity of non remunerated deposits demanded by the public. Therefore we will have:

$$D = Cb + DV. \qquad (12$$

where Cb is the non remunerated component of bank deposits, DV the remunerated one which depends on the interest rates. The remunerated component of deposits, DV are the money market liabilities that banks issue in order to provide themselves with loanable funds, according to the assumption of "active liability management" previously mentioned.

The funds collected can be invested (once the reserve requirement has been satisfied) in loans, (non remunerated) free reserves, or public bonds.

If, for the sake of simplicity, we neglect the shares, the balance constraint of banks is given by:

$$L^s + R + B^b = D \qquad (13$$

L^s = supply of credit;

R = commercial banks' liquid reserves at the central bank;

D = bank deposits.

The banks' demand for public bonds will depend positively on the interest rate on public bonds, negatively on the interest rate on loans (which represent an opportunity cost) and the interest rate on time deposits. We have, therefore:

$$B^b(\overset{+}{r_B}, \overset{-}{r_D}, \overset{-}{r_L}) \qquad (14$$

Public bonds, unlike loans, can be sold on a spot market. This implies that public bonds held by commercial banks can be regarded both as a form of portfolio investment and a partially liquid asset, to the extent that it is traded on a "spot" market instead of a "customer" market. We say "partially" because, although B^b is traded on a "spot" market, we cannot exclude, for the sake of generality, that it carries some transaction costs.

On the other hand, we can assume that commercial banks hold free (non constrained) liquid reserves for transactionary purposes, and in order to be able to satisfy unexpected requests of deposit reimbursements by the public. Therefore, since B^b is, for the bank, also a liquid asset, we may think that the transaction costs associated with B^b could determine some kind of hierarchy in the allocation of liquid assets between R and B^b, and we can expect that the opportunity cost of the free liquid reserves might be mainly represented by the interest rate on loans.

The reserves R include the reserve requirements and the free liquid reserves. Therefore, if we define:

$q0$ = reserve requirements coefficient;

q' = free liquidity ratio of the commercial banks;

we can write:

$$R = q0 \cdot D + q' \cdot D = (q0 + q') \cdot D .$$

We will assume, for simplicity, that q' behaves as follows:

$$q' = q'(\bar{q0}, \bar{r_L})$$

since, assuming some form of "hierarchical" funds allocation between the two liquid assets R and B^b (determined by the fact that B^b, unlike R, brings some transaction costs), we can regard r_L as the main opportunity cost for R, and we may regard as negligible the effect of the interest rate on public bonds. Furthermore, as it is argued in Hörngren [1985], the higher the reserve requirements, the more costly it is for the bank to hold free reserves. Considering equation 5, we can write:

$$BM = R = q(\bar{q0}, \bar{r_L})D; \qquad (15$$

with $q = q0 + q'$ and $0 < q < 1$;

then: $D = BM/q(\cdot)$;

and defining

$$q(\cdot) = 1/\Phi(\cdot) \qquad (16$$

we have:

$$D(\cdot) = BM \cdot \Phi(\cdot) \qquad (17$$

and, obviously, $\Phi > 1$ [8].

In accordance with Hörngren's [1985] "active liability management" assumption, the banks issue remunerated time deposits in order to provide themselves with loanable funds. The amount of time deposits that the banks are willing to issue is then decided simultaneously with the supply of credit to the industrial firms. This means, that for the purposes of our model, the remunerated component of deposits DV, is directly linked to the supply of loans by the bank.

While Hörngren [1985] assumes that (due to the market structure of the banking sector) the relevant variable affecting the supply of banks' loans and the remunerated deposits is the (constant) spread "$r_L - r_D$", we will simply assume here that there is a generical functional link between the interest rate on bank loans r_L and the interest rate on ("variable") remunerated deposits r_D. In other words, we are saying that a functional link $r_D(r_L)$ exists and is determined by the fact that the remunerated deposits are issued by the banks in order to provide themselves with loanable funds, given

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8 In a previous version of this paper we assumed

$$q = q(\overset{-}{r_L}, \overset{+}{r_D}, \overset{-}{r_B}, \overset{-}{q_0})$$

where r_L, is the interest rate on bank loans, r_B the interest rate on public bonds, and r_D the interest rate on deposits. This seems to be a less restrictive assumption. However, as will be clear later, some additional restrictions had to be taken, in order to obtain a bank credit supply function behaving consistently with the portfolio allocation theory. In particular, we would have to assume:

$$|(\delta\Phi/\delta r_B)BM| < |\delta B^b/\delta r_B|.$$

Having made this assumption, the results would be equivalent to those of the present model, but the calculations would be more complex.

the (perfectly competitive) market structure of the banking sector, and given the presence of administrative costs for the banks (which prevents, in equilibrium, r_D and r_L to be equal).

Our assumption is not very different from the one made by Hörngren, who, having defined $L^S((r_L-r_D),q_0)$ as the supply of banks' loans, assumes

$\delta L^S(\cdot)/r_L = - \delta L^S(\cdot)/r_D$.

In our case, having defined

$r_D = r_D(r_L)$ (18

we assume, for simplicity[9]

$\delta r_L/\delta r_D = 1$ (18".

A similar assumption, although slightly more restrictive, is found in Modigliani and Papademos [1980] and [1987], where it is simply assumed that in a perfectly competitive banking sector, neglecting the administrative costs, the equality $r_D=r_L$ holds.

For what concerns the nonbank agents, their behaviour functions will still include the interest rate r_D on "variable" deposits as an explanatory variable, but we will have to keep in mind the functional link $r_D = r_D(r_L)$. In other words, we will have:

$B^P = B^P(\overset{+}{r_B}, \overset{-}{r_D(r_L)}, \overset{-}{r_L}, \overset{+}{W})$ (demand for public bonds) (8'

$D^P = D^P(\overset{-}{r_B}, \overset{+}{r_D(r_L)}, \overset{-}{r_L}, \overset{+}{W})$ (demand for bank deposits) (9'

$L^d = L^d(\overset{+}{r_B}, \overset{-}{r_L}, \overset{+}{r_D(r_L)}, \overset{+}{W})$ (demand for banks' loans by the households) (10'

For what concerns equations 9 and 10, the sign of the partial derivatives with respect to r_L is unambiguously defined, if we

9 The following assumption of equation 18" could actually be weakened, but it has been expressed in this form for the sake of simplicity.

consider that we have assumed that the partial derivative with respect to their own interest rate is greater, in absolute value than the cross derivatives, and we take into account equation 18".

For what concerns the banks, we can rewrite equation 17 as follows

$$D = BM \cdot \overset{+}{\Phi}(r_L) \qquad (17'$$

Like in Hörngren [1985], we assume that the "variable" component of deposits issued by commercial banks depends on the profitability of bank loans:

$$\frac{\delta D(\cdot)}{\delta r_L} = \frac{\delta \Phi(\cdot)}{\delta r_L} \cdot BM > 0 \qquad (19$$

In equation 19, the interest rate r_D does not appear because the bank "recognizes" the link existing between r_L and r_D, and equation 19 express the amount of deposits (consistent with the banks' maximization of profits and to the unit cost r_D of the "variable" component of deposits, "linked" to r_D) that the banking system is willing to issue, given the fact that banks issue remunerated deposits only to provide themselves with loanable funds, to be supplied on the loans market, remunerated at the rate r_L.

Introducing the functional relation $r_D(r_L)$ into the banks' demand for public bonds does not create any particular problem:

$$B^b(\overset{+}{r_B}, \overset{-}{r_D(r_L)}, \overset{-}{r_L}) \qquad (14'$$

The banks' budget constraint can also be written as follows:

$$B^b + L^s = [\Phi(\cdot) - 1] \cdot BM \qquad (13'.$$

Equality 13' implicitly defines the supply of banks loans:

$$L^s = L^s(\overset{-}{r_B}, \overset{+}{r_L}, \overset{+}{BM}) = [\Phi(\overset{+}{r_L}) - 1] \cdot BM - B^b(\overset{+}{r_B}, \overset{-}{r_L}) \qquad (20.$$

Considering equation 20 with equation 10, we can define the function S(•), which represents the supply of bank credit available to the industrial firms:

$$S(\overset{-}{r_B}, \overset{+}{r_L}, \overset{+}{BM}\cdot) = [\Phi(\overset{+}{r_L}) - 1]\cdot BM - B^b(\overset{+}{r_B}, \overset{-}{r_L}) - L^d(\overset{+}{r_B}, \overset{-}{r_L}) \qquad (21$$

From equation 19, we have $\delta L^d/\delta r_L < 0$. This can be easily verified if we look at equation 10', and we consider two assumptions that we have made earlier: the first is that the derivatives of the demand and supply functions with respect to their own interest rates are greater, in absolute value, than the cross derivatives; the second is $\delta r_D/\delta r_L = 1$ [10].

3.4 The Industrial Sector

The industrial sector has the same characteristics as the one described in the simplified model of section 2. The differences lie in the behaviour of the banking sector, which is described here by a more complex model, instead of being captured by a reduced form, like in section 2.

The optimization problem of the representative enterprise is the following:

$$\max \pi = (N/n)(\ f(k) - r_L k)$$

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10 In a previous version of this paper we assumed that the banking system only lent to the industrial firms. In this case, equation 21 would have been simplified as follows:

$$S(\overset{-}{r_B}, \overset{+}{r_L}, \overset{+}{BM}\cdot) = [\Phi(\overset{+}{r_L}) - 1]\cdot BM - B^b(\overset{+}{r_B}, \overset{-}{r_L})$$

the result would have been equivalent, but we have preferred to remove this restriction and assume that households can borrow from the banking sector, since this does not excessively complicate the model.

$$\text{s.t.} \quad \frac{N}{n} \cdot k + K' = S(\cdot)$$

or, equivalently,

$$k = (S(\cdot) - K')\, n/N$$

where K' is the capital of the remaining n-1 firms, $S(\cdot)$ is the supply of credit (loans supplied by the banking system), π the profit, r_L the interest rate on the loans to industrial firms.

Assuming that the second order conditions are satisfied, the first order conditions are the following:

$$\delta\pi/\delta r_L = \frac{N}{n}\left[\left(\frac{\delta g(k)}{\delta k} - r_L\right)\frac{\delta S(.)}{\delta r_L}\,\frac{n}{N} - k\right] = 0$$

hence

$$\delta g(k)/\delta k - r_L - \frac{1}{n}\,\frac{kN/n}{\delta S(.)/\delta r_L} = 0$$

Since, for symmetry, we have $S(\cdot) = Nk$, then we can write:

$$\alpha B k^{\alpha-1} - r_L - \frac{1}{n}\,\frac{S(.)}{\delta S(.)/\delta r_L} = f_1(k, r_L, n) = 0 \qquad (22$$

or, solving with respect to k:

$$k = \left[\frac{1}{B\alpha}\left(r_L + \frac{1}{n}\,\frac{S(\cdot)}{\delta S(\cdot)/\delta r_L}\right)\right]^{1/(\alpha-1)} \qquad (23$$

Expressions (22) and (23) are then F.O.C. of the optimization problem of the representative firm. They describe the relation between the marginal productivity of capital and r_L (or, equivalently, a relation between k and r_L), in a context characterized by oligopsonistic power of industrial firms on the market for credit.

3.5 Equilibrium Conditions

Since the money base is exogenous, there are three relevant financial assets in our model: bank loans, public bonds and bank deposits.

Moreover, we must add condition (22) to the equilibrium conditions of the assets markets. Condition (22) defines a relation between the marginal productivity of capital and the interest rate on the loan market, and (given the elasticity of output with respect to capital in the production function) a relation between the optimal level of investments and the interest rates. It contains the information concerning the oligopsonistic power of industrial firms in the credit market. Since the market for bank credit is described by an oligopsony "à la Cournot", we cannot properly define a demand function for capital, from the industrial firms, but we have an optimizing decision taken by the firms simultaneously to the decision of the monetary authority concerning the value of the monetary policy instrument, given the behaviour functions of the agents operating on the assets markets. Therefore the value for k chosen by the individual enterprise (and as a consequence the aggregate value $K = Nk$, since in an oligopsony à la Cournot the behaviour of the firms is symmetrical) is the level of investments resulting from the F.O.C. of the optimization problem of the firm. k can be intuitively thought of as the equilibrium value in the game describing the behaviour of the "n" oligopsonists, given the banks' credit supply available to industrial firms.

In our model we have three markets: loans, deposits and public bonds, and three interest rates: r_B, r_L and r_D. Equation (22) determines the relation existing between k, r_L, and the other interest rates which appear in the supply of bank credit. Since the (competitive) market structure in the banking sector and the assumption of "active liability management" determines r_D through equation 18, and since W, BT, and y_{t-1} are given, we have actually three unknowns: k, r_B, r_L.

$$\alpha B k^{\alpha-1} - r_L - \frac{1}{n}\frac{S(\cdot)}{\delta S(\cdot)/\delta r_L} = 0 = f_1(k, r_L, r_B, n, BM) \qquad (22$$

Considering that the aggregate investments Nk are equal to the banks' credit supply available to the industrial firms S(•), we obtain the equilibrium condition for the market for bank loans:

$$Nk - S(\overset{+}{r_L}, \overset{-}{r_B}, \overset{+}{BM}) = f_2(k, r_L, r_B, BM) = 0 \qquad (24$$

Considering equations 14', 8, and 6, we obtain the condition of equilibrium on the market for public bonds:

$$B^b(\overset{+}{r_B}, \overset{-}{r_L}) + B^P(\overset{+}{r_B}, \overset{-}{r_L}, \overset{+}{W}) + BM - BT = f_3(r_L, r_B, BM) = 0 \qquad (25$$

Combining equations 9' and 17' we obtain the equilibrium conditions for bank deposits:

$$D^P(\overset{-}{r_B}, \overset{+}{r_D(r_L)}, \overset{-}{r_L}, \overset{+}{W}) - D(\overset{+}{r_L}, \overset{+}{BM}) = f_4(r_L, r_B, BM) = 0 \qquad (26$$

Condition (22) is "microeconomic", since it is obtained from the F.O.C. of the optimization problem for the industrial firm. Equations (24), (25) and (26) are, on the contrary, "macroeconomic" conditions.

Given equation 11, defining the wealth constraint of the private sector, equation 5, defining the budget constraint of the central bank, and equation 6', one can see, after doing some substitutions, that equations 25 and 26 are not independent. We will therefore drop equation 26, and we will work on consider only the remaining three.

3.6 Comparative Statics

We must now first analyze the effects of a variation of the exogenous variables BM and "n" (money base and number of oligopsonistic firms in the market) on the endogenous variables of the system. Then, after calculating the value of the monetary policy multiplier dk/dBM, we can see how a variation in "n" affects this multiplier, taking into account the direct effects of a variation of "n" on the money multiplier dk/dBM, as well as the "indirect" effects, induced through a modification (induced by a variation in "n") in the equilibrium levels of the interest rates, and in the higher order derivatives of the functions relevant for the comparative statics.

Assuming that the vector function F (composed of the four functions f_1, f_2, f_3, f_4) satisfies the conditions of the implicit function theorem, we may implement a comparative static analysis considering the effects of a variation in the monetary policy instrument BM and in the number of firms "n", on the endogenous variables of the system. We consider equations 22, 24, 25, and differentiating them at the equilibrium we get the following system:

$$\begin{bmatrix} \frac{\delta f_1}{\delta k} & \frac{\delta f_1}{\delta r_L} & \frac{\delta f_1}{\delta r_B} \\ \frac{\delta f_2}{\delta k} & \frac{\delta f_2}{\delta r_L} & \frac{\delta f_2}{\delta r_B} \\ 0 & \frac{\delta f_3}{\delta r_L} & \frac{\delta f_3}{\delta r_B} \end{bmatrix} \begin{bmatrix} dk \\ dr_L \\ dr_B \end{bmatrix} = \begin{bmatrix} -\frac{\delta f_1}{\delta BM} & -\frac{\delta f_1}{\delta n} \\ -\frac{\delta f_2}{\delta BM} & 0 \\ -\frac{\delta f_3}{\delta BM} & 0 \end{bmatrix} \begin{bmatrix} dBM \\ dn \end{bmatrix} \qquad (27$$

We assume that system 27 is stable; the appendix contains the algebraic details concerning system 27, and an explanation of the signs of all the relevant partial derivatives. Let us define A the matrix on the left hand side of system 27, $\triangle$ the determinant of the matrix A, and a_{ij} the element of matrix A placed in the i-th row and j-th column. We have then:

$$dr_B/dn = \overset{+}{\frac{1}{\triangle}} \left[- \overset{-}{\frac{\delta f_1}{\delta n}} \right] \overset{+}{a21}\ \overset{-}{a32} > 0 \qquad (28$$

$$dr_L/dn = \overset{+}{\frac{1}{\triangle}} \{ - \left[- \overset{-}{\frac{\delta f_1}{\delta n}} \right] \overset{+}{a21}\ \overset{+}{a33} \} > 0 \qquad (29$$

$$dk/dn = \frac{1}{\triangle} \{ \left[- \frac{\delta f_1}{\delta n} a22\ a33 \right] - \left[- \frac{\delta f_1}{\delta n} a23\ a32 \right] \} > 0 \qquad (30$$

Inequality 30 is true because we have assumed that the derivatives with respect to their own interest rates are greater, in absolute value, than the cross derivatives. As shown in the appendix, this implies that

$$|a22| > |a23| \quad \text{and} \quad |a33| > |a32| \quad .$$

In the appendix it is also shown, given our assumptions, that $\Delta > 0$.

Form 28, 29 and 30, that an exogenous increase of the degree of competition (a reduction of the degree of concentration) in the industrial sector increases the interest rate on loans, public bonds and the optimal level of investments for the industrial firms. This happens because a reduction in the degree of concentration in the industrial sector, reducing the spread between marginal productivity of capital and interest rate on loans, leads to an expansionary effect.

Let us now consider the effect of monetary policy.

$$dr_L/dBM = \frac{\overset{+}{1}}{\Delta} \{[\overset{-}{a11}(\Phi(\cdot)-1)\overset{+}{a33}\ ] + [\overset{+}{a13}\ \overset{+}{a21}\ (-1)] - [\overset{-}{a11}\ \overset{+}{a23}\ (-1)] +$$

$$- \left[- \overset{+}{\frac{\delta f1}{\delta BM}}\right] \overset{+}{a21}\ \overset{+}{a33}\} < 0 \qquad (31$$

$$dr_B/dBM = \frac{\overset{+}{1}}{\Delta} \{[\overset{-}{a11}\ \overset{-}{a22}\ (-1)] + \left[- \overset{+}{\frac{\delta f1}{\delta BM}}\right] \overset{+}{a21}\ \overset{-}{a32} +$$

$$-[\overset{-}{a12}\ \overset{+}{a21}\ (-1)] - [\overset{-}{a11}\ (\Phi(\cdot)-1)\ \overset{-}{a32}]\} \quad < 0 \qquad (32$$

$$dk/dBM = \overset{+}{\frac{1}{\Delta}} \left\{ \left[- \overset{+}{\frac{\delta f_1}{\delta BM}}\right] \overset{-}{a_{22}}\ \overset{+}{a_{33}} + [\overset{-}{a_{12}}\ \overset{+}{a_{23}}\ (-1)] + \right.$$

$$+ [\overset{+}{a_{13}}\ (\Phi(\cdot)-1)\ \overset{-}{a_{32}}\ ] - [\overset{+}{a_{13}}\ \overset{-}{a_{22}}\ (-1)] - [\overset{-}{a_{12}}\ (\Phi(\cdot)-1)\ \overset{+}{a_{33}}] +$$

$$\left. - \left[- \overset{+}{\frac{\delta f_1}{\delta BM}}\right] \overset{+}{a_{23}}\ \overset{-}{a_{32}} \right\} \qquad (33$$

The sign of 33 is uncertain. When 33 is negative, the monetary policy will have perverse effects, i.e. and increase in the money base will reduce the level of investments instead of increasing it. The monetary policy will not have perverse effects when the positive addenda of 33 are greater than the absolute value of the negative addenda, i.e. when:

$$a_{12}\ a_{23}\ (-1) - [a_{12}\ (\Phi(\cdot)-1)\ a_{33}] - \left[- \frac{\delta f_1}{\delta BM}\right] a_{23}\ a_{32} >$$

$$> \left| \left[- \frac{\delta f_1}{\delta BM}\right] a_{22}\ a_{33} + a_{13}\ (\Phi(\cdot)-1)\ a_{32} + a_{13}\ a_{22} \right| \qquad (34$$

At this point, the most obvious strategy would be to perform the analysis for two different cases: effective and perverse monetary policy. However, if the monetary policy has perverse effects (i.e. if condition 34 is not met), it seems to be quite pointless to investigate how and wether market structure affects it, because, in any case, a monetary policy with perverse effects is not advisable. Therefore, in what follows, the analysis will be implemented only for the case of monetary policy effectiveness, i.e., when condition 34 is true.

This means that $\delta k/\delta BM > 0$, i.e., the multiplier of monetary policy 33 is positive.

Now let us analyze the effects on the monetary policy multiplier of an exogenous increase in the degree of competition (decrease in the degree of concentration) in the industrial sector. Differentiating equation (33) with respect to "n" we get the following expression, which will be positive when an increase in the number of industrial firms (keeping constant the number of enterprises) increases the effectiveness of monetary policy. Having defined (with reference to the multiplier 33):

$$A1 = \left\{ \left[- \frac{\delta f1}{\delta BM}\right] a22\ a33 + [a12\ a23\ (-1)] + \right.$$

$$+ [a13\ (\Phi(\cdot)-1)\ a32\ ] - [a13\ a22\ (-1)] - [a12\ (\Phi(\cdot)-1)\ a33] +$$

$$\left. - \left[- \frac{\delta f1}{\delta BM}\right] a23\ a32 \right\} \qquad (35$$

we have:

$$d(dk/dBM)/dn = \frac{\dfrac{dA1}{dn} \cdot \Delta - \dfrac{d\Delta}{dn} \cdot A1}{\Delta^2} \qquad (36$$

We can see in the appendix that $d\Delta/dn < 0$. If, as we assumed earlier $dk/dBM > 0$, then we also have $A1 > 0$. The expression $-(d\Delta/dn) \cdot A1$, the second addendum at the numerator of expression 36, is therefore positive. For what concerns the first addendum, we have (see appendix for algebraic details):

$$dA1/dn = \overbrace{\frac{\overset{-}{\delta}}{\delta n}\left[- \frac{\delta f1}{\delta BM}\right]\overset{-}{(a22\ a33-a23\ a32)}}^{+} + \overbrace{\frac{\overset{+}{\delta}}{\delta r_B}\left[- \frac{\delta f1}{\delta BM}\right]\frac{dr_B}{dn}\overset{-}{(a22a33-a23a32)}}^{-} +$$

$$+ \overbrace{\overset{+}{\frac{\delta\Phi(\cdot)}{\delta r_L}}\,\frac{dr_L}{dn}\,\overset{+}{(a_{13}\,a_{32}-a_{12}\,a_{33})}}^{+} + \overbrace{(\overset{-}{\delta a_{13}/\delta n})(\Phi(\cdot)-1)\overset{-}{a_{32}}}^{+} +$$

$$- \overbrace{(\overset{+}{\delta a_{12}/\delta n})(\Phi(\cdot)-1)\overset{+}{a_{33}}}^{-} - \overbrace{(\overset{+}{\delta a_{12}/\delta n})\,\overset{+}{a_{23}}}^{-} + \overbrace{(\overset{-}{\delta a_{13}/\delta n})\,\overset{-}{a_{22}}}^{+} \quad . \qquad (37$$

Therefore, defining:

$$ED = (1/\triangle)\,\frac{\delta}{\delta n}\left[-\frac{\delta f_1}{\delta BM}\right](a_{22}\,a_{33}-a_{23}\,a_{32}) \quad > 0 \qquad (38$$

$$EB = (1/\triangle)\,\frac{\delta}{\delta r_B}\left[-\frac{\delta f_1}{\delta BM}\right]\frac{dr_B}{dn}(a_{22}\,a_{33}-a_{23}\,a_{32}) \quad < 0 \qquad (39$$

$$EL = (1/\triangle)\,\frac{\delta\Phi(\cdot)}{\delta r_L}\,\frac{dr_L}{dn}\,(a_{13}\,a_{32}-a_{12}\,a_{33}) \quad > \quad 0 \qquad (41$$

$$ES=(1/\triangle)\Big[(\delta a_{13}/\delta n)(\Phi(\cdot)-1)a_{32} - (\delta a_{12}/\delta n)(\Phi(\cdot)-1)a_{33}-(\delta a_{12}/\delta n)\,a_{23}+ + (\delta a_{13}/\delta n)\,a_{22}\Big] \quad . \qquad (42$$

$$E\triangle = (1/\triangle^2)\,[(d\triangle/dn)\cdot A1] \quad > 0 \qquad (43$$

we will have:

$$d(dk/dBM)/dn = ED + EB + EL + ES + E\triangle \qquad (44.$$

The sign of ES (from definition 42) is uncertain, while the signs of ED, EB, EL, $E\triangle$ are unambiguously determined. Equation 44 tells us that the effect of an exogenous increase in the number of industrial firms (decrease in the degree of concentration) on the monetary policy multiplier dk/dBM can be decomposed into five parts. EB and EL can be intuitively thought of as the effect on dk/dBM induced through a variation in the equilibrium level of r_L and r_B, originated by an increase in n. ED can be thought of as a direct effect on the multiplier dk/dBM of a variation in n, comparable to the one considered in the simplified case of section 2. EΔ is the effect of a variation of n on the determinant of matrix "A", on the left hand side of system 27. ES is, like EΔ, a "structural" effect of a variation in n. I call them "structural" because they can be intuitively thought of as variations (due to a change in "n") in the system "sensitivity" to monetary policy and market perturbations. For example, ES contains the effects, induced by a variation of "n", on the marginal productivity of capital, due to the fact that a variation in "n", by changing the equlibrium level of "k", changes the point of the production function chosen by each enterprise. ES also contains the effects of a variation of "n" on the elasticity of the slope of the credit supply function, since, a different point on the function S(.) is "picked up" by the firms, again due to a modification of "n". EΔ contains analogous effects, taking the form of modifications in the determinant of matrix "A" on the left hand side of the equality of system (27.

In other words, the direct effect on dk/dBM of an increase in n, also brings some market perturbations (i.e. effects on the equilibrium values of the interest rates and other variables, as well as variations in the "sensitivity" of the system to market signals).

As we can see from equations and definitions 37, 38, 39, 40, 41, 42, and 43, ED, EΔ and EL are positive, EB is negative, and ES has an uncertain sign. Obviously, an increase in the degree of competition (reduction in the degree of concentration) in the industrial sector, will increase the effectiveness of monetary policy on the level of investments if the positive effects prevail over the negative ones.

However, we can conclude that, in general, a change in the oligopsonistic power of industrial firms on credit market should affect the effectiveness of the monetary policy, except in the very particular and extreme case where the negative elements of multiplier (44) exactly compensate the positive ones.

4. Conclusions.

The models presented in this paper described an economy characterized by industrial firms oligopsonistic in the market for credit. Some effects of an exogenous variation of the market power of the industrial firms have been analyzed using two models. In the first one, the behaviour of the monetary sector is captured by a supply function of bank credit to the industrial firms, which depends positively on the (unique) interest rate, and on a generic parameter θ, whose value is bigger the more expansionary the monetary policy. In this simplified case, an increase in the degree of competition in the industrial sector (decrease in the degree of concentration) increases the effectiveness of monetary policy. This happens because an increase in the degree of competition, reducing the existing spread between marginal productivity of capital and interest rate on the credit market, creates an expansionary effect.

The model of section 3 attempts to generalize the analysis of section 2, and describes the behaviour of the banking sector in accordance with the portfolio allocation theory. Having introduced into the model a banking system and other agents allocating their wealth according to the portfolio allocation theory, weakens the results of section two.

However, a first result is that, in general, an exogenous change in the market power of industrial firms on credit market indeed affects the transmission mechanism of monetary policy. The direct effect (defined as "ED") of an exogenous increase in "n" (i.e. an increase in the degree of competition) is positive and analogous to the one considered in the simplified case. Some ambiguity appears in considering the sign of the indirect effects.

The indirect effect induced through the equilibrium value of the interest rate on bank loans r_L (defined as EL) is still positive. The indirect effect (again of an increase in the number of industrial firms) on the monetary policy multiplier 37 induced through the equilibrium level of r_B is negative, and the effect on the system "sensitiveness" to market signals, (mainly determined by the reciprocal interactions of several agents allocating their wealth among several assets, and represented by $ES + E\Delta$) has an uncertain sign. However, in this model, a situation of irrelevance of the degree of concentration in the industrial sector on the transmission mechanism of monetary policy can only happen in the very extreme and particular case where the opposite effects affecting the monetary policy multiplier exactly compensate one another.

Bibliography of Chapter 2

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Appendix

System 27 is obtained by differentiating at the equilibrium functions f_1, f_2, and f_3. We consider then linear approximations of the functions f_1, f_2, and f_3. This implies that the second derivatives of the behavioural functions are null. We also assume that the generical derivative $\delta f_i/\delta r_L \delta r_B$ is null.

$$-\frac{\delta f_1}{\delta BM} = \frac{\delta}{\delta BM}\left[(1/n)\cdot\frac{S(\cdot)}{\delta S(\cdot)/\delta r_L}\right] =$$

$$= \frac{1}{n}\cdot\frac{[\Phi(\cdot)-1]\cdot\left[\frac{\delta\Phi(\cdot)}{\delta r_L}\cdot BM - \frac{\delta B^b}{\delta r_L} - \frac{\delta L^d}{\delta r_L}\right] - \frac{\delta\Phi(\cdot)}{\delta r_L}[BM(\Phi(\cdot)-1)-B^b-L^d]}{\cdot\left[\frac{\delta\Phi(\cdot)}{\delta r_L}\cdot BM - \frac{\delta B^b}{\delta r_L} - \frac{\delta L^d}{\delta r_L}\right]^2} > 0$$

$$-\frac{\delta f_2}{\delta BM} = [\Phi(\cdot) - 1] > 0$$

$$-\frac{\delta f_3}{\delta BM} = -1$$

$$-\frac{\delta f_1}{\delta n} = -\frac{1}{n^2}\frac{S(.)}{\delta S(.)/\delta r_L} < 0$$

$$\frac{\delta f_1}{\delta k} = \alpha(\alpha-1)Bk^{\alpha-2} = a_{11} < 0$$

$$\frac{\delta f_1}{\delta r_L} = -1 - \frac{1}{n}\,\delta\left[\frac{S(.)}{\delta S(.)/\delta r_L}\right]/\delta r_L \quad ;$$

which can be rearranged as follows:

$$\frac{\delta f_1}{\delta r_L} = -1 - \frac{1}{n}\left[1 - \frac{E}{\epsilon}\right]$$

where $\epsilon = [\delta S(.)/\delta r_L][r_L/S(.)]$ is the credit supply elasticity with respect to the interest rate; and

$$E = [\delta^2 S(.)/\delta r_L^2]\left[\frac{r_L}{\delta S(.)/\delta r_L}\right]$$

is the elasticity of the slope of the same function; but since we are considering linear approximations of the functions at the equilibrium, we will have E = 0, hence:

$$\frac{\delta f_1}{\delta r_L} = -1 - \frac{1}{n} = a_{12} < 0$$

For what concerns the remaining signs, we will have:

$$\frac{\delta f_1}{\delta r_B} = - \frac{\delta S(.)/r_B}{\delta S(.)/\delta r_L} \frac{1}{n} = a_{13} > 0$$

$$\frac{\delta f_2}{\delta k} = N = a_{21} > 0$$

$$\frac{\delta f_2}{\delta r_L} = - \delta S(.)/\delta r_L = a_{22} < 0$$

$$\frac{\delta f_2}{\delta r_B} = - \delta S(.)/\delta r_B = a_{23} > 0$$

$$\frac{\delta f_3}{\delta k} = a_{31} = 0.$$

$$\frac{\delta f_3}{\delta r_L} = \delta B^b/\delta r_L + \delta B^P/\delta r_L = a_{32} < 0$$

$$\frac{\delta f_3}{\delta r_B} = \delta B^b/\delta r_B + \delta B^P/\delta r_B = a_{33} > 0$$

Therefore, the sign pattern of matrix A on the left hand side of system 27 is the following:

$$\begin{bmatrix} - & - & + \\ + & - & + \\ 0 & - & + \end{bmatrix}$$

the determinant of the matrix A is:

$$\Delta = (\overset{-}{a_{11}}\ \overset{-}{a_{22}}\ \overset{+}{a_{33}}) + (\overset{+}{a_{13}}\ \overset{+}{a_{21}}\ \overset{-}{a_{32}}) - (\overset{-}{a_{12}}\ \overset{+}{a_{21}}\ \overset{+}{a_{33}}) - (\overset{-}{a_{11}}\ \overset{+}{a_{23}}\ \overset{-}{a_{32}})$$

Since we assumed that in each demand or supply function the derivatives with respect to their own interest rate are bigger, in absolute value, than the cross derivatives, we have:

$|a22| > |a23|$; $|a33| > |a32|$;

and $|a12| > |a13|$;

which implies $\Delta > 0$.

In addition we have:

$\delta a12/\delta n = n^{-2} > 0;$

$$\delta a13/\delta n = n^{-2}\cdot\frac{\delta S(\cdot)/\delta r_B}{\delta S(\cdot)/\delta r_L} < 0;$$

$d(\Phi(\cdot)-1)/dn = (\delta\Phi(\cdot)/\delta r_L)\cdot(dr_L/dn)$

$$\frac{d}{dn}\left[-\frac{\delta f1}{\delta BM}\right] = \frac{\delta}{\delta n}\left[-\frac{\delta f1}{\delta BM}\right] + \frac{\delta}{\delta r_B}\left[-\frac{\delta f1}{\delta BM}\right]\frac{dr_B}{dn} + \frac{\delta}{\delta r_L}\left[-\frac{\delta f1}{\delta BM}\right]\frac{dr_L}{dn}$$

where:

$$\frac{\delta}{\delta n}\left[-\frac{\delta f1}{\delta BM}\right] = (-1)\cdot n^{-2}(-\delta f_1 /\delta BM) < 0.$$

$$\frac{\delta}{\delta r_L}\left[-\frac{\delta f1}{\delta BM}\right] = [(\delta\Phi/\delta r_L)BM+(-\delta B^b/\delta r_L)+(-\delta L^d/\delta r_L)]^{-2}[(\delta\Phi/\delta r_L)(\delta S(\cdot)/\delta r_L)+$$

$$+ (\delta\Phi/\delta r_L)(-\delta S(\cdot)/\delta r_L)] \cdot (1/n) = 0$$

$$\frac{\delta}{\delta r_B}\left[-\frac{\delta f1}{\delta BM}\right] = [(\delta\Phi/\delta r_L)BM+(-\delta B^b/\delta r_L)+(-\delta L^d/\delta r_L)]^{-2} \cdot$$

$$\cdot \{(\delta\Phi/\delta r_L)[(\delta B^b/\delta r_B) + (\delta L^d/\delta r_B)]\} > 0$$

At this point we are enabled to calculate $dA1/dn$ and $d\Delta/dn$, which appears at the numerator of equation 36.

$$dA1/dn = \frac{(-1)n^{-2}[(\Phi(\cdot)-1)(\delta S(\cdot)/\delta r_L) + (\delta\Phi/\delta r_L)\cdot(S(\cdot))]}{[(\delta\Phi/\delta r_L)\cdot BM + (-\delta B^b/\delta r_L)+(-\delta L^d/\delta r_L)]^2}\cdot$$

$$\cdot(a22\ a33-a23\ a32) + \frac{\frac{1}{n}\frac{\delta\Phi}{\delta r_L}\cdot[(\delta B^b/\delta r_B)+(\delta L^d/\delta r_B)]\ (dr_B/dn)}{[(\delta\Phi/\delta r_L)\cdot BM + (-\delta B^b/\delta r_L)+(-\delta L^d/\delta r_L)]^2}$$

$$\cdot(a22\ a33-a23\ a32) + \frac{\delta\Phi}{\delta r_L}\frac{dr_L}{dn}(a13\ a32-a12\ a33)+(n^{-2})\frac{\delta S(\cdot)/\delta r_B}{\delta S(\cdot)/\delta r_L}(\Phi-1)\cdot$$

$$\cdot a32 + (-1)\ (n^{-2})a23 + (n^{-2})\ \frac{\delta S(\cdot)/\delta r_B}{\delta S(\cdot)/\delta r_L}\ a22 - (n^{-2})(\Phi-1)a_{33}.$$

$$d\Delta/dn = \frac{\delta a11}{\delta k}\frac{dk}{dn}(a22\ a33-a23\ a32)+\frac{\delta a13}{\delta n}(a21\ a32)-\frac{\delta a12}{\delta n}(a21\ a33).$$

Since we assumed that in each demand or supply function the derivatives with respect to their own interest rate are bigger, in absolute value, than the cross derivatives, we have:

$$\left|\frac{\delta a12}{\delta n}\right| > \left|\frac{\delta a13}{\delta n}\right| \quad \text{and} \quad |a33| > |a32|$$

which implies $d\Delta/dn < 0$.

CHAPTER 3

CAPITAL MARKETS' SOPHISTICATION AND BANK LENDING: AN INTERPRETATION IN THE SPIRIT OF O. WILLIAMSON (1985) AND AN EMPIRICAL ANALYSIS

* I am very grateful to Keith Cowling, Norman Ireland, Giovanni Amisano and David Vanhoose for helpful comments. I am obviously the only one responsible for any mistakes that might be found and for the views expressed here.

CAPITAL MARKETS' SOPHISTICATION AND BANK LENDING: AN INTERPRETATION IN THE SPIRIT OF O. WILLIAMSON (1985) AND AN EMPIRICAL ANALYSIS.

1. Introduction.

In this chapter it is argued that the distinction made in some "institutional" analyses between "securitized" and "non securitized" financial sectors is more than a purely theoretical classification and may indeed carry some macroeconomic implications, empirically detectable, for what concerns the behaviour of the credit supply to industry. For this purpose, some empirical analysis will be implemented to show how the different behaviour of bank credit to industry in two different institutional contexts could be interpreted in the light of Williamson's [1985] contractual relations framework.

While in most countries the most relevant source of finance is provided by profits retentions, it is well known that stock and bond markets are relevant sources of financial funds for the industrial firms in the U.S. and in the U.K. only. In continental Europe, the source of external finance is predominantly provided by the banking system.

A distinction is made between the countries whose financial sectors are "intermediaries oriented" and the ones whose financial sectors are "securitized" is made by, among others, Rybczynski [1984]. While Japan is often quoted as a typical example of non-securitized financial system, the distincion between securitized and non-securitized financial systems, might be informative for a few European countries. Gardener [1991], following Rybczynsky's classification, argues that the United Kingdom is, at the moment, in the phase of "securitization", France and Germany are approaching it, while Italy is only entering an intermediate stage of gradual development of financial markets. The reason for such an evolution could lie in the increasing efficiency of markets and in their increasing capacity for risk bearing. Similar analyses have been made by Frankel and Montgomery [1991] and Mayer [1992]. The latter also points out that in the German "non-securitized" financial sector (unlike in the British "securitized" one) hostile takeovers are a very rare phenomenon. This fact, due to a higher dispersion of share ownership in the "securitized" financial sectors, suggests that in non securitized financial sectors the connection between market for shares and market for control could be less direct and less straightforward.

Outside Europe, the most significant example of "securitized" financial sector is the United States, while Japan is an often-quoted example of a financial system strongly oriented towards intermediaries. The impressive economic growth of Japan and Germany in the last decades shows that no value judgement may be associated to the concept of "securitization". In the "intermediary-oriented" financial systems, a direct control on bank credit by the government authorities is, theoretically speaking, feasible (although not necessarily advisable), and constitutes an historically relevant experience.

In what follows, Williamson's [1985] contract relations framework will be adopted in order to interpret the existence and development of securitized and non-securitized financial systems. A description of Williamson's approach and its implications are explained in section 2. Sections 3 and 4 contain an empirical analysis of the implications of the two different financial systems. In particular, it will be argued that the phenomenon of securitization can make the demand for bank credit by industrial firms more unstable than the supply. Empirical evidence in favour of this last point will be provided by an analysis based on British and German data. Section 5 contains the conclusions drawn from the analysis.

2 An interpretation of securitization based on O. Williamson's [1985] contractual relations framework.

Williamson's [1985] approach, based on the relevance of transaction costs, suggests an interpretation of the behaviour of economic agents in terms of contractual relations: the relevance of transaction costs (that Williamson defines - by quoting Arrow - as the "costs of running the economic system") is also implied by those interpretations of the Arrow-Debreu model defining commodities not only by physical, spatial, and time characteristics, but also by those elements of environmental uncertainty referred to as the "state of the world".

Economies on transaction costs can be implemented by assigning transactions to governance structures chosen among different institutional alternatives: the "classical market contracting" at one extreme, a centralized hierarchical organization at the opposite side, and mixed models of firm and market organization in between. In this context a relevant role is played by the assumption of "bounded rationality" and the analysis of agents' opportunistic behaviour. The relevance of bounded rationality contrasts with the traditional approach which suppresses the role of institutions in favour of the interpretations of firms as "production functions", or "black boxes". In Williamson's words:

> "Confronted with the realities of bounded rationality, the costs of planning, adapting, and monitoring transactions need expressly to be considered. ... Transactions that are subject to ex post opportunism will benefit if appropriate safeguards can be devised ex ante."
>
> (Williamson [1985], pp.46-48).

In such a context, "asset specificity" is a conceptual tool that contains many informationally relevant elements (such as the frequency of the transaction) for the decision process described by the bounded rationality approach. In a context of unbounded rationality, contracts would determine a world of planning. On the other hand, in a world with transaction costs,

> "the organizational imperative that emerges ... is this: *organize transactions so as to economize on bounded rationality while simultaneously safeguarding them against the hazards of opportunism*. Such a statement supports a different and larger conception of the economic problem than does the imperative 'Maximize profits'! "
>
> (Williamson, cit. p. 32).

In what follows the theoretical contracting schema presented in Williamson [1985] will be applied to bank credit. Instead of the "supply for a commodity", the "supply for financial funds" will be used, instead of the "general purpose technology", a "spot market for financial funds" will be used, and instead of Williamson's "*transaction specific asset*", the credit supplied by the bank to the specific firm will be used[11] .

The contracting schema could be represented as follows:

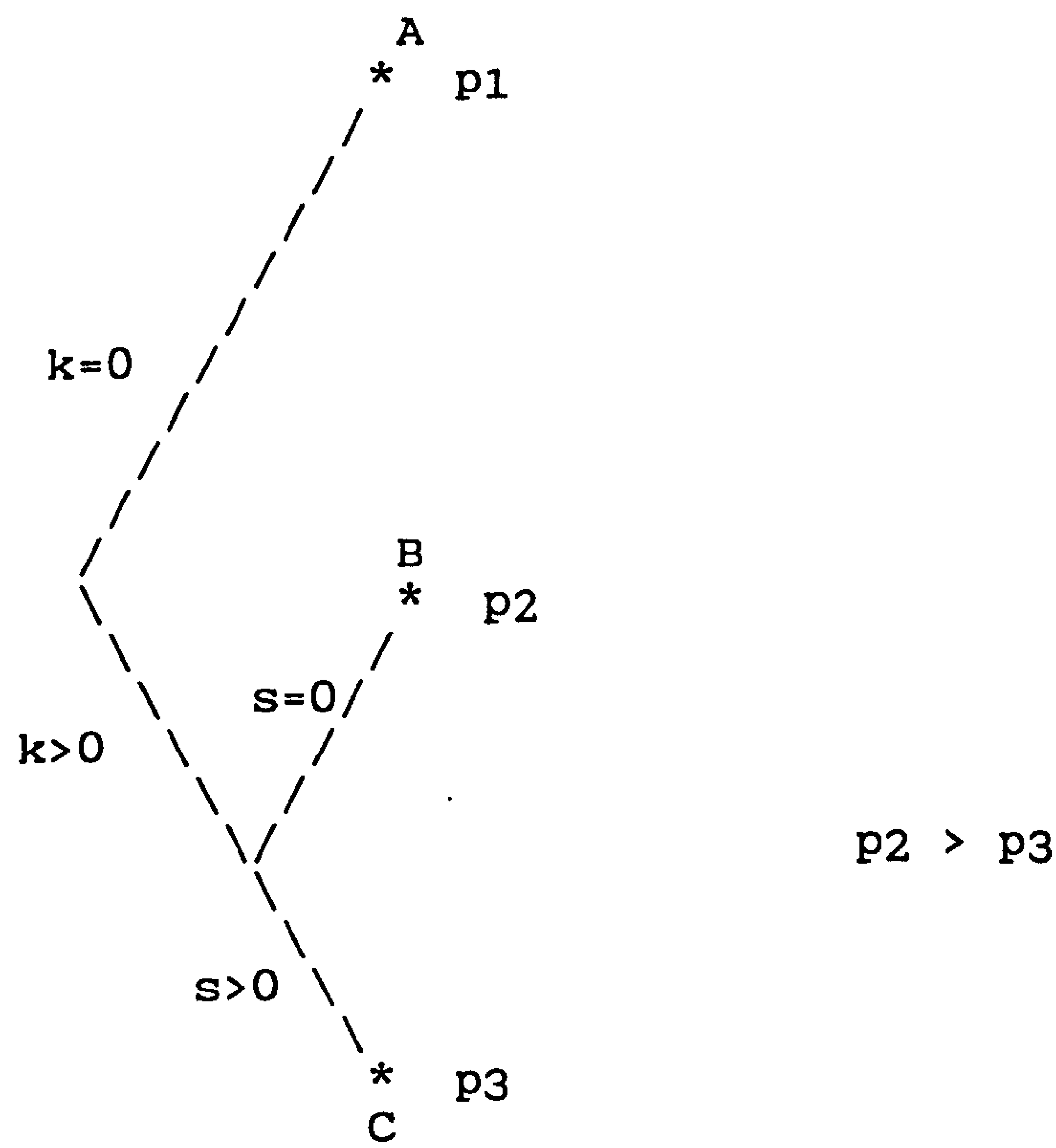


FIGURE 1.

Referring to figure 1, if one defines "k" as a measure of transaction-specific sunk cost for collecting information about borrowers' riskiness (the correspondent of Williamson's *transaction specific assets*), financial funds may be supplied on a bonds market, or intermediated and supplied by the banks. Banks can be thought of as agencies specialized in performing economies of scale in

11 Such a definition shows some similarity with Okun's [1981] distinction between "auction markets" and "customer markets". According to Okun, in the latter, the kind of contract ties together particular sellers to particular buyers (in our case, particular financial intermediaries to particular firms), creating a sort of long-run relationship where the quantities (in our case the financial flows) or the prices (in our case the interest rates) might be fixed in the short run.

collecting information. In Williamson's terminology, the first case corresponds to the *general purpose* technology, the second one to the *special purpose* technology. Since parties have an interest in creating safeguards to protect investments in transactions, "s" can be defined as the *magnitude* of those safeguards which could be assimilated to the collaterals in banks' loans.

Following Williamson [1985] again, one can assume that suppliers are risk neutral, willing to supply under either kind of transaction, and accept any safeguard condition provided that expected breakeven results can be obtained. In the absence of transaction-specific sunk costs (k=0), node A is reached; this corresponds to a breakeven price (interest rate) p_1. The node B is reached in the presence of transaction-specific sunk costs (k>0) without safeguard (in our case without collateral, i.e. s=0). In the contract corresponding to node C we have transaction-specific sunk costs in the presence of safeguard (k>0, s>0).

k,s, and p are determined simultaneously by a contract, and obviously influence each other. Transactions performed under each of those regimes can take place at the same time. In particular, in the real world, we see banks supplying credit with or without collateral (obviously at different breakeven levels of interest rates) when they lend different amounts of money to different categories of borrowers, and, above all, we see the coexistence of bonds markets and intermediated credit.

We can further imagine that, since in node A transactions take place without asset specificity, such a situation may be reached when the *state of nature* is such that the number of relatively low-risk agents is high enough to trigger a supply of financial funds under a general purpose contract. This may happen if the governance institution is able to prevent forms of moral hazard and opportunistic behaviour that would undermine the feasibility of *general purpose* contracts. In other word, the existence, efficiency, size and macroeconomic relevance of stock markets might depend on the effectiveness of governance structure (and, of course, on all the other features influencing the number of relatively low-risk borrowers and agents, which might have to do with the degree of economic development). Securitized financial systems could be thought of as institutional contexts where the magnitude of the financial flows negotiated under the kind of contracts associated to node A is macroeconomically relevant compared to those associated to nodes B and C.

We can further think of nodes B and C as different "hierarchical" contractual forms of banks loans. Williamson's observation that "... transaction located at node B ... are apt to be unstable contractually ... (and) ... may revert to node A ... or be relocated to node C " (Williamson [1985], p.34), could be interpreted as a description of phenomena relating to credit rationing (i.e. unwillingness to supply credit to those agents unable to provide collateral) or other situations where the supply of bank credit to industries is affected by the willingness of banks to lend, and their subjective valuation on the riskiness of lenders. Such subjective valuations might be affected by the business cycle, as in the Bernanke and Blinder [1988] model.

2.1 Securitization: empirical relevance for bank credit and some macroeconomic implications.

If, as Fama [1985] suggests, bank credit is a non substitutable source of finance for the firms penalized on bonds and shares markets by phenomena of asymmetric information and agency costs, then in a "securitized" financial system banks would conceivably face two different kinds of customers: firms non penalized on capital markets, for which the different sources of funds are substitutable, and firms penalized on capital markets. The firms of the first type (usually big corporations with a "strong" reputation), due to the high substitutability among the different sources of funds, would probably express a more unstable demand for banking credit than the firms of the second type.

Fama's [1985] analysis, is obviously not inconsistent with the financial economics literature which describes the dividend decision by the firm's controlling group as a problem of signaling (Leland and Pyle [1977]): in the presence of information asymmetry, if the dividend policy can be used as a "signal" (on the quality of the firm's investment) in order to reduce the transaction costs, smaller firms (with lower market power and lower profit flow) might not be able to send the "signal" that would enable them to reduce the transaction costs. For this reason, they may be more dependent on the supply of credit by agencies specialized in monitoring and in economies of scale in collecting information (i.e. banks).

For the same reason, in securitized financial systems, where the spot market for financial funds is empirically relevant, substitution between bank credit and securities is likely to be an empirical phenomenon too.

To the extent that the bank credit to large corporations represents a big portion of the total bank credit to industry, the demand for bank credit expressed by "strong" firms would contribute to determine an empirically observable stock level of bank credit to industry consistent with the behaviour of a supply function rather than a demand function. In fact, if the demand function for bank credit is more unstable than the supply (due to the high substitutability between bonds, shares and bank credit for the industrial firms), then, looking at the equilibrium stock of bank credit (and estimate with a monoequational model) a supply function is observed, rather than the usual demand function. This contrasts with the approach followed by most empirical works, which estimate a demand function with the assumption of partial adjustment. On the other hand, in a non securitized financial sector there is no reason to expect a demand for bank credit to industry more unstable than the supply. Therefore, a demand function for bank credit to industry could be identified in this last case. All these points deserve an intuitive explanation.

Let us consider a supply of bank credit (in our case to the industrial sector) analogous to the one employed in the theoretical part of Bernanke and Blinder [1988], i.e. :

$$L^S = \mu(\overset{+}{r_L},\overset{-}{r_B})\cdot D(1-\tau) \qquad (1$$

where L^S = banks' credit supply;

D = banks' deposits;

τ = banks' required reserves coefficient;

r_L = interest rate on banks' loans;

r_B = interest rate on bonds;

Let us assume that the following function

$$D = D(\overset{+}{Y},\overset{+}{P},\overset{-}{r_D}) \qquad (2$$

describes the deposits supplied by the banks to the public. In this function (where Y is defined as the national income, P the price level, and r_D as the interest rate on banks' deposits) the deposits supplied by the banks are assumed to depend positively on the aggregate income, on the price level, and negatively on their cost, i.e. the interest rate r_D. Let us further assume that a stable functional link exists between the two liquid assets traded on the spot markets: bank deposits and bonds. Let us define this functional link as follows

$$r_D=r_D(\overset{+}{r_B}); \qquad (3$$

the behaviour of such functional link may be determined by the term structure of the interest rate.

The above-mentioned case, where the demand for bank credit is more unstable than the supply for bank credit, may be intuitively described with the help of the following figure (assuming, only for the sake of this graphic, that the competition between the different banks determine a fixed spread between r_L and r_D, so that r_L may be expressed as a function of r_D, and, figure 1 may be drawn, for simplicity, with one interest rate only):

L^s = supply of bank credit to the industrial firms;

L^d = demand for bank credit by the industrial firms

FIGURE 2

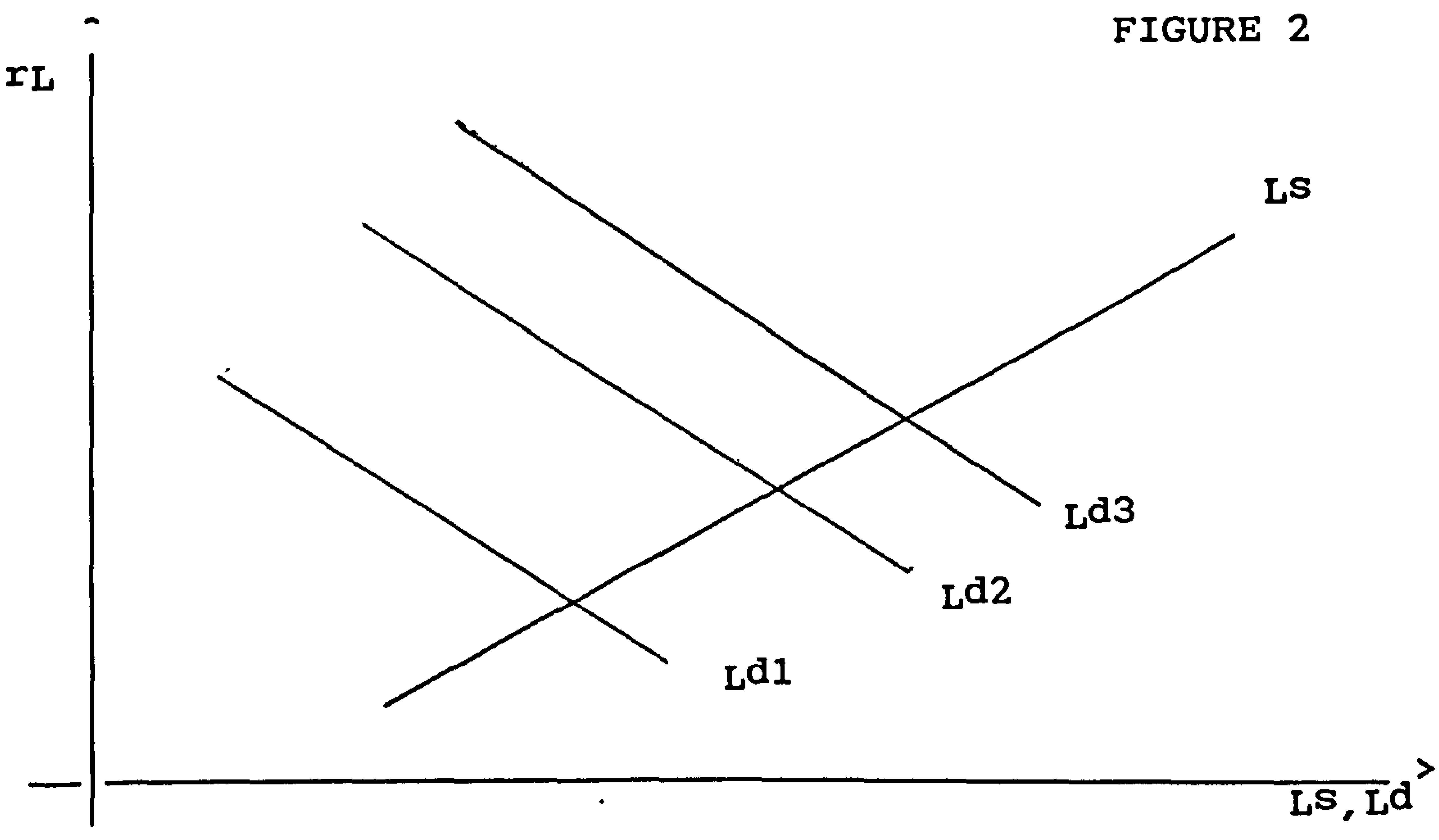


Figure 2 shows (although in a simplistic way) that if, in a monoequational context, the demand function is more unstable than the supply, the simple observation of the stock values of the bank credit to the industry would identify a supply rather than a demand function. In fact, when the credit demand shifts from L^{d1} to L^{d2} and L^{d3}, the three observable equilibrium stocks of credit lie in the same supply function, which is then identified. It is argued here that in a "securitized" financial system, the bank credit to industry is highly substitutable by the recourse to the "spot" market. Therefore, the demand for bank credit by industrial firms might shift when conjunctural causes affect the transaction and monitoring costs by making the spot market comparatively less or more convenient. Substitutability between bank credit and non-intermediated credit is possible both in a securitized and in a non-securitized financial sector. If, according to the institutional analysis, substitutability is expected to be empirically relevant in securitized financial systems and not in the non-securitized ones, a supply function for bank credit to industry can be estimated, in the former and not in the latter, using macroeconomic data. It must be stressed that observable data correspond to the equilibrium levels of bank credit to industry. In other words, since they correspond to actual negotiations, they might be thought of as equilibrium values between demand and supply: they are, *per se* both demand and supply values, and it is the relatively larger instability of one of the two functions that allows the identification of the other.

A further element which may contribute to increase the instability of the demand for bank credit is the diffusion of "loan commitment" contracts. In such contracts the bank commits itself to provide the customer with an overdraft availability, at the interest rate prevailing on the market at the moment of the actual utilization of the loan. The "loan commitment" contract is more flexible for the firm, which may decide not to use the credit availability (reducing, in that case its financial costs). On the other hand, the loan commitment brings higher opportunity costs in case the interest rate prevailing at the moment of the actual use of the loan availability is higher than the interest rate on long term loans at an initial moment, when a normal spot contract could be stipulated. In such a framework, a loan commitment contract is convenient for the firm if the expectations of variability in aggregate demand (and then the possible risk of undertaking unnecessary financial costs) are higher than the expectations of increase in the interest rate on loans. Duca and Vanhoose [1990] show that an increasing diffusion of loan commitment contracts could alter the macroeconomic impact of monetary policy. A large diffusion of loan commitment contracts would also carry higher instability of the demand for bank credit to industry. Duca and Vanhoose also point out that the empirical evidence for the United States shows that loan commitment contracts have a lower bankrupt ratio than other loan contracts. This seems to suggest that the banks tend to stipulate loan commitment contracts with less risky firms. Also, quoting the "Federal Reserve Bulletin" ("Terms of Lending at Commercial Banks: Survey of loans made", vol.74, September 1988), they remark that the share of loan contracts stipulated under the form of "loan commitment" tend to increase with the size of the single loan contracts: "...This suggest that large firms, which probably pose less credit risk and are thus less likely to be rationed, tend to borrow under commitments to a greater extent than smaller, and probably less secure, firms" (Duca and Vanhoose, [1990], p.180).

It must be said, however, that the actual diffusion of such a kind of contract is not easily detectable, because its main element is the continuity in the relationship between bank and industrial firm. This element can be determined also by extensions or renegotiations of the terms of the contracts, which may not be explicitly observable and may constitute one of the main features of the relationship between bank and customer in the non-securitized financial systems.

3. An empirical analysis of some macroeconomic implications of securitization: the United Kingdom and Germany.

To perform a comparative analysis of the behaviour of bank credit to industry in the two different kinds of financial systems, the United Kingdom and Germany, have been taken into consideration, during the period between the 1974 oil shock and the German Unification. Such a choice is due to the fact that the magnitude of the two economies is comparable, and, as Frankel and Montgomery [1991] point out, many legal issues and structural features (such as the degree of concentration in the banking sector) are very similar in spite of the two countries having very different financial systems. Thus, by comparing the behaviour of bank credit in the two countries, it might be possible to "isolate" (at least to some extent) the effects of the two different financial systems.

In Frankel and Montgomery [1991], a comparison of several different legal issues between Germany, U.K., U.S. and Japan shows that

> "regulation of British and German banks follows a universal bank model, under which banks are permitted to engage in a wide range of financial activities, including all insurance and securities activities. The main difference between the British and the German versions of the universal bank is that British banks usually conduct their securities business through subsidiaries, while German banks conduct their business directly"
>
> (Frankel and Montgomery, (1991), p.273).

The regulation issues analyzed by Frankel and Montgomery are: the *principal regulators of commercial banks, geographic and regulatory banking restrictions, the scope of permissible activities* (such as securities, insurance, industrial investments) *capital requirements, deposit protection scheme, and reserve requirements*. No relevant differences have been found, in this regard, between the British and the German banking systems, while some relevant differences are pointed out in a few institutional features which are, incidentally, at the core of the attention in most studies on securitization, namely the customer relationship and the bankruptcy procedures. For what concerns the former point, in Germany (like Japan), banks are able to establish "very close ties" with industrial firms, whilst this happens only very rarely in the U.K. and in the U.S. For what concerns the bankruptcy procedures, while the British (and American) law heavily penalizes banks that have close relationships with customers and imposes greater losses on the banks than on other creditors, not only are banks less penalized in Germany than in Britain, in case of customers' distress, but

> "often take responsibility for organizing creditor coalitions for financially troubled firms. a bank's behaviour in such a workout may be disciplined by its interest in establishing and maintaining a reputation as a structurer and arranger of successful firms' finance"
>
> (Frankel and Montgomery (1991), p.288).

For this reason, informal bankruptcy arrangements are in Germany more frequent than the informal ones, and this may help to explain why the number of corporate bankruptcies has greatly increased in the U.K. (and in the U.S.), while it does not show any clear upward trend for Germany (and Japan). Frankel and Montgomery [1991] also report some empirical data concerning the trend of real assets of the largest banks (dramatically increasing for Germany, more stable for Britain, between 1970 and 1989), and the comparison between funds raised through securities and bank loans. The data reported in Frankel and Montgomery [1991] clearly show that by comparing all the quinquennia between 1965 and 1989 in the U.K., any increase in aggregate bank loans is associated with a decrease in funds raised through securities, and viceversa. Such phenomenon (which, curiously, has not been pointed out by Frankel and Montgomery) only affects the U.K. and the U.S. (i.e. the two securitized financial systems) and seems to be consistent with the fact that (as argued in this paper) the securitized financial systems are characterized by higher instability in the demand for bank credit to industry than non-securitized financial systems. This might also be consistent with Mayer's [1992] observation of the fact that bank credit is the most relevant "anti-cyclical" source of financial funds for the industrial firms.

For what concerns the degree of concentration in the banking sector, the data reported by Frankel and Montgomery show that the concentration of bank assets in the five largest banks is very similar between the U.K. and Germany, while the German banking system seems to be slightly more concentrated if one looks at the ten largest banks. Data on the degree of concentration in the banking sector are also reported by Gardener [1991], on the basis of OECD data, and the review "The Banker" (for what concerns the concentration ratios). Gardener's [1991] data are reported in the following tables.

Degree of market concentration and size of the banking systems for Germany and the United Kingdom in 1988.

	concentration % share of the market.			
	total assets		deposits	
	5 banks	3 banks	5 banks	3 banks
Germany	31.2	21.2	30.5	19.1
United Kingdom	32.6	26.5	30.3	21.6

	number of banks	size of the banking sector Assets (billions of $)
Germany	4465	1465.0
United Kingdom	661	1337.8

According to the concentration ratios calculated with 3 or 5 banks, the British banking system seems to be only slightly more concentrated than the German one. On the other hand, if one calculates the ratio between the size of the banking sector (measured by the assets in billions of dollars) and the number of banks operating in the market, it can be seen that the average size of the banks is larger in the United Kingdom than in Germany.

The British and the German banking sectors seem, then, to differ in all the features (such as customer relations, bankruptcies procedures and substitutability between bank credit and securities) connected with the phenomenon of securitization, while they do not show any relevant difference for what concerns the regulatory issues and the market structure. In addition, both economies are in a stage of advanced industrialization, their magnitude is comparable (at least until the German Unification), and they are highly integrated (which could lead us to assume that they are subjected to the same sources of disturbances, at a macro level). For these reasons, a comparative analysis on the behaviour of bank credit to industry should be able to provide information on the institutional differences of the two financial systems by isolating (at least to some extent) their macroeconomic implications.

For what concerns Germany, bank credit will be modelled following the standard approach (demand function containing an interest rate representative of the cost of borrowing, and another interest rate containing information on the money market conditions) because, being the German financial system non-securitized, substitutability between securities and bank credit is not empirically relevant. On the other hand, bank credit to industry in the United Kingdom will be described by a supply function, analogous to the one contained in the theoretical part of the paper by Bernanke and Blinder [1988]. This because in the securitized British financial system substitutability between bank credit and securities is expected to be empirically relevant. The empirical specification derived from such a function contains an interest rate representative for bank assets and another for the banks liabilities. If these two interest rates have very similar coefficients, they may capture (if jointly considered) the information for the interest rate spread between banks' liabilities and banks' assets, which could be interpreted either as a mark-up pricing mechanism, or (if one does not assume imperfect competition in the banking sector) as a proxy for the margin of intermediation necessary in order to cover the administrative costs of the bank. The analytical form of the supply for bank credit to industry is log linear like the following:

$$C_t = \alpha_0 + \alpha_1 \cdot \ln(Y_t) + \alpha_2 \cdot \ln(P_t) + \alpha_3 \cdot r_L - \alpha_5 \cdot r_D \qquad (4$$

This equation may be obtained by substituting equations 2 and 3 into equation 1, and approximating the resulting equation with a Cobb-Douglas, exponential in the interest rates. A more complex dynamic structure of equation 4 will be obtained by following the general-to-specific approach. In this case, equation 4 would be considered in the more general form

$$C_t = b_0 + b_1(L)\ln(Y_t) + b_2(L)\ln(P_t) + b_3(L)r_L - b_5(L)r_D \qquad (4'$$

where b2(L), b3(L), b4(L), b5(L) are lag polynomials, on which a series of zero restrictions have to be tested, as explained in the next section.

3.1 A Brief description of the econometric methodology.

The purpose of the following analysis is to show how the behaviour of the bank credit to the industrial firms is affected by such an institutional feature as the relevance of the stock market. To do so, the behaviour of some relevant credit aggregates for Germany and United Kingdom will be compared and contrasted. For the sake of completeness, the demand for money will also be taken into account. The specifications of the different equations have been obtained following the "general-to-specific" (Hendry [1985], Harvey [1989]) methodology, starting from a general unrestricted specification containing four lags. Simulation studies have shown that this seems to be an appropriate dynamic structure to start with in order to capture the dynamic properties of the models, while several studies in the 1980's (for example Hendry [1988] and Muscatelli [1988]) have shown that Feedback mechanisms (like the one at the basis of the general-to-specific approach) yield better econometric performances that the "forward-looking" ones (for instance Cuthbertson [1985]).

The appendix contains the tables with the data, the estimations and the results. All the estimations have been implemented with "Microfit", version 3.0. In the tests, the level of confidence of .95 has been used unless otherwise specified.

3.2 General-to-specific and partial adjustment.

The partial adjustment mechanism can be consistent with an optimizing behaviour of economic agents. It can be assumed that individuals face costs due to the fact that they are holding a quantity of money different from the one of long run equilibrium, and other adjustment costs. Considering a quadratic cost function, the decision of the agents can be described as follows:

$$\min C = a(M_t - M^*)^2 + b(M_t - M_{t-1})^2$$

where C is the total cost, M a financial asset. The asterisk stands for "desired" level; "a" is the cost of holding a level of asset different from the equilibrium one, "b" represents the adjustment cost. Assuming that the second order conditions for optimization are satisfied, the first order conditions are the following:

$$\frac{\delta C}{\delta M_t} = 2a(M_t - \overline{M}) + 2b(M_t - M_{t-1}) = 0$$

$$M_t = \frac{a}{a+b}\overline{M} + \frac{b}{a+b}M_{t-1} = \theta\overline{M} + (1-\theta)M_{t-1}$$

with $\theta = a/(a+b)$. In the case of the money demand, we have

$$\overline{M} = k + \alpha Y_t - \beta R_t + u_t$$

(where "Y" is the income, "R" an interest rate representative of the conditions of the money market, "k" a constant, "u" a stochastic disturbance). then the estimable equation describing the short run demand for money is:

$$M_t = \theta k + \theta\alpha Y_t - \theta\beta R_t + (1-\theta)M_{t-1} + \theta u_t$$

$$M_t = const + g_1 Y_t + g_2 R_t + g_3 M_{t-1} + V_t$$

where $const = \theta k$; $g_1 = \theta\alpha$; $g_2 = \theta\beta$; $g_3 = (1-\theta)$; $V_t = \theta u_t$.

A similar procedure and analytical function would be obtained for the demand for credit.

In the estimates unadjusted data have been employed, because, as Wallis [1974] points out, the use of seasonally adjusted data could induce distortions in the estimations, apart from the very particular case where the same lag operator applies for the dependent variable and the regressors.

The estimates have been performed with the method of ordinary least squares, but a test of exogeneity on income has been implemented in the final specification of the functions of demand for money and credit, in order to detect simultaneity between income and the dependent variable considered. For this purpose the Hausman exogeneity test has been implemented. This test is composed of two phases: in the first phase the variable subject to exogeneity test must be regressed on an instrument. The residuals of this regression must be included, in a second phase, in the original regression, containing the variable subject to exogeneity test. If the coefficient referred to the residuals does not seem to be significant (according to the statistics), then the variable subject to test can be considered exogenous with respect to the independent variable.

4.The Empirical Results

In what follows I will comment briefly on the estimates for each country and the relative economic implications.

4.1 The United Kingdom.

In the case of the United Kingdom, three credit aggregates have been considered: the bank credit to industry, the bank credit to sectors other than industry, and the total bank credit (given by the sum between the bank credit to industry and the bank credit to the other sectors). The qualitative behaviour of the bank credit to industry differs a great deal from the other two credit aggregates. However, the information referred to the bank credit to industry seems to be more interesting because it identifies a well-defined category of credit users. For the reason mentioned earlier, a supply function for bank credit to industry has been estimated for the U.K., instead of a demand function. This supply function contains the interest rate on seven days notice deposit account with London clearing banks, (here defined RLCB, which can be regarded as a leading interest rate on banks' deposits market) and the interest rate on banks' overdrafts (ROV). The former is an indicator for the interest rates on banks' liabilities, the latter is obviously an interest rate on banks' assets. The spread between these two interest rates could represent a proxy for the "gross margin of intermediation" existing in the banking system. If we accept such an interpretation, in an hypothetical estimation of the supply function of bank credit to industry, the coefficient referred to RLCB should be negative, while the one referred to ROV should be positive, and, if one regards the difference "ROV-RLCB" as a proxy for the banks' margin of profit, or for the margin of intermediation, they should have very close absolute value. We could imagine, as a first approximation, a partial adjustment mechanism of the kind:

$$St - St\text{-}1 = \theta(S^{*}t - St\text{-}1)$$

with $S^*_t = S(ROV_t, RLCB_t, P_t, Y_t)$

where the asterisk indicates "desired value", S_t is the supply of bank credit to industrial firms at time t, P_t the level of prices, Y_t the real output. The lagged dependent variable mechanism could be justified with the same kind of argumentations which justify a partial adjustment mechanism for a demand function for a financial asset.

Preliminary analyses have shown that, even if the data employed are non seasonally adjusted, seasonal dummies were not significant in any credit aggregate "general" unrestricted specification (unlike the demand for money equation, as we will see later). Therefore seasonal dummies were not included in the general unrestricted models employed for the "general-to-specific" analysis.

In the estimates referring to the total credit the interest rates employed were analogous to the ones used by Bernanke and Blinder [1988]: the interest rate on short run treasury bills (TREBIRA) and the interest rate on bank overdrafts (ROV). In some preliminary analyses, ROV turned out to be more significant than the prime rate.

Tables 1 and 2 in the appendix show the general unrestricted model for the total bank credit to the economy. There seems to be a structural break at the end of 1988 (i.e. 1988 QIV), corresponding to the period where the Bank of England definitively dropped M1 as an intermediate target for monetary policy: in fact, the model estimated over the sample period 1975 QII to 1991 QIV largely fails the test for normality of the residuals (and marginally fails the test of serial correlation); the same model estimated over the sample period 1975 QII to 1988 QIV largely fails the predictive failure test calculated on the data of 1989, 1990 and 1991, while it largely passes all of the other diagnostic tests. The general unrestricted model for the bank credit to other sectors than industry (tables 3 and 4) yields very similar results and also shows as well a structural break at the end of 1988: the model estimated over the sample period 1975 QII to 1988 QIV fails the predictive failure, while the model estimated over the sample 1975 QII to 1991 QIV largely fails the test for normality of the residuals. Both bank credit to other sectors than industry and the total bank credit supports a partial adjustment mechanism with a lagged dependent variable (tables 5 and 6 respectively). Such models, determined by imposing some parameters restrictions on the general models of tables 4 and 2, are estimated over the sample period 1975 QII to 1988 QIV, in order to run the predictive failure test, for the years after the Bank of England had dismissed M1 as an intermediated target monetary policy. LBACROIN (table 5) fails the predictive failure and the Chow test, and does not fail all of the other diagnostic tests. The same equation estimated over the sample period 1975 QII - 1991 QIV (table 7) largely fails the test for normality of the residuals. On the other hand, the "restricted" model for the total bank credit (LBACRTO, table 6, over the sample period 1975 QII - 1988 QIV) passes all of the diagnostic tests, including (although marginally) the predictive failure and the Chow test. It largely fails the test for normality of the residuals when estimated over the sample period 1975 QII - 1991 QIV (table 8). These results suggest that the bank credit to other sectors than industry and the total bank credit seem to be quite sensitive to changes in the monetary policy targeting, and do not seem to be very stable. The results are quite different for what concerns the bank credit to industry (LBACREIN) which seem to be much more stable than the other two credit aggregates. For the reason illustrated earlier, LBACREIN has been estimated as a supply function. Tables 9 and 10 show the general unrestricted model with four lags estimated over the sample period 1975 QII - 1991 QIV and 1975 QII - 1988 QIV respectively. The model of table 9 marginally fails the test on the normality of residuals at the level of confidence of 0.95 (while it does not fail it at the level of confidence of 0.99), and the model of table 10 yields satisfactory results in all of the diagnostic tests, including the predictive failure one. However the low number of degrees of freedom of the estimates of table 9 weakens the reliability of the tests. In both sample periods LBACREIN supports the parameters restrictions necessary to obtain a "partial adjustment" model with a lagged dependent variable (tables 13 and 14 respectively). Since it is somehow "unusual" to estimate a supply function for bank credit to industry in a monoequational framework, the procedure implemented in order to obtain the final dynamic specification have been shown. Tables 11 and 12 respectively show the variable deletion tests for the restrictions allowing to obtain the restricted model of table 13 from the general model of table 9, and the restricted model of table 14 from the unrestricted one of table 10.

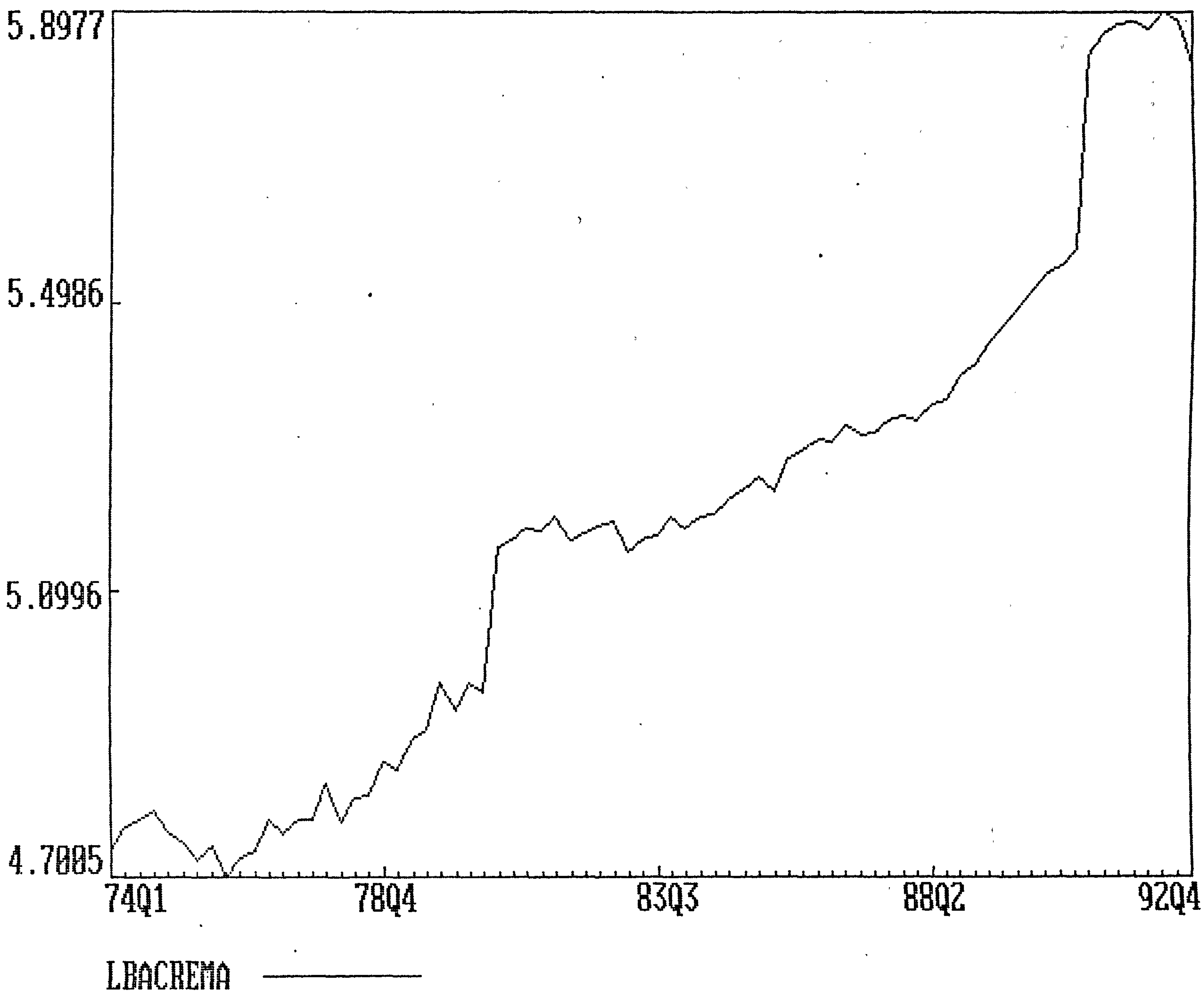
In both sample periods, the "restricted" models yield very satisfactory results in all of the diagnostic tests, including the predictive failure ones and the Chow test. This seems to suggest that the "supply function" of bank credit to industry seem to be much more stable than the "demand function" for bank credit to other sectors than industry and the "demand function" for total bank credit. One of the possible reasons for such a result is the fact that the bank credit to industry refers to a category of borrowers which is much more homogeneous than for the other two aggregates. In particular, the total bank credit is a highly heterogeneous aggregate, which might be affected by a much larger set of disturbances.

Tables 15, 16 and 17 refer to the Hausman test of exogeneity calculated for the variable LRUKYDS (log of the British real GDP) in the "restricted" specifications of LBACREIN, LBACROIN and LBACRTO respectively. In all of the three cases the null hypothesis of exogeneity of the variable LRUKYDS is not rejected at the level of confidence of 0.95.

4.2 Germany.

If one had to give an example of structural break, one of the best would probably be that of Germany in 1989-1990. Since testing for structural stability on the post-unification data would yield too obvious results, the regressions have been run on the sample period 1975 QI - 1989 QIII (i.e. until the announcement of the opening of the East German frontiers, which could rationally be interpreted as the first step of unification), while the last quarter of 1989 and the first one of 1990 have been employed to run a meaningful predictive failure test, since the formal process of unification took place gradually after the elections of 1990.

The bank credit to manufacturing sector has been estimated as a demand function with partial adjustment, since in this case the assumptions by Fama 1985 and the empirical evidence for substitutability between security and bank credit do not apply, given that the German financial system is not "securitized". A set of interest rates analogous to those employed by Bernanke and Blinder [1988] has been used (namely the interest rate on banks' credit on current account and the interest rate on treasury bills). Observing the graphic with the path of the dependent variable (LBACREMA in Figure 3), it can clearly be seen that in 1980, term 3 there is a structural break, probably determined jointly by the effects of the implementation of the European Monetary System and by the recession which took place that year. In order to apply the general-to specific methodology, a general unrestricted model with four lags has been estimated using the data from 1975 QII to 1989 QIII. However, (as one can see from tables 18 and 19 for the estimates without seasonal dummies and with seasonal dummies respectively) the general unrestricted model largely fails the diagnostic test on the normality of residuals, due to the structural break of 1980. Therefore a model with partial adjustment has been estimated over the sample period from 1980-QIV to 1989-QIII, without testing the coefficients restrictions on a general unrestricted model with lagged variables, because there would not have been enough degrees of freedom to make the variable deletion tests reliable. Table 20 shows the estimates with OLS over the sample period 1975 QII - 1989 QIII, and table 21 shows the same model estimated over the reduced sample period 1975-QII to 1980-QIII, which largely fails both the predictive failure and the Chow test for structural stability, proving that there is indeed a structural


5.8977
5.4986
5.0996
4.7085
74Q1
78Q4
83Q3
88Q2
92Q4
LBACREMA

break in 1980 QIV. The coefficient of the implicit deflator of GNP (LIPGNP) has a wrong sign, but the variable is not significant.

Tables 22, 23 and 24 refer to the Hausman test of exogeneity for the variable LRGGNP (log of the real German GNP). In particular, table 22 shows the regression of LRGGNP on the instruments employed for the test (a constant and the lagged values of LRGGNP, the implicit deflator of GNP LIPGNP, the German treasury bill rate GTRBR, the log of M1 LNM1, and the log of the bank credit to manufacturing sector LBACREMA). The residuals HREBCMA of such regression have been included in the regression for LBACREMA in order to implement the second step of the test, shown in table 23 and 24 (the regression without seasonal dummies and with seasonal dummies respectively). In both cases the model fails the Hausman test for exogeneity for the variable LRGGNP. Therefore new estimates have been implemented using the method of instrumental variables. In particular, tables 25 and 26 show the instrumental variable estimation of the equation without seasonal dummies and with seasonal dummies respectively. Again, in both the regressions of table 25 and 26, the coefficient for the implicit deflator of the GNP has a wrong sign, but it is not significant. The estimates with the dummies have been shown only for the sake of completeness, since the dummies do not seem to be significant in this case.

For what concerns Germany, the demand for bank credit by manufacturing industries does not seem to be very stable. It is very sensitive to changes in the business cycle, like the structural break in 1980 seems to show. Therefore the estimates for LBACREMA do not seem to perform well enough to provide reliable information on the use of the demand for bank credit to industry as a possible intermediate target for monetary policy. However, this may be due to the fact that the observable values of LBACREMA are just equilibrium stocks, and could be thought of as linear combinations of demand and supply functions. In this case LBACREMA has been interpreted in the former way, because it has been argued that in a non securitized financial sector there is not high substitutability between bank credit and securities, or bonds. As a consequence, in a monoequational framework one can follow the predominant approach in the existing empirical literature, and estimate a demand function for bank credit. In order to run a "counterfactual" experiment, it is shown, in tables 27 and 28, that estimating a supply function for banks' credit analogous to the one estimated for the U.K. (i.e. containing a set of interest rates which could be interpreted as a proxy for the banks' gross margin of intermediation) does not yield any sensible result. The results of table 27 (estimation with instrumental variables) do not make much sense, while the equation shown in table 28 (estimate with OLS) looks more like a demand function where the interest rate RTDEP acts as a proxy for GTRBR.

Therefore, the prediction that securitized financial sectors would make the demand for bank credit by industry more unstable than the supply seems to be confirmed by the data.

4.3 A quick comparison with the demand for money

The behaviour of the various credit aggregates have been compared to the one of the money demand, in order to obtain further information by comparing the stability and statistic performances of the two functions. The main purpose of the estimates commented in this section is to detect the presence of structural breaks (possibly different from the ones affecting the credit stocks). Like in Bernanke and Blinder [1988], the money aggregate employed both for the U.K. and Germany is M1. The estimates for the money demand in the U.K. have been implemented only over the sample period where M1 has been used as an intermediate target of monetary policy, i.e. 1975 QII - 1988 QIV. This is also the period relevant for the comparative analysis on credit aggregates, since the comparison of the data after 1989 are obviously biased by the beginning of the process of unification in Germany. In addition, the data later than 1988 for M1 (i.e. after M1 has been definitively abandoned as an intermediate target for monetary policy) have not been reported by any OECD statistical publication, and only a few quarters later disappeared even from the CSO financial statistics.

Table 29 shows the general unrestricted model for the money demand, which gives satisfactory results for all of the diagnostic tests. The dummy variables have been included because they appeared to be more significant than in the previous pieces of analysis. Table 30 shows the variable deletion test which leads to the "parsimonious" specification with partial adjustment shown in table 31. The signs and magnitudes of the parameters seem to be consistent with the standard theory. The coefficient referred to the implicit deflator of GDP is not significant, and the model marginally fails (at the level of confidence of 95%) the diagnostic test for serial correlation. Table 32 shows the Hausman test for exogeneity calculated for the variable LRUKYDS (log of the real GDP), which turns out to be exogenous at the level of confidence of 95% and (marginally) 90% .

In the context of Germany, the equation for the demand for money seems to perform much better than the demand for bank credit to manufacturing sector. Tables 33 to 36 show the general-to-specific analysis. Table 33 shows the general unrestricted model, which yields satisfactory results for all of the diagnostic tests, excepting, obviously, the predictive failure test calculated over the last quarter of 1989 and 1990, due to the drastic changes in the monetary policy regime, immediately after the announcement of the end of Berlin's wall and the beginning of the process of unification. The seasonal dummies have been omitted because they turned out to be largely non significant in a preliminary analysis. Obviously this does not mean that seasonality is disregarded: it is assumed, instead, that the seasonal effects are captured by the dynamic structure of the model. The variable deletion test in table 34 shows that the general unrestricted model does not support a partial adjustment mechanism, and requires a more complex dynamic structure, which has been determined through the variable deletion test of table 35 by keeping the most statistically significant regressor in the general unrestricted model. The final specification is shown in table 36. The diagnostic tests yield satisfactory results (excepting again the predictive failure test calculated over the period after the announcement of the unification), and the coefficients of the various regressors seem to have signs and magnitudes correspondent to the predictions of economic theory, apart from the more complex dynamic structure. In particular, it can be seen that the real GNP affects M1 with a delay of three quarters, the level of M1 shows some hysteresis, and seems to react to some weighted time-difference in the price level, rather than to the price level itself.

5. Conclusions.

The empirical analysis of the previous sections show that the mechanisms characterizing the credit market are heavily influenced by institutional features (such as whether a financial system is market-oriented or bank-oriented). Also, the theoretical framework commonly employed to interpret the behaviour of money stock does not necessarily describe appropriately in any institutional context the behaviour of another liquid asset such as bank credit to industry, which may be affected by the specificity of the assets, determined by the interactions between industrial firms and financial intermediaries.

For the sake of the present analysis, the most relevant credit aggregate is credit to industrial firms.

The simplifying assumption of the traditional IS-LM model, which only envisages a distinction between money and generical "bonds", and implicitly aggregates any form of credit (i.e. bank credit and securities) in a unique financial sector, might turn out to be unreliable, due to the role of asset specificity and endogenous contractual response that characterizes the behaviour of the financial sector. The role of endogenous contractual response becomes empirically relevant in the context of securitized financial systems, because of the substitutability between bank credit and securities.

The institutional factors taken into account in this analysis are the distinction between "securitized" financial systems (like the British one), "intermediaries-oriented" financial systems (like the German one).

Such a distinction is significant, especially in connection with Fama's [1985] assumptions, according to which some classes of enterprises, facing agency costs in the financial markets due to informational asymmetry phenomena, are heavily dependent on bank credit. In such a context banks could face two kinds of customers (in the industrial sector): "strong" enterprises which can easily substitute bank credit by issuing assets on the capital markets, and firms penalized by access costs in the financial markets. The demand for bank credit expressed by the "strong" firms could be more unstable than the supply, due to the high substitutability between direct emission of financial market assets and recourse to the bank credit. Both the situations contribute to create the conditions which allow for the estimation (within a monoequational model) of a supply function of bank credit, rather than a demand function, starting from the observation of credit stock.

Such a situation seems to apply in the "securitized" financial sectors, in our case in the United Kingdom, where the following supply function of bank credit to industry has been estimated.

$$\underset{}{LBACREIN} = \underset{(1.5756)}{.79068} + \underset{(2.3964)}{.19881}\, LRUKYDS + \underset{(9.6660)}{.64950}\, LNIP + \underset{(7.5303)}{.032855}\, ROV - \underset{(-6.8997)}{.028242}\, RLCB + \underset{(10.2420)}{.49464}\, LBACREIN_{-1}$$

$R^2 = .99796$; the numbers in brackets refer to the t-statistics.

On the other hand, for the total bank credit (where it is not possible to picture a particular class of agents having homogeneous characteristics) a demand function has been estimated, according to the approach most commonly followed in empirical works, and similarly to what has been done by Bernanke and Blinder [1988].

The fact that a supply function for bank credit to industry was identified yields some evidence (perhaps not very strong) in favour of the theoretical interpretation suggested in section 2, 2.1 and 3.

The empirical literature often implicitly assumes that the stock of credit is "demand determined". This is an interpretation once more based on the implicit assumption of macroeconomic irrelevance of the decisions of the banking sector concerning the allocation of credit, like in the IS-LM model. In other words the relevant behavioural relation would be a demand function and the existing stock would differ from the one desired by agents only because of adjustment costs, lags in correcting expectations, or modifications in the equilibrium levels of the relevant variables. Such a specification derives often from the application to credit demand of the specifications commonly employed to describe money demand, and implicitly assumes that the supply of banks' credit adjusts to the shocks and modifications originating on the (credit) demand side of the market.

Following a "Poole-like" analysis (in the spirit of Bernanke and Blinder [1988]), one could argue that in a securitized financial system, if the monetary policy has to rely on the most stable behaviourial relation, then, to the extent that a policy target may be represented by the volume of activity of the industrial sector, some proper intermediate target could be chosen among the variables appearing in the supply function of bank credit to the industrial sector. A monetary policy based on a strict control of money aggregates may be less effective in a securitized sector, where substitutability between different sources of financial funds and endogenous contractual response could determine other forms of "virtual liquidity". Finally, the present empirical analysis seems to testify to the relevance of institutional features in determining the behaviour of financial assets, as argued by many post-keynesian economists, like Davidson [1982].

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APPENDIX.

List of the variables employed in the regressions.

United Kingdom:

BACREIN = bank credit to the industry;
BACROIN = bank credit to other sectors than industry;
BACRTO = BACREIN + BACROIN;
IP = implicit price deflator of GDP;
LBACREIN = log(BACREIN);
LBACROIN = log(BACROIN);
LBACRTO = log(BACRTO);
LNIP = log(IP);
LNM1 = log(M1);
LRUKYDS = log(UKGDP/IP);
RLCB = interest rate on deposit account at seven days notice with London clearing banks;
ROV = interest rate on banks' overdraft;
TREBIRA = interest rate on treasury bills;
UKYDS = UK GDP at market prices;
UHAUS = residuals for the Hausman test of exogeneity of LRUKYDS;

Germany:

BACREMA = bank credit to the manufacturing sector
GTRBR = German treasury bill rate;
HREBCMA = residuals for the Hausman test for exogeneity for LRGGNP in the equation for LABCREMA;
GGNP = GNP at current prices;
IPGNP = implicit price deflator of the GNP;
LIPGNP = log(IPGNP);
LNM1 = log of M1
LBACREMA = log(BACREMA);
LRGGNP = log(GGNP/IPGNP);
RCRCA = interest rate on bank credit on current account;

CONST = intercept term;
S1, S2, S3 = seasonal dummies for the first, second and third terms repsectively.

Source of data: DATASTREAM SERVICES at the University of Warwick, on the basis of seasonally unadjusted OECD data.

Diagnostic Tests

The diagnostic test performed in the tables that follows are those provided by the package MICROFIT 3.0. In particular, the main references are the following.

The diagnostic test for serial correlation is the one suggested by Godfrey [1978a], [1978b].

The diagnostic test for the functional form is Ramsey's RESET test (Ramsey [1969], [1970]).

The diagnostic test for the normality of the regression residuals is the Jarque-Bera test (Jarque and Bera [1980], Bera and Jarque [1981]).

The following pages contain the tables with the estimates and the diagnostic tests.

The diagnostic test for heteroscedasticity is based on the auxiliary regression

$$e^2_t = const + \alpha \bar{y}_t$$

where e_t are the residuals of the regression and $\bar{y}_t$ the fitted values of the dependent variable. the auxiliary regression gives the LM and F-test for the null hypothesis H_0: α=0.

The diagnostic test for predictive failure is the one suggested by Salkever [1976] and Dufour [1980].

A note on Hausman Test

The variable UHAUS corresponds to the residuals of the regression of LRUKYDS on a constant term, LNM1(-1), LNIP(-1), TREBIRA(-1) ROV(-1). It has been employed to run the Hausman test of exogeneity of LRUKYDS in the equations of the different credit aggregates considered for the United Kingdom and in the demand for money.

The variable HREBCMA corresponds to the residuals of the regression of LRGGNP on a constant term, LNM1(-1), GTRBR(-1), LIPGNP(-1), LRGGNP(-1), LBACREMA(-1). It has been employed to run the Hausman test of exogeneity of LRGGNP in the demand for money and in the demand for bank credit by the manufacturing sector for Germany.

TABLE 1

Ordinary Least Squares Estimation

Dependent variable is LBACRTO

67 observations used for estimation from 75Q2 to 91Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-2.0358	.83005	-2.4526[.018]
LRUKYDS	-.11573	.22205	-.52117[.605]
TREBIRA	.0039656	.0078004	.50838[.614]
ROV	.0029105	.0078261	.37189[.712]
LNIP	.11723	.45402	.25820[.798]
LBACRTO(-1)	.87233	.14047	6.2099[.000]
LRUKYDS(-1)	-.083276	.17858	-.46633[.643]
TREBIRA(-1)	.0055581	.0087271	.63687[.528]
ROV(-1)	-.012758	.0085051	-1.5000[.141]
LNIP(-1)	-1.0562	.71822	-1.4706[.149]
LBACRTO(-2)	.070153	.19410	.36143[.720]
LRUKYDS(-2)	.19811	.17952	1.1036[.276]
TREBIRA(-2)	.013295	.0089514	1.4852[.145]
ROV(-2)	-.011686	.0085800	-1.3620[.180]
LNIP(-2)	1.1411	.74117	1.5396[.131]
LBACRTO(-3)	-.14279	.19065	-.74897[.458]
LRUKYDS(-3)	.039115	.17631	.22185[.826]
TREBIRA(-3)	.0022162	.0092368	.23993[.812]
ROV(-3)	-.0010068	.0086834	-.11594[.908]
LNIP(-3)	-.72609	.74357	-.97650[.334]
LBACRTO(-4)	.10437	.12671	.82371[.415]
LRUKYDS(-4)	.39537	.24929	1.5860[.120]
TREBIRA(-4)	.0097853	.0082237	1.1899[.241]
ROV(-4)	-.0095220	.0076518	-1.2444[.220]
LNIP(-4)	.59539	.44998	1.3232[.193]

R-Squared	.99950	F-statistic F(24, 42)	3524.6[.000]
R-Bar-Squared	.99922	S.E. of Regression	.024995
Residual Sum of Squares	.026240	Mean of Dependent Variable	11.5937
S.D. of Dependent Variable	.89506	Maximum of Log-likelihood	167.7445
DW-statistic	1.9561		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 10.4741[.033]	F(4, 38)= 1.7603[.157]
B:Functional Form	CHI-SQ(1)= .060794[.805]	F(1, 41)= .037236[.848]
C:Normality	CHI-SQ(2)= 72.7916[.000]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.7691[.183]	F(1, 65)= 1.7629[.189]

A:Lagrange multiplier test of residual serial correlation

B:Ramsey's RESET test using the square of the fitted values

C:Based on a test of skewness and kurtosis of residuals

D:Based on the regression of squared residuals on squared fitted values

TABLE 2

Ordinary Least Squares Estimation

Dependent variable is LBACRTO

55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-1.2184	.76809	-1.5862[.123]
LRUKYDS	-.24495	.23711	-1.0331[.310]
TREBIRA	.0068020	.0074765	.90978[.370]
ROV	.0011040	.0075895	.14547[.885]
LNIP	.53695	.42697	1.2576[.218]
LBACRTO(-1)	.82726	.15212	5.4380[.000]
LRUKYDS(-1)	-.078376	.18113	-.43270[.668]
TREBIRA(-1)	-.0026383	.0083816	-.31477[.755]
ROV(-1)	-.0077774	.0076742	-1.0134[.319]
LNIP(-1)	-1.4062	.68857	-2.0422[.050]
LBACRTO(-2)	.014378	.21016	.068414[.946]
LRUKYDS(-2)	.11944	.17277	.69134[.495]
TREBIRA(-2)	.024531	.0089570	2.7388[.010]
ROV(-2)	-.019632	.0080627	-2.4349[.021]
LNIP(-2)	.95055	.72384	1.3132[.199]
LBACRTO(-3)	-.041719	.19306	-.21609[.830]
LRUKYDS(-3)	-.0065664	.17341	-.037867[.970]
TREBIRA(-3)	-.0048277	.010074	-.47920[.635]
ROV(-3)	.0042089	.0093340	.45092[.655]
LNIP(-3)	-1.1133	.71012	-1.5677[.127]
LBACRTO(-4)	.12326	.13338	.92415[.363]
LRUKYDS(-4)	.49234	.25226	1.9517[.060]
TREBIRA(-4)	.010556	.0093633	1.1274[.269]
ROV(-4)	-.0086290	.0090824	-.95008[.350]
LNIP(-4)	1.1006	.44528	2.4718[.019]

R-Squared	.99951	F-statistic F(24, 30)	2567.8[.000]
R-Bar-Squared	.99912	S.E. of Regression	.021051
Residual Sum of Squares	.013294	Mean of Dependent Variable	11.3063
S.D. of Dependent Variable	.71132	Maximum of Log-likelihood	150.9714
DW-statistic	1.7663		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 4.8242[.306]	F(4, 26)= .62495[.649]
B:Functional Form	CHI-SQ(1)= 1.7476[.186]	F(1, 29)= .95171[.337]
C:Normality	CHI-SQ(2)= 1.5298[.465]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.1547[.283]	F(1, 53)= 1.1366[.291]
E:Predictive Failure	CHI-SQ(12)= 29.2123[.004]	F(12, 30)= 2.4344[.024]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

TABLE 3

Ordinary Least Squares Estimation

Dependent variable is LBACROIN
67 observations used for estimation from 75Q2 to 91Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-.79924	.88418	-.90393[.371]
LRUKYDS	-.065499	.22933	-.28561[.777]
TREBIRA	.0056553	.0080818	.69975[.488]
ROV	.3913E-3	.0080968	.048332[.962]
LNIP	.044714	.48334	.092510[.927]
LBACROIN(-1)	1.1450	.15281	7.4926[.000]
LRUKYDS(-1)	-.11110	.18976	-.58545[.561]
TREBIRA(-1)	.0046143	.0090731	.50858[.614]
ROV(-1)	-.013353	.0087181	-1.5317[.133]
LNIP(-1)	-.43357	.74889	-.57895[.566]
LBACROIN(-2)	-.017760	.23871	-.074399[.941]
LRUKYDS(-2)	.14276	.19286	.74019[.463]
TREBIRA(-2)	.012706	.0093915	1.3529[.183]
ROV(-2)	-.010728	.0088941	-1.2062[.234]
LNIP(-2)	.55450	.74932	.74000[.463]
LBACROIN(-3)	-.30347	.24124	-1.2580[.215]
LRUKYDS(-3)	-.039560	.18767	-.21080[.834]
TREBIRA(-3)	.3915E-3	.0094871	.041269[.967]
ROV(-3)	.0026562	.0089616	.29640[.768]
LNIP(-3)	-.42116	.73911	-.56982[.572]
LBACROIN(-4)	.12930	.15556	.83121[.411]
LRUKYDS(-4)	.23999	.25652	.93556[.355]
TREBIRA(-4)	.0049479	.0084412	.58616[.561]
ROV(-4)	-.0059477	.0078452	-.75813[.453]
LNIP(-4)	.31894	.45071	.70765[.483]

R-Squared	.99958	F-statistic F(24, 42)	4130.5[.000]
R-Bar-Squared	.99933	S.E. of Regression	.025871
Residual Sum of Squares	.028112	Mean of Dependent Variable	11.2562
S.D. of Dependent Variable	1.0029	Maximum of Log-likelihood	165.4357
DW-statistic	2.0887		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 6.5790[.160]	F(4, 38)= 1.0344[.402]
B:Functional Form	CHI-SQ(1)= 2.0358[.154]	F(1, 41)= 1.2848[.264]
C:Normality	CHI-SQ(2)= 87.0336[.000]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 3.0557[.080]	F(1, 65)= 3.1061[.083]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 4

Ordinary Least Squares Estimation

Dependent variable is LBACROIN
55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.15181	.80987	.18745[.853]
LRUKYDS	-.22406	.22820	-.98188[.334]
TREBIRA	.0066164	.0071439	.92617[.362]
ROV	.0024822	.0073719	.33671[.739]
LNIP	.44920	.42707	1.0518[.301]
LBACROIN(-1)	1.1725	.16748	7.0007[.000]
LRUKYDS(-1)	-.18873	.18510	-1.0196[.316]
TREBIRA(-1)	-.0040258	.0081026	-.49685[.623]
ROV(-1)	-.0094500	.0073266	-1.2898[.207]
LNIP(-1)	-1.1004	.67732	-1.6246[.115]
LBACROIN(-2)	.057313	.27470	.20864[.836]
LRUKYDS(-2)	.11694	.18484	.63266[.532]
TREBIRA(-2)	.022463	.0089046	2.5227[.017]
ROV(-2)	-.018938	.0080074	-2.3651[.025]
LNIP(-2)	.48539	.69523	.69818[.490]
LBACROIN(-3)	-.38855	.26118	-1.4877[.147]
LRUKYDS(-3)	-.12429	.17922	-.69354[.493]
TREBIRA(-3)	-.0074315	.0096489	-.77019[.447]
ROV(-3)	.012685	.0091406	1.3878[.175]
LNIP(-3)	-.58278	.65771	-.88608[.383]
LBACROIN(-4)	.15244	.17208	.88588[.383]
LRUKYDS(-4)	.41259	.24899	1.6570[.108]
TREBIRA(-4)	-.0026362	.0091496	-.28813[.775]
ROV(-4)	.0022472	.0091198	.24641[.807]
LNIP(-4)	.75093	.41699	1.8008[.082]

R-Squared	.99964	F-statistic F(24, 30)	3511.5[.000]
R-Bar-Squared	.99936	S.E. of Regression	.020388
Residual Sum of Squares	.012470	Mean of Dependent Variable	10.9378
S.D. of Dependent Variable	.80556	Maximum of Log-likelihood	152.7325
DW-statistic	2.0335		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 9.0862[.059]	F(4, 26)= 1.2863[.301]
B:Functional Form	CHI-SQ(1)= .70307[.402]	F(1, 29)= .37551[.545]
C:Normality	CHI-SQ(2)= 5.3441[.069]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.2486[.264]	F(1, 53)= 1.2312[.272]
E:Predictive Failure	CHI-SQ(12)= 37.6325[.000]	F(12, 30)= 3.1360[.005]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

TABLE 5

Ordinary Least Squares Estimation

Dependent variable is LBACROIN

55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-.24058	.48144	-.49971[.620]
LRUKYDS	.030167	.090003	.33518[.739]
TREBIRA	.0093062	.0060473	1.5389[.130]
ROV	-.0080704	.0059709	-1.3516[.183]
LNIP	.091203	.032716	2.7877[.008]
LBACROIN(-1)	.97143	.019598	49.5690[.000]

R-Squared	.99921	F-statistic F(5, 49)	12339.0[.000]
R-Bar-Squared	.99913	S.E. of Regression	.023823
Residual Sum of Squares	.027809	Mean of Dependent Variable	10.9378
S.D. of Dependent Variable	.80556	Maximum of Log-likelihood	130.6756
DW-statistic	1.5695	Durbin's h-statistic	1.6137[.107]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 2.7165[.606]	F(4, 45)= .58453[.675]
B:Functional Form	CHI-SQ(1)= .62058[.431]	F(1, 48)= .54778[.463]
C:Normality	CHI-SQ(2)= 3.1669[.205]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .15508[.694]	F(1, 53)= .14987[.700]
E:Predictive Failure	CHI-SQ(12)= 25.7471[.012]	F(12, 49)= 2.1456[.031]
F:Chow Test	CHI-SQ(6)= 12.9889[.043]	F(6, 55)= 2.1648[.060]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)
F:Test of stability of the regression coefficients

TABLE 6

Ordinary Least Squares Estimation

Dependent variable is LBACRTO

55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-1.0193	.50292	-2.0267[.048]
LRUKYDS	.19837	.098910	2.0056[.050]
TREBIRA	.0045923	.0066625	.68927[.494]
ROV	-.0043673	.0065566	-.66610[.508]
LNIP	.13516	.040266	3.3567[.002]
LBACRTO(-1)	.92411	.026786	34.5003[.000]

R-Squared	.99877	F-statistic F(5, 49)	7925.6[.000]
R-Bar-Squared	.99864	S.E. of Regression	.026242
Residual Sum of Squares	.033743	Mean of Dependent Variable	11.3063
S.D. of Dependent Variable	.71132	Maximum of Log-likelihood	125.3567
DW-statistic	1.6446	Durbin's h-statistic	1.3445[.179]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 1.0685[.899]	F(4, 45)= .22289[.924]
B:Functional Form	CHI-SQ(1)= 3.1858[.074]	F(1, 48)= 2.9512[.092]
C:Normality	CHI-SQ(2)= 2.9399[.230]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.0496[.306]	F(1, 53)= 1.0311[.315]
E:Predictive Failure	CHI-SQ(12)= 17.5673[.129]	F(12, 49)= 1.4639[.171]
F:Chow Test	CHI-SQ(6)= 8.3930[.211]	F(6, 55)= 1.3988[.232]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)
F:Test of stability of the regression coefficients

TABLE 7

Ordinary Least Squares Estimation

Dependent variable is LBACROIN
67 observations used for estimation from 75Q2 to 91Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-.71216	.48714	-1.4619[.149]
LRUKYDS	.12476	.089084	1.4004[.166]
TREBIRA	.012572	.0060654	2.0728[.042]
ROV	-.011654	.0057443	-2.0289[.047]
LNIP	.10470	.029404	3.5607[.001]
LBACROIN(-1)	.95169	.015402	61.7914[.000]

R-Squared	.99936	F-statistic F(5, 61)	19077.9[.000]
R-Bar-Squared	.99931	S.E. of Regression	.026371
Residual Sum of Squares	.042422	Mean of Dependent Variable	11.2562
S.D. of Dependent Variable	1.0029	Maximum of Log-likelihood	151.6514
DW-statistic	1.4756	Durbin's h-statistic	2.1635[.031]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 4.8465[.303]	F(4, 57)= 1.1112[.360]
B:Functional Form	CHI-SQ(1)= 5.3024[.021]	F(1, 60)= 5.1566[.027]
C:Normality	CHI-SQ(2)= 29.5368[.000]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.0968[.295]	F(1, 65)= 1.0818[.302]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 8

Ordinary Least Squares Estimation

Dependent variable is LBACRTO
67 observations used for estimation from 75Q2 to 91Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-1.2952	.48056	-2.6952[.009]
LRUKYDS	.24893	.091091	2.7327[.008]
TREBIRA	.0065996	.0063085	1.0461[.300]
ROV	-.0056548	.0059626	-.94837[.347]
LNIP	.12935	.032194	4.0179[.000]
LBACRTO(-1)	.92014	.018629	49.3927[.000]

R-Squared	.99913	F-statistic F(5, 61)	14059.6[.000]
R-Bar-Squared	.99906	S.E. of Regression	.027413
Residual Sum of Squares	.045841	Mean of Dependent Variable	11.5937
S.D. of Dependent Variable	.89506	Maximum of Log-likelihood	149.0547
DW-statistic	1.5834	Durbin's h-statistic	1.7251[.085]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 1.6737[.795]	F(4, 57)= .36510[.832]
B:Functional Form	CHI-SQ(1)= .14853[.700]	F(1, 60)= .13331[.716]
C:Normality	CHI-SQ(2)= 10.7174[.005]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .0086916[.926]	F(1, 65)= .0084332[.927]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 9

Ordinary Least Squares Estimation

Dependent variable is LBACREIN
65 observations used for estimation from 75Q2 to 91Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.55726	.96694	.57631[.568]
LRUKYDS	-.14611	.26052	-.56083[.578]
LNIP	1.6399	.47509	3.4519[.001]
ROV	.031990	.0075072	4.2612[.000]
RLCB	-.023026	.0069883	-3.2949[.002]
LBACREIN(-1)	.45516	.11174	4.0734[.000]
LRUKYDS(-1)	-.35439	.18796	-1.8854[.067]
LNIP(-1)	-2.1545	.72199	-2.9841[.005]
ROV(-1)	-.0081279	.011105	-.73189[.469]
RLCB(-1)	.0041172	.010118	.40691[.686]
LBACREIN(-2)	.10056	.13451	.74756[.459]
LRUKYDS(-2)	.20805	.20082	1.0360[.306]
LNIP(-2)	1.2111	.79996	1.5139[.138]
ROV(-2)	.0064698	.010822	.59784[.553]
RLCB(-2)	-.0075966	.010006	-.75923[.452]
LBACREIN(-3)	-.064081	.12674	-.50561[.616]
LRUKYDS(-3)	-.069630	.19389	-.35912[.721]
LNIP(-3)	-.66353	.82167	-.80754[.424]
ROV(-3)	-.0033591	.010568	-.31785[.752]
RLCB(-3)	.0016658	.010272	.16218[.872]
LBACREIN(-4)	.0068142	.083401	.081704[.935]
LRUKYDS(-4)	.62356	.30350	2.0546[.046]
LNIP(-4)	.57872	.53479	1.0821[.286]
ROV(-4)	.0027407	.0079658	.34406[.733]
RLCB(-4)	-.0027679	.0076920	-.35985[.721]

R-Squared	.99889	F-statistic F(24, 40)	1505.6[.000]
R-Bar-Squared	.99823	S.E. of Regression	.025038
Residual Sum of Squares	.025076	Mean of Dependent Variable	10.2549
S.D. of Dependent Variable	.59526	Maximum of Log-likelihood	163.2261
DW-statistic	1.8430		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 4.5860[.332]	F(4, 36)= .68319[.608]
B:Functional Form	CHI-SQ(1)= .48629[.486]	F(1, 39)= .29397[.591]
C:Normality	CHI-SQ(2)= 6.4983[.039]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.8001[.180]	F(1, 63)= 1.7944[.185]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 10

Ordinary Least Squares Estimation

Dependent variable is LBACREIN

55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	1.3321	1.0402	1.2806[.210]
LRUKYDS	-.34137	.27006	-1.2640[.216]
LNIP	2.1198	.50171	4.2251[.000]
ROV	.030662	.0086020	3.5646[.001]
RLCB	-.021049	.0079781	-2.6383[.013]
LBACREIN(-1)	.42233	.11089	3.8085[.001]
LRUKYDS(-1)	-.53869	.22082	-2.4395[.021]
LNIP(-1)	-2.3248	.75597	-3.0753[.004]
ROV(-1)	-.010058	.013123	-.76643[.449]
RLCB(-1)	.0048474	.012119	.40000[.692]
LBACREIN(-2)	.023757	.13578	.17496[.862]
LRUKYDS(-2)	.33485	.21668	1.5454[.133]
LNIP(-2)	1.2057	.84065	1.4343[.162]
ROV(-2)	.026803	.014883	1.8010[.082]
RLCB(-2)	-.024553	.013842	-1.7738[.086]
LBACREIN(-3)	-.018112	.12954	-.13983[.890]
LRUKYDS(-3)	-.28696	.22011	-1.3037[.202]
LNIP(-3)	-1.6247	.82145	-1.9779[.057]
ROV(-3)	-.013385	.014312	-.93527[.357]
RLCB(-3)	.0099275	.013445	.73836[.466]
LBACREIN(-4)	.073450	.083853	.87595[.388]
LRUKYDS(-4)	.93541	.29026	3.2227[.003]
LNIP(-4)	1.2769	.53668	2.3792[.024]
ROV(-4)	.012345	.013990	.88245[.385]
RLCB(-4)	-.011439	.012860	-.88946[.381]

R-Squared	.99881	F-statistic F(24, 30)	1045.8[.000]
R-Bar-Squared	.99785	S.E. of Regression	.022409
Residual Sum of Squares	.015066	Mean of Dependent Variable	10.0879
S.D. of Dependent Variable	.48341	Maximum of Log-likelihood	147.5321
DW-statistic	2.1383		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 4.1881[.381]	F(4, 26)= .53576[.711]
B:Functional Form	CHI-SQ(1)= .54545[.460]	F(1, 29)= .29048[.594]
C:Normality	CHI-SQ(2)= 2.4638[.292]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .13703[.711]	F(1, 53)= .13238[.717]
E:Predictive Failure	CHI-SQ(10)= 19.9344[.030]	F(10, 30)= 1.9934[.071]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

TABLE 11

Variable Deletion Test (OLS case)

****

Dependent variable is LBACREIN

List of the variables deleted from the regression:

LRUKYDS(-1)	LNIP(-1)	ROV(-1)	RLCB(-1)	LBACREIN(-2)
LRUKYDS(-2)	LNIP(-2)	ROV(-2)	RLCB(-2)	LBACREIN(-3)
LRUKYDS(-3)	LNIP(-3)	ROV(-3)	RLCB(-3)	LBACREIN(-4)
LRUKYDS(-4)	LNIP(-4)	ROV(-4)	RLCB(-4)	

55 observations used for estimation from 75Q2 to 88Q4

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.80853	.52561	1.5383[.130]
LRUKYDS	.23453	.092817	2.5268[.015]
LNIP	.69678	.072310	9.6360[.000]
ROV	.028274	.0063952	4.4212[.000]
RLCB	-.024785	.0055098	-4.4983[.000]
LBACREIN(-1)	.45151	.054591	8.2708[.000]

****

Joint test of zero restrictions on the coefficient of deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(19)=	33.3536[.022]
Likelihood Ratio Statistic	CHI-SQ(19)=	51.2871[.000]
F Statistic	F(19, 30)=	2.4329[.014]

****

Y

TABLE 12

Variable Deletion Test (OLS case)

Dependent variable is LBACREIN

List of the variables deleted from the regression:

LRUKYDS(-1)	LNIP(-1)	ROV(-1)	RLCB(-1)	LBACREIN(-2)
LRUKYDS(-2)	LNIP(-2)	ROV(-2)	RLCB(-2)	LBACREIN(-3)
LRUKYDS(-3)	LNIP(-3)	ROV(-3)	RLCB(-3)	LBACREIN(-4)
LRUKYDS(-4)	LNIP(-4)	ROV(-4)	RLCB(-4)	

65 observations used for estimation from 75Q2 to 91Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.79068	.50182	1.5756[.120]
LRUKYDS	.19881	.082961	2.3964[.020]
LNIP	.64950	.067195	9.6660[.000]
ROV	.032855	.0043631	7.5303[.000]
RLCB	-.028242	.0040932	-6.8997[.000]
LBACREIN(-1)	.49464	.048295	10.2420[.000]

Joint test of zero restrictions on the coefficient of deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(19)=	29.6848[.056]
Likelihood Ratio Statistic	CHI-SQ(19)=	39.6548[.004]
F Statistic	F(19, 40)=	1.7696[.064]

Ordinary Least Squares Estimation

Dependent variable is LBACREIN
65 observations used for estimation from 75Q2 to 91Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.79068	.50182	1.5756[.120]
LRUKYDS	.19881	.082961	2.3964[.020]
LNIP	.64950	.067195	9.6660[.000]
ROV	.032855	.0043631	7.5303[.000]
RLCB	-.028242	.0040932	-6.8997[.000]
LBACREIN(-1)	.49464	.048295	10.2420[.000]

R-Squared	.99796	F-statistic F(5, 59)	5786.0[.000]
R-Bar-Squared	.99779	S.E. of Regression	.027969
Residual Sum of Squares	.046155	Mean of Dependent Variable	10.2549
S.D. of Dependent Variable	.59526	Maximum of Log-likelihood	143.3988
DW-statistic	1.7666	Durbin's h-statistic	1.0213[.307]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 4.4276[.351]	F(4, 55)= 1.0051[.413]
B:Functional Form	CHI-SQ(1)= 2.3694[.124]	F(1, 58)= 2.1942[.144]
C:Normality	CHI-SQ(2)= .34882[.840]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .047012[.828]	F(1, 63)= .045599[.832]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 14

Ordinary Least Squares Estimation

Dependent variable is LBACREIN

55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.80853	.52561	1.5383[.130]
LRUKYDS	.23453	.092817	2.5268[.015]
LNIP	.69678	.072310	9.6360[.000]
ROV	.028274	.0063952	4.4212[.000]
RLCB	-.024785	.0055098	-4.4983[.000]
LBACREIN(-1)	.45151	.054591	8.2708[.000]

R-Squared	.99697	F-statistic F(5, 49)	3220.9[.000]
R-Bar-Squared	.99666	S.E. of Regression	.027950
Residual Sum of Squares	.038279	Mean of Dependent Variable	10.0879
S.D. of Dependent Variable	.48341	Maximum of Log-likelihood	121.8885
DW-statistic	1.7188	Durbin's h-statistic	1.1405[.254]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 4.2798[.369]	F(4, 45)= .94928[.445]
B:Functional Form	CHI-SQ(1)= 1.4592[.227]	F(1, 48)= 1.3082[.258]
C:Normality	CHI-SQ(2)= .26491[.876]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .018527[.892]	F(1, 53)= .017859[.894]
E:Predictive Failure	CHI-SQ(10)= 10.0813[.433]	F(10, 49)= 1.0081[.450]
F:Chow Test	CHI-SQ(6)= 5.1444[.525]	F(6, 53)= .85740[.532]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)
F:Test of stability of the regression coefficients

TABLE 15

Ordinary Least Squares Estimation

Dependent variable is LBACREIN
55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.28829	.76062	.37902[.706]
LBACREIN(-1)	.43894	.056237	7.8052[.000]
ROV	.025950	.0068564	3.7848[.000]
RLCB	-.022293	.0061109	-3.6480[.001]
LNIP	.68937	.072807	9.4685[.000]
LRUKYDS	.33670	.14237	2.3650[.022]
UHAUS	-.19467	.20553	-.94716[.348]

R-Squared	.99702	F-statistic F(6, 48)	2678.6[.000]
R-Bar-Squared	.99665	S.E. of Regression	.027979
Residual Sum of Squares	.037577	Mean of Dependent Variable	10.0879
S.D. of Dependent Variable	.48341	Maximum of Log-likelihood	122.3977
DW-statistic	1.6476	Durbin's h-statistic	1.4376[.151]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 4.3038[.366]	F(4, 44)= .93383[.453]
B:Functional Form	CHI-SQ(1)= .56896[.451]	F(1, 47)= .49129[.487]
C:Normality	CHI-SQ(2)= .42192[.810]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .070770[.790]	F(1, 53)= .068285[.795]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 16

Ordinary Least Squares Estimation

Dependent variable is LBACROIN
55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.31480	.99482	.31643[.753]
LBACROIN(-1)	.98688	.031195	31.6360[.000]
ROV	-.0074258	.0060913	-1.2191[.229]
TREBIRA	.0088873	.0061193	1.4523[.153]
LNIP	.084783	.034414	2.4637[.017]
LRUKYDS	-.073717	.18606	-.39621[.694]
UHAUS	.15089	.23607	.63915[.526]

R-Squared	.99921	F-statistic F(6, 48)	10158.5[.000]
R-Bar-Squared	.99911	S.E. of Regression	.023968
Residual Sum of Squares	.027575	Mean of Dependent Variable	10.9378
S.D. of Dependent Variable	.80556	Maximum of Log-likelihood	130.9086
DW-statistic	1.5652	Durbin's h-statistic	1.6571[.097]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 2.8406[.585]	F(4, 44)= .59905[.665]
B:Functional Form	CHI-SQ(1)= .22032[.639]	F(1, 47)= .18903[.666]
C:Normality	CHI-SQ(2)= 4.7468[.093]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .22464[.636]	F(1, 53)= .21736[.643]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 17

Ordinary Least Squares Estimation

Dependent variable is LBACRTO
55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-2.4260	.97715	-2.4828[.017]
LBACRTO(-1)	.87322	.040281	21.6785[.000]
ROV	-.0058994	.0065055	-.90684[.369]
TREBIRA	.0056996	.0065780	.86646[.391]
LNIP	.16102	.042480	3.7904[.000]
LRUKYDS	.47695	.19317	2.4691[.017]
UHAUS	-.40993	.24567	-1.6686[.102]

R-Squared	.99883	F-statistic F(6, 48)	6845.6[.000]
R-Bar-Squared	.99869	S.E. of Regression	.025777
Residual Sum of Squares	.031894	Mean of Dependent Variable	11.3063
S.D. of Dependent Variable	.71132	Maximum of Log-likelihood	126.9072
DW-statistic	1.5823	Durbin's h-statistic	1.6232[.105]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 1.2853[.864]	F(4, 44)= .26322[.900]
B:Functional Form	CHI-SQ(1)= .69466[.405]	F(1, 47)= .60121[.442]
C:Normality	CHI-SQ(2)= .020663[.990]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.0975[.295]	F(1, 53)= 1.0791[.304]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 18

Ordinary Least Squares Estimation

Dependent variable is LBACREMA

55 observations used for estimation from 76Q1 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-.35933	.74550	-.48200[.633]
LIPGNP	-.16194	1.0891	-.14869[.883]
RCRCA	.017869	.016456	1.0858[.286]
GTRBR	-.0022717	.017372	-.13077[.897]
LRGGNP	-.035235	.43417	-.081156[.936]
LBACREMA(-1)	.57581	.21446	2.6849[.012]
LIPGNP(-1)	-.063215	.78316	-.080717[.936]
RCRCA(-1)	-.022368	.020045	-1.1159[.273]
GTRBR(-1)	.0053293	.019135	.27851[.783]
LRGGNP(-1)	.0065390	.38454	.017005[.987]
LBACREMA(-2)	.030388	.24024	.12649[.900]
LIPGNP(-2)	.16640	.69188	.24051[.812]
RCRCA(-2)	.024663	.019380	1.2726[.213]
GTRBR(-2)	-.033598	.020907	-1.6070[.119]
LRGGNP(-2)	-.0011550	.37284	-.0030979[.998]
LBACREMA(-3)	-.31913	.25230	-1.2649[.216]
LIPGNP(-3)	-.65022	.70296	-.92498[.362]
RCRCA(-3)	-.010640	.019360	-.54960[.587]
GTRBR(-3)	.039694	.020788	1.9095[.066]
LRGGNP(-3)	.46122	.39312	1.1732[.250]
LBACREMA(-4)	.18037	.24441	.73797[.466]
LIPGNP(-4)	1.1508	.78096	1.4736[.151]
RCRCA(-4)	.0058343	.011643	.50111[.620]
GTRBR(-4)	-.016251	.016112	-1.0086[.321]
LRGGNP(-4)	.25019	.46309	.54027[.593]

R-Squared	.99248	F-statistic F(24, 30)	164.9864[.000]
R-Bar-Squared	.98647	S.E. of Regression	.026151
Residual Sum of Squares	.020516	Mean of Dependent Variable	5.1154
S.D. of Dependent Variable	.22478	Maximum of Log-likelihood	139.0401
DW-statistic	2.0718		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 6.9427[.139]	F(4, 26)= .93904[.457]
B:Functional Form	CHI-SQ(1)= 11.0080[.001]	F(1, 29)= 7.2566[.012]
C:Normality	CHI-SQ(2)= 67.4654[.000]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .096699[.756]	F(1, 53)= .093347[.761]
E:Predictive Failure	CHI-SQ(5)= 1.7945[.877]	F(5, 30)= .35889[.872]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

TABLE 19

Ordinary Least Squares Estimation

Dependent variable is LBACREMA

55 observations used for estimation from 76Q1 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-.23809	.75921	-.31361[.756]
LIPGNP	-1.2089	1.2004	-1.0070[.323]
RCRCA	.023049	.016634	1.3856[.177]
GTRBR	-.0051042	.017002	-.30022[.766]
LRGGNP	-.48238	.47900	-1.0071[.323]
LBACREMA(-1)	.61491	.22899	2.6854[.012]
LIPGNP(-1)	1.0086	1.2226	.82490[.417]
RCRCA(-1)	-.035924	.020629	-1.7414[.093]
GTRBR(-1)	.0075801	.018805	.40308[.690]
LRGGNP(-1)	.62724	.55312	1.1340[.267]
LBACREMA(-2)	.12237	.25957	.47145[.641]
LIPGNP(-2)	.52754	1.1527	.45764[.651]
RCRCA(-2)	.029605	.020181	1.4669[.154]
GTRBR(-2)	-.029204	.020540	-1.4218[.167]
LRGGNP(-2)	.064044	.51602	.12411[.902]
LBACREMA(-3)	-.24648	.28234	-.87300[.390]
LIPGNP(-3)	-.24286	1.1130	-.21820[.829]
RCRCA(-3)	-.0086810	.020072	-.43248[.669]
GTRBR(-3)	.034192	.020487	1.6690[.107]
LRGGNP(-3)	.77873	.56441	1.3797[.179]
LBACREMA(-4)	-.014206	.25770	-.055126[.956]
LIPGNP(-4)	.33456	.92838	.36038[.721]
RCRCA(-4)	.0088733	.011758	.75468[.457]
GTRBR(-4)	-.016762	.015929	-1.0523[.302]
LRGGNP(-4)	-.28630	.52506	-.54527[.590]
S1	-.20508	.10690	-1.9183[.066]
S2	-.11209	.078295	-1.4317[.164]
S3	-.12051	.10352	-1.1641[.255]

R-Squared	.99356	F-statistic F(27, 27)	154.2491[.000]
R-Bar-Squared	.98712	S.E. of Regression	.025513
Residual Sum of Squares	.017574	Mean of Dependent Variable	5.1154
S.D. of Dependent Variable	.22478	Maximum of Log-likelihood	143.2961
DW-statistic	2.1119		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 14.7266[.005]	F(4, 23)= 2.1026[.113]
B:Functional Form	CHI-SQ(1)= 12.7089[.000]	F(1, 26)= 7.8133[.010]
C:Normality	CHI-SQ(2)= 56.9649[.000]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .24830[.618]	F(1, 53)= .24036[.626]
E:Predictive Failure	CHI-SQ(5)= 4.1430[.529]	F(5, 27)= .82860[.541]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

TABLE 20

Ordinary Least Squares Estimation

Dependent variable is LBACREMA
36 observations used for estimation from 80Q4 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	1.7754	.88080	2.0157[.053]
RCRCA	-.024272	.0073592	-3.2981[.003]
GTRBR	.031603	.0081176	3.8932[.001]
LIPGNP	-.17755	.30159	-.58871[.560]
LRGGNP	.61163	.16511	3.7045[.001]
LBACREMA(-1)	.66422	.091883	7.2289[.000]

R-Squared	.96048	F-statistic F(5, 30)	145.8120[.000]
R-Bar-Squared	.95389	S.E. of Regression	.019172
Residual Sum of Squares	.011027	Mean of Dependent Variable	5.2647
S.D. of Dependent Variable	.089284	Maximum of Log-likelihood	94.5550
DW-statistic	1.6201	Durbin's h-statistic	1.3660[.172]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 6.5130[.164]	F(4, 26)= 1.4357[.250]
B:Functional Form	CHI-SQ(1)= 4.6352[.031]	F(1, 29)= 4.2857[.047]
C:Normality	CHI-SQ(2)= .93140[.628]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.0544[.305]	F(1, 34)= 1.0258[.318]
E:Predictive Failure	CHI-SQ(5)= 2.4704[.781]	F(5, 30)= .49408[.778]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

Ordinary Least Squares Estimation

Dependent variable is LBACREMA
22 observations used for estimation from 75Q2 to 80Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.52153	.83003	.62832[.539]
RCRCA	.014915	.0089298	1.6703[.114]
GTRBR	-.0075008	.012664	-.59227[.562]
LIPGNP	.51499	.32936	1.5636[.137]
LRGGNP	.47562	.22586	2.1058[.051]
LBACREMA(-1)	.26919	.15098	1.7829[.094]

R-Squared	.97435	F-statistic F(5, 16)	121.5760[.000]
R-Bar-Squared	.96634	S.E. of Regression	.015561
Residual Sum of Squares	.0038742	Mean of Dependent Variable	4.8197
S.D. of Dependent Variable	.084815	Maximum of Log-likelihood	63.8724
DW-statistic	1.7404	Durbin's h-statistic	.86227[.389]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 6.1201[.190]	F(4, 12)= 1.1562[.378]
B:Functional Form	CHI-SQ(1)= 1.5005[.221]	F(1, 15)= 1.0980[.311]
C:Normality	CHI-SQ(2)= 1.1755[.556]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .83048[.362]	F(1, 20)= .78459[.386]
E:Predictive Failure	CHI-SQ(41)= 133.3209[.000]	F(41, 16)= 3.2517[.007]
F:Chow Test	CHI-SQ(6)= 65.6391[.000]	F(6, 51)= 10.9399[.000]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)
F:Test of stability of the regression coefficients

TABLE 22

Ordinary Least Squares Estimation

Dependent variable is LRGGNP
36 observations used for estimation from 80Q4 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	1.3197	1.3687	.96417[.343]
LRGGNP(-1)	.027380	.35973	.076114[.940]
LIPGNP(-1)	-.62398	.47679	-1.3087[.201]
GTRBR(-1)	-.0076095	.010058	-.75658[.455]
LNM1(-1)	.35045	.17960	1.9513[.060]
LBACREMA(-1)	.20111	.19184	1.0483[.303]

R-Squared	.69364	F-statistic F(5, 30)	13.5849[.000]
R-Bar-Squared	.64258	S.E. of Regression	.036468
Residual Sum of Squares	.039898	Mean of Dependent Variable	1.5234
S.D. of Dependent Variable	.060999	Maximum of Log-likelihood	71.4075
DW-statistic	2.5186	Durbin's h-statistic	*NONE*

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 32.3701[.000]	F(4, 26)= 57.9650[.000]
B:Functional Form	CHI-SQ(1)= 5.2221[.022]	F(1, 29)= 4.9205[.035]
C:Normality	CHI-SQ(2)= 1.8534[.396]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.3857[.239]	F(1, 34)= 1.3611[.251]
E:Predictive Failure	CHI-SQ(5)= 3.3951[.639]	F(5, 30)= .67902[.643]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

TABLE 23

Ordinary Least Squares Estimation

Dependent variable is LBACREMA
36 observations used for estimation from 80Q4 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.31470	.81014	.38844[.701]
LRGGNP	.97201	.16296	5.9647[.000]
RCRCA	-.011416	.0068451	-1.6678[.106]
GTRBR	.029543	.0066695	4.4296[.000]
LIPGNP	.49955	.30035	1.6632[.107]
LBACREMA(-1)	.22162	.13466	1.6458[.111]
HREBCMA	-.81282	.20506	-3.9639[.000]

R-Squared	.97437	F-statistic F(6, 29)	183.7181[.000]
R-Bar-Squared	.96906	S.E. of Regression	.015704
Residual Sum of Squares	.0071520	Mean of Dependent Variable	5.2647
S.D. of Dependent Variable	.089284	Maximum of Log-likelihood	102.3481
DW-statistic	1.7104	Durbin's h-statistic	1.4745[.140]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 3.8715[.424]	F(4, 25)= .75312[.565]
B:Functional Form	CHI-SQ(1)= .15274[.696]	F(1, 28)= .11931[.732]
C:Normality	CHI-SQ(2)= 1.2672[.531]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.5417[.214]	F(1, 34)= 1.5211[.226]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 24

Ordinary Least Squares Estimation

Dependent variable is LBACREMA

36 observations used for estimation from 80Q4 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.60632	.86523	.70076[.490]
LRGGNP	1.0240	.15837	6.4658[.000]
RCRCA	-.013911	.0092921	-1.4971[.146]
GTRBR	.031021	.0086344	3.5927[.001]
LIPGNP	.36052	.34543	1.0437[.306]
LBACREMA(-1)	.27797	.16886	1.6462[.112]
S1	-.013442	.026918	-.49937[.622]
S2	-.0022458	.020278	-.11075[.913]
S3	-.017970	.018340	-.97982[.336]
HREBCMA	-.91843	.28692	-3.2010[.004]

R-Squared	.97893	F-statistic F(9, 26)	134.2007[.000]
R-Bar-Squared	.97163	S.E. of Regression	.015038
Residual Sum of Squares	.0058795	Mean of Dependent Variable	5.2647
S.D. of Dependent Variable	.089284	Maximum of Log-likelihood	105.8748
DW-statistic	1.5912	Durbin's h-statistic	*NONE*

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 2.2314[.693]	F(4, 22)= .36343[.832]
B:Functional Form	CHI-SQ(1)= .034942[.852]	F(1, 25)= .024289[.877]
C:Normality	CHI-SQ(2)= 1.6854[.431]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .040879[.840]	F(1, 34)= .038652[.845]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 25

Instrumental Variable Estimation

Dependent variable is LBACREMA

List of instruments:

CONST LRGGNP(-1) RCRCA(-1) GTRBR(-1) LIPGNP(-1) LBACREMA(-2)

36 observations used for estimation from 80Q4 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	6.4250	5.9995	1.0709[.293]
LRGGNP	1.3245	.77588	1.7071[.098]
RCRCA	-.040922	.030294	-1.3508[.187]
GTRBR	.025565	.020619	1.2399[.225]
LIPGNP	-2.0921	2.4379	-.85817[.398]
LBACREMA(-1)	1.2853	.84504	1.5210[.139]

R-Squared	.88905	F-statistic F(5, 30)	48.0766[.000]
R-Bar-Squared	.87055	S.E. of Regression	.032123
Residual Sum of Squares	.030957	Mean of Dependent Variable	5.2647
S.D. of Dependent Variable	.089284	Value of IV Minimand	.0000
DW-statistic	2.3399	Sargan's	*NONE*

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 1.3477[.853]	Not applicable
B:Functional Form	CHI-SQ(1)= 1.1632[.281]	Not applicable
C:Normality	CHI-SQ(2)= 4.3598[.113]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.0959[.295]	Not applicable

A:Lagrange multiplier test of residual serial correlation

B:Ramsey's RESET test using the square of the fitted values

C:Based on a test of skewness and kurtosis of residuals

D:Based on the regression of squared residuals on squared fitted values

TABLE 26

Instrumental Variable Estimation

Dependent variable is LBACREMA

List of instruments:

CONST	LRGGNP(-1)	RCRCA(-1)	GTRBR(-1)	LIPGNP(-1)
LBACREMA(-2)	S1	S2	S3	

36 observations used for estimation from 80Q4 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	4.7372	4.6934	1.0093[.322]
LRGGNP	1.0147	.30879	3.2862[.003]
RCRCA	-.038867	.036253	-1.0721[.293]
GTRBR	.032137	.016613	1.9345[.064]
LIPGNP	-1.4645	2.1479	-.68181[.501]
LBACREMA(-1)	1.1416	1.0558	1.0813[.289]
S1	-.022185	.10087	-.21993[.828]
S2	-.018889	.079875	-.23648[.815]
S3	-.037288	.075763	-.49216[.627]

R-Squared	.94522	F-statistic F(8, 27)	58.2307[.000]
R-Bar-Squared	.92898	S.E. of Regression	.023793
Residual Sum of Squares	.015285	Mean of Dependent Variable	5.2647
S.D. of Dependent Variable	.089284	Value of IV Minimand	.0000
DW-statistic	2.3421	Sargan's	*NONE*

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 3.9102[.418]	Not applicable
B:Functional Form	CHI-SQ(1)= 1.5723[.210]	Not applicable
C:Normality	CHI-SQ(2)= 3.2706[.195]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 2.4764[.116]	Not applicable

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 27

Instrumental Variable Estimation

Dependent variable is LBACREMA

List of instruments:

CONST	LRGGNP(-1)	RCRCA(-1)	RTDEP(-1)	LIPGNP(-1)
LBACREMA(-2)	S1	S2	S3	

36 observations used for estimation from 80Q4 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-4.5984	6.2938	-.73062[.471]
LRGGNP	1.0409	.93171	1.1172[.274]
RCRCA	.037556	.030528	1.2302[.229]
RTDEP	.0045315	.033732	.13434[.894]
LIPGNP	2.9247	2.7143	1.0775[.291]
LBACREMA(-1)	-1.0837	1.0883	-.99574[.328]
S1	.18857	.095787	1.9686[.059]
S2	.14952	.075199	1.9883[.057]
S3	.12135	.074643	1.6257[.116]

R-Squared	.90377	F-statistic F(8, 27)	31.6970[.000]
R-Bar-Squared	.87526	S.E. of Regression	.031534
Residual Sum of Squares	.026849	Mean of Dependent Variable	5.2647
S.D. of Dependent Variable	.089284	Value of IV Minimand	.0000
DW-statistic	1.3765	Sargan's	*NONE*

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 2.8407[.585]	Not applicable
B:Functional Form	CHI-SQ(1)= 2.6979[.100]	Not applicable
C:Normality	CHI-SQ(2)= 2.7898[.248]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 5.4182[.020]	Not applicable

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 28

Ordinary Least Squares Estimation

Dependent variable is LBACREMA

36 observations used for estimation from 80Q4 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-.19398	1.0125	-.19158[.850]
LRGGNP	.77563	.23901	3.2452[.003]
RCRCA	-.6703E-3	.010741	-.062403[.951]
RTDEP	.013468	.0099354	1.3556[.186]
LIPGNP	.79938	.38656	2.0679[.048]
LBACREMA(-1)	.095496	.16327	.58490[.563]
S1	.064207	.020762	3.0925[.005]
S2	.055813	.016281	3.4281[.002]
S3	.034212	.015014	2.2786[.031]

R-Squared	.96742	F-statistic F(8, 27)	100.2310[.000]
R-Bar-Squared	.95777	S.E. of Regression	.018347
Residual Sum of Squares	.0090887	Mean of Dependent Variable	5.2647
S.D. of Dependent Variable	.089284	Maximum of Log-likelihood	98.0347
DW-statistic	1.2204	Durbin's h-statistic	11.6426[.000]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 7.4930[.112]	F(4, 23)= 1.5114[.232]
B:Functional Form	CHI-SQ(1)= 3.0715[.080]	F(1, 26)= 2.4252[.131]
C:Normality	CHI-SQ(2)= .23515[.889]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 2.1698[.141]	F(1, 34)= 2.1807[.149]
E:Predictive Failure	CHI-SQ(5)= .18813[1.00]	F(5, 27)= .037626[1.00]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

TABLE 29

Ordinary Least Squares Estimation

Dependent variable is LNM1

55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	2.3506	2.1862	1.0752[.290]
LRUKYDS	.30430	.37295	.81594[.421]
TREBIRA	-.0027194	.0030928	-.87927[.386]
LNIP	.13397	.52997	.25278[.802]
S1	.017464	.034059	.51275[.612]
S2	.061714	.038245	1.6136[.116]
S3	.027178	.028624	.94949[.349]
LNM1(-1)	.80488	.16954	4.7475[.000]
LRUKYDS(-1)	-.035825	.35655	-.10048[.921]
TREBIRA(-1)	-.0019011	.0041827	-.45450[.653]
LNIP(-1)	.10027	.80507	.12455[.902]
LNM1(-2)	.10112	.22356	.45234[.654]
LRUKYDS(-2)	-.56339	.33305	-1.6916[.100]
TREBIRA(-2)	.3665E-3	.0039493	.092806[.927]
LNIP(-2)	-.62832	.76441	-.82197[.417]
LNM1(-3)	-.096791	.23172	-.41771[.679]
LRUKYDS(-3)	-.16949	.33620	-.50415[.618]
TREBIRA(-3)	-.9524E-3	.0038873	-.24499[.808]
LNIP(-3)	.72150	.78914	.91428[.367]
LNM1(-4)	.32485	.18865	1.7219[.095]
LRUKYDS(-4)	-.052253	.32779	-.15941[.874]
TREBIRA(-4)	.0033477	.0031951	1.0478[.303]
LNIP(-4)	-.38369	.47425	-.80904[.424]

R-Squared	.99885	F-statistic F(22, 32)	1267.7[.000]
R-Bar-Squared	.99807	S.E. of Regression	.024629
Residual Sum of Squares	.019411	Mean of Dependent Variable	10.5365
S.D. of Dependent Variable	.56005	Maximum of Log-likelihood	140.5631
DW-statistic	1.8263		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 1.9701[.741]	F(4, 28)= .26005[.901]
B:Functional Form	CHI-SQ(1)= .094030[.759]	F(1, 31)= .053090[.819]
C:Normality	CHI-SQ(2)= 1.6194[.445]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 1.3574[.244]	F(1, 53)= 1.3411[.252]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 30

Variable Deletion Test (OLS case)

****

Dependent variable is LNM1

List of the variables deleted from the regression:

LNM1(-2)	LNM1(-3)	LNM1(-4)	TREBIRA(-1)	TREBIRA(-2)
TREBIRA(-3)	TREBIRA(-4)	LNIP(-1)	LNIP(-2)	LNIP(-3)
LNIP(-4)	LRUKYDS(-1)	LRUKYDS(-2)	LRUKYDS(-3)	LRUKYDS(-4)

55 observations used for estimation from 75Q2 to 88Q4

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-1.2430	1.0899	-1.1405[.260]
LNM1(-1)	.93225	.057709	16.1543[.000]
TREBIRA	-.0041181	.0016314	-2.5243[.015]
LNIP	.034486	.040625	.84888[.400]
LRUKYDS	.28016	.22985	1.2189[.229]
S1	-.019253	.016447	-1.1706[.248]
S2	.020343	.015896	1.2798[.207]
S3	-.5155E-4	.011712	-.0044010[.997]

****

Joint test of zero restrictions on the coefficient of deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(15)=	17.2703[.303]
Likelihood Ratio Statistic	CHI-SQ(15)=	20.7287[.146]
F Statistic	F(15, 32)=	.97651[.500]

****

TABLE 31

Ordinary Least Squares Estimation

Dependent variable is LNM1
55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-1.2430	1.0899	-1.1405[.260]
LNM1(-1)	.93225	.057709	16.1543[.000]
TREBIRA	-.0041181	.0016314	-2.5243[.015]
LNIP	.034486	.040625	.84888[.400]
LRUKYDS	.28016	.22985	1.2189[.229]
S1	-.019253	.016447	-1.1706[.248]
S2	.020343	.015896	1.2798[.207]
S3	-.5155E-4	.011712	-.0044010[.997]

R-Squared	.99833	F-statistic F(7, 47)	4012.3[.000]
R-Bar-Squared	.99808	S.E. of Regression	.024536
Residual Sum of Squares	.028296	Mean of Dependent Variable	10.5365
S.D. of Dependent Variable	.56005	Maximum of Log-likelihood	130.1988
DW-statistic	2.1156	Durbin's h-statistic	-.47440[.635]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 11.6429[.020]	F(4, 43)= 2.8867[.033]
B:Functional Form	CHI-SQ(1)= 1.1956[.274]	F(1, 46)= 1.0222[.317]
C:Normality	CHI-SQ(2)= 2.5891[.274]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .16650[.683]	F(1, 53)= .16093[.690]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 32

Ordinary Least Squares Estimation

Dependent variable is LNM1
55 observations used for estimation from 75Q2 to 88Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	7.4106	5.5543	1.3342[.189]
LNM1(-1)	1.3625	.27687	4.9212[.000]
TREBIRA	-.0014730	.0023136	-.63665[.528]
LNIP	-.14916	.12237	-1.2189[.229]
LRUKYDS	-1.5631	1.1827	-1.3217[.193]
S1	-.015069	.016400	-.91885[.363]
S2	.019445	.015655	1.2421[.221]
S3	.9009E-4	.011527	.0078151[.994]
UHAUS	1.8340	1.1550	1.5879[.119]

R-Squared	.99842	F-statistic F(8, 46)	3624.8[.000]
R-Bar-Squared	.99814	S.E. of Regression	.024149
Residual Sum of Squares	.026825	Mean of Dependent Variable	10.5365
S.D. of Dependent Variable	.56005	Maximum of Log-likelihood	131.6663
DW-statistic	2.0002	Durbin's h-statistic	*NONE*

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 8.1040[.088]	F(4, 42)= 1.8145[.144]
B:Functional Form	CHI-SQ(1)= 3.0411[.081]	F(1, 45)= 2.6338[.112]
C:Normality	CHI-SQ(2)= 2.8935[.235]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .30334[.582]	F(1, 53)= .29393[.590]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

TABLE 33

Ordinary Least Squares Estimation

Dependent variable is LNM1
58 observations used for estimation from 75Q2 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.20561	.22167	.92754[.360]
LIPGNP	1.3342	.46900	2.8448[.007]
LRGGNP	-.046444	.27678	-.16780[.868]
GTRBR	-.011860	.0063120	-1.8790[.068]
LNM1(-1)	.51404	.15090	3.4065[.002]
LIPGNP(-1)	-.79230	.45303	-1.7489[.088]
LRGGNP(-1)	-.15623	.21839	-.71539[.479]
GTRBR(-1)	-.0064080	.0088798	-.72164[.475]
LNM1(-2)	.22067	.17324	1.2738[.210]
LIPGNP(-2)	.016559	.43240	.038295[.970]
LRGGNP(-2)	-.056192	.22004	-.25537[.800]
GTRBR(-2)	.0010452	.0088811	.11769[.907]
LNM1(-3)	-.036711	.17786	-.20640[.838]
LIPGNP(-3)	-.53168	.44056	-1.2068[.235]
LRGGNP(-3)	.12903	.19256	.67008[.507]
GTRBR(-3)	.0068959	.0095354	.72319[.474]
LNM1(-4)	.30819	.17739	1.7374[.090]
LIPGNP(-4)	-.11103	.48841	-.22732[.821]
LRGGNP(-4)	.27014	.20524	1.3162[.196]
GTRBR(-4)	-.0013906	.0066269	-.20984[.835]

R-Squared	.99777	F-statistic F(19, 38)	896.1401[.000]
R-Bar-Squared	.99666	S.E. of Regression	.015225
Residual Sum of Squares	.0088080	Mean of Dependent Variable	5.5718
S.D. of Dependent Variable	.26343	Maximum of Log-likelihood	172.6851
DW-statistic	2.0552		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 7.7235[.102]	F(4, 34)= 1.3058[.288]
B:Functional Form	CHI-SQ(1)= .78471[.376]	F(1, 37)= .50746[.481]
C:Normality	CHI-SQ(2)= 1.3591[.507]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= 2.0681[.150]	F(1, 56)= 2.0706[.156]
E:Predictive Failure	CHI-SQ(5)= 49.3080[.000]	F(5, 38)= 9.8616[.000]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

TABLE 34

Variable Deletion Test (OLS case)

****

Dependent variable is LNM1

List of the variables deleted from the regression:

GTRBR(-1)	LIPGNP(-1)	LRGGNP(-1)	LNM1(-2)	GTRBR(-2)
LIPGNP(-2)	LRGGNP(-2)	LNM1(-3)	GTRBR(-3)	LIPGNP(-3)
LRGGNP(-3)	LNM1(-4)	GTRBR(-4)	LIPGNP(-4)	LRGGNP(-4)

58 observations used for estimation from 75Q2 to 89Q3

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-.38177	.19042	-2.0049[.050]
GTRBR	-.011328	.0023204	-4.8818[.000]
LIPGNP	.51855	.10113	5.1278[.000]
LRGGNP	1.1338	.12097	9.3726[.000]
LNM1(-1)	.35908	.050294	7.1396[.000]

****

Joint test of zero restrictions on the coefficient of deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(15)=	45.2796[.000]
Likelihood Ratio Statistic	CHI-SQ(15)=	87.9996[.000]
F Statistic	F(15, 38)=	9.0177[.000]

****

TABLE 35

Variable Deletion Test (OLS case)

****

Dependent variable is LNM1

List of the variables deleted from the regression:

LRGGNP	LRGGNP(-1)	GTRBR(-1)	LIPGNP(-2)	LRGGNP(-2)
GTRBR(-2)	LNM1(-3)	LRGGNP(-3)	GTRBR(-3)	LIPGNP(-4)
GTRBR(-4)				

58 observations used for estimation from 75Q2 to 89Q3

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.10915	.13324	.81923[.417]
LIPGNP	1.1245	.27209	4.1328[.000]
GTRBR	-.013043	.0016601	-7.8567[.000]
LNM1(-1)	.40071	.076563	5.2337[.000]
LIPGNP(-1)	-.70029	.23469	-2.9839[.004]
LNM1(-2)	.32381	.057716	5.6103[.000]
LIPGNP(-3)	-.36372	.10305	-3.5294[.001]
LNM1(-4)	.098078	.096766	1.0136[.316]
LRGGNP(-4)	.46180	.13274	3.4790[.001]

****

Joint test of zero restrictions on the coefficient of deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(11)=	8.5549[.663]
Likelihood Ratio Statistic	CHI-SQ(11)=	9.2556[.598]
F Statistic	F(11, 38)=	.59770[.819]

****

TABLE 36

Ordinary Least Squares Estimation

Dependent variable is LNM1
58 observations used for estimation from 75Q2 to 89Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	.10915	.13324	.81923[.417]
GTRBR	-.013043	.0016601	-7.8567[.000]
LIPGNP	1.1245	.27209	4.1328[.000]
LNM1(-1)	.40071	.076563	5.2337[.000]
LIPGNP(-1)	-.70029	.23469	-2.9839[.004]
LNM1(-2)	.32381	.057716	5.6103[.000]
LIPGNP(-3)	-.36372	.10305	-3.5294[.001]
LNM1(-4)	.098078	.096766	1.0136[.316]
LRGGNP(-4)	.46180	.13274	3.4790[.001]

R-Squared	.99739	F-statistic F(8, 49)	2338.7[.000]
R-Bar-Squared	.99696	S.E. of Regression	.014521
Residual Sum of Squares	.010332	Mean of Dependent Variable	5.5718
S.D. of Dependent Variable	.26343	Maximum of Log-likelihood	168.0573
DW-statistic	1.8432		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHI-SQ(4)= 2.8819[.578]	F(4, 45)= .58822[.673]
B:Functional Form	CHI-SQ(1)= 1.2390[.266]	F(1, 48)= 1.0478[.311]
C:Normality	CHI-SQ(2)= 1.5709[.456]	Not applicable
D:Heteroscedasticity	CHI-SQ(1)= .023815[.877]	F(1, 56)= .023004[.880]
E:Predictive Failure	CHI-SQ(5)= 101.1438[.000]	F(5, 49)= 20.2288[.000]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
E:A test of adequacy of predictions (Chow's second test)

DATA : U.K.

OBS.	IP	UKYDS	M1	BACREIN	BACROIN
74Q1	27.1000	18494.0	12123.0	10655.0	16721.0
74Q2	28.0000	20140.0	12520.0	11415.0	17000.0
74Q3	30.2000	22155.0	12798.0	12638.0	17804.0
74Q4	32.0000	23890.0	13714.0	13074.0	18180.0
75Q1	34.8000	23845.0	13763.0	13617.0	18710.0
75Q2	36.6000	25820.0	15292.0	10757.0	18465.0
75Q3	38.6000	27502.0	16032.0	10825.0	19133.0
75Q4	39.8000	29816.0	16680.0	10600.0	19543.0
76Q1	41.3000	29748.0	16906.0	10454.0	19612.0
76Q2	42.3000	30377.0	17468.0	10679.0	20371.0
76Q3	43.5000	32532.0	18560.0	11495.0	21182.0
76Q4	44.8000	35125.0	18897.0	12490.0	22423.0
77Q1	46.7000	33804.0	18392.0	12799.0	22385.0
77Q2	47.6000	35423.0	19825.0	12849.0	23108.0
77Q3	48.9000	37549.0	20796.0	13790.0	23820.0
77Q4	49.8000	40344.0	22695.0	13857.0	24247.0
78Q1	52.8000	39448.0	22886.0	14365.0	24612.0
78Q2	53.6000	41116.0	23594.0	14812.0	26051.0
78Q3	54.7000	43306.0	24621.0	15408.0	26047.0
78Q4	55.3000	45753.0	26137.0	15651.0	26931.0
79Q1	57.7000	44027.0	25659.0	16488.0	27741.0
79Q2	59.2000	47813.0	26590.0	17301.0	28619.0
79Q3	62.3000	51815.0	27376.0	18220.0	29270.0
79Q4	64.5000	54803.0	28318.0	18783.0	30758.0
80Q1	68.1000	54096.0	27188.0	19872.0	31714.0
80Q2	70.5000	55511.0	27595.0	20962.0	33036.0
80Q3	73.8000	60264.0	28388.0	23297.0	35177.0
80Q4	76.5000	62676.0	30161.0	22960.0	35901.0
81Q1	78.3000	61209.0	29398.0	22908.0	37255.0
81Q2	78.5000	62077.0	31077.0	22813.0	39314.0
81Q3	80.1000	65165.0	31727.0	24710.0	43133.0
81Q4	81.3000	67915.0	34859.0	24594.0	47211.0
82Q1	82.7000	66963.0	34244.0	26418.0	53936.0
82Q2	84.4000	67554.0	36777.0	26828.0	58192.0
82Q3	85.9000	70778.0	37819.0	27984.0	61844.0
82Q4	87.1000	74286.0	40035.0	29047.0	65805.0
83Q1	88.7000	73668.0	41290.0	29562.0	71672.0
83Q2	88.7000	72982.0	42435.0	28915.0	73419.0
83Q3	90.6000	77496.0	42766.0	30479.0	77060.0
83Q4	91.6000	81276.0	44539.0	31433.0	82238.0
84Q1	92.7000	78819.0	46372.0	32349.0	86100.0
84Q2	94.4000	77957.0	48499.0	33392.0	90684.0
84Q3	95.0000	81228.0	49855.0	34035.0	95006.0
84Q4	96.9000	86627.0	51558.0	36360.0	102955.0
85Q1	98.4000	85258.0	53462.0	38362.0	112767.0
85Q2	99.5000	85685.0	55947.0	36406.0	114522.0
85Q3	100.4000	89767.0	58507.0	36482.0	114927.0
85Q4	101.6000	95229.0	60957.0	36382.0	118697.0
86Q1	101.6000	91570.0	64191.0	36861.0	122277.0
86Q2	102.2000	92113.0	68370.0	37831.0	129989.0

OBS.	IP	UKYDS	M1	BACREIN	BACROIN
86Q3	102.8000	96772.0	73307.0	38429.0	137682.0
86Q4	103.8000	102680.0	74695.0	39612.0	149833.0
87Q1	105.3000	99244.0	79170.0	39893.0	157659.0
87Q2	107.6000	100624.0	84982.0	42301.0	171342.0
87Q3	108.6000	107250.0	88664.0	41571.0	180908.0
87Q4	109.7000	113739.0	91866.0	41853.0	190749.0
88Q1	111.3000	109690.0	95799.0	42767.0	196187.0
88Q2	113.6000	111742.0	100883.0	45595.0	206869.0
88Q3	116.0000	119512.0	103987.0	52258.0	221554.0
88Q4	118.1000	126289.0	105048.0	55801.0	233364.0
89Q1	121.1000	122509.0	*NONE*	58151.0	250551.0
89Q2	123.4000	123321.0	*NONE*	62189.0	267262.0
89Q3	124.5000	129580.0	*NONE*	69420.0	309287.0
89Q4	125.4000	136089.0	*NONE*	71480.0	324492.0
90Q1	128.7000	132339.0	*NONE*	73250.0	332208.0
90Q2	133.0000	133459.0	*NONE*	74957.0	342310.0
90Q3	136.5000	138845.0	*NONE*	74814.0	346054.0
90Q4	136.9000	144869.0	*NONE*	76972.0	356647.0
91Q1	139.5000	136597.0	*NONE*	76913.0	364411.0
91Q2	141.9000	140385.0	*NONE*	76976.0	373765.0
91Q3	143.7000	146129.0	*NONE*	75280.0	375420.0
91Q4	144.0000	152253.0	*NONE*	74870.0	384545.0
92Q1	145.1000	*NONE*	*NONE*	74471.0	359764.0
92Q2	147.5000	*NONE*	*NONE*	72256.0	360748.0
92Q3	148.1000	*NONE*	*NONE*	71540.0	358591.0
92Q4	*NONE*	*NONE*	*NONE*	*NONE*	*NONE*

OBS.	TREBIRA	ROV	RLCB	LNM1	LBACROIN	LBACREIN
74Q1	*NONE*	*NONE*	*NONE*	9.4029	9.7244	9.2738
74Q2	11.2400	13.0000	9.5000	9.4351	9.7410	9.3427
74Q3	10.9800	13.0000	9.5000	9.4570	9.7872	9.4445
74Q4	10.9900	13.0000	9.5000	9.5262	9.8081	9.4784
75Q1	9.3700	11.5000	7.5000	9.5297	9.8368	9.5191
75Q2	9.4800	10.5000	6.2500	9.6351	9.8236	9.2833
75Q3	10.4800	11.0000	6.5000	9.6823	9.8592	9.2896
75Q4	10.6400	12.0000	7.0000	9.7220	9.8804	9.2686
76Q1	8.4200	10.5000	5.5000	9.7354	9.8839	9.2547
76Q2	10.9900	11.5000	6.5000	9.7681	9.9219	9.2760
76Q3	12.3500	13.0000	8.5000	9.8288	9.9609	9.3497
76Q4	13.5100	15.0000	11.0000	9.8468	10.0178	9.4327
77Q1	9.3500	10.5000	5.0000	9.8197	10.0161	9.4571
77Q2	7.4600	9.5000	4.0000	9.8947	10.0479	9.4610
77Q3	5.3000	8.0000	3.0000	9.9425	10.0783	9.5317
77Q4	6.2900	8.1200	4.0000	10.0299	10.0960	9.5365
78Q1	5.9900	7.5000	3.0000	10.0383	10.1110	9.5725
78Q2	9.2700	11.0000	6.7500	10.0687	10.1678	9.6032
78Q3	9.1700	11.0000	6.7500	10.1114	10.1677	9.6426
78Q4	11.5600	13.5000	10.0000	10.1711	10.2010	9.6583
79Q1	11.4400	14.0000	10.5000	10.1526	10.2307	9.7104
79Q2	13.3300	15.0000	11.5000	10.1883	10.2618	9.7585
79Q3	13.3600	15.0000	11.5000	10.2174	10.2843	9.8103
79Q4	15.8400	18.0000	15.0000	10.2513	10.3339	9.8407
80Q1	16.2800	18.0000	15.0000	10.2105	10.3645	9.8971
80Q2	15.6800	18.0000	15.0000	10.2254	10.4054	9.9505
80Q3	14.4000	17.0000	14.0000	10.2537	10.4681	10.0561
80Q4	13.0700	15.0000	11.6800	10.3143	10.4885	10.0415
81Q1	11.5300	13.6400	9.9100	10.2887	10.5255	10.0392
81Q2	12.0900	13.0000	9.0000	10.3442	10.5793	10.0351
81Q3	13.9600	14.0000	10.2500	10.3649	10.6720	10.1150
81Q4	14.5100	15.6000	12.5500	10.4591	10.7624	10.1103
82Q1	12.4900	14.2200	10.5400	10.4413	10.8956	10.1818
82Q2	12.2300	13.6400	9.6900	10.5126	10.9715	10.1972
82Q3	9.9100	11.5000	7.3100	10.5406	11.0324	10.2394
82Q4	9.9000	11.0600	6.7500	10.5975	11.0945	10.2767
83Q1	10.4100	11.7200	7.7200	10.6284	11.1799	10.2942
83Q2	9.4700	10.7300	6.3400	10.6557	11.2039	10.2721
83Q3	9.1600	10.5000	6.0000	10.6635	11.2523	10.3248
83Q4	8.8700	10.0000	5.5000	10.7041	11.3174	10.3556
84Q1	8.4300	9.7400	5.3100	10.7445	11.3633	10.3843
84Q2	8.8600	10.1500	5.8100	10.7893	11.4151	10.4161
84Q3	10.0200	11.5000	7.3100	10.8169	11.4617	10.4351
84Q4	9.1000	10.5600	6.2500	10.8505	11.5420	10.5012
85Q1	12.9300	14.8000	10.1300	10.8867	11.6331	10.5548
85Q2	11.8900	13.5500	9.3500	10.9322	11.6485	10.5025
85Q3	11.0600	12.5000	7.8600	10.9769	11.6521	10.5046
85Q4	11.1500	12.5000	7.8600	11.0179	11.6843	10.5018
86Q1	11.0600	13.1300	8.3500	11.0696	11.7140	10.5149
86Q2	9.3200	11.0000	6.0800	11.1327	11.7752	10.5409

OBS.	TREBIRA	ROV	RLCB	LNM1	LBACROIN	LBACREIN
86Q3	9.6100	11.0000	6.0800	11.2024	11.8327	10.5566
86Q4	10.6600	12.0000	6.9200	11.2212	11.9173	10.5869
87Q1	9.3500	11.4300	6.1600	11.2794	11.9682	10.5940
87Q2	8.5400	10.0000	4.6900	11.3502	12.0514	10.6526
87Q3	9.6900	11.0000	4.9000	11.3926	12.1057	10.6352
87Q4	8.1900	8.5700	3.6700	11.4281	12.1587	10.6419
88Q1	8.4400	8.7600	3.8200	11.4700	12.1868	10.6635
88Q2	8.4900	8.5700	2.8700	11.5217	12.2398	10.7276
88Q3	11.5600	13.0000	5.1200	11.5520	12.3084	10.8639
88Q4	12.5500	14.0000	5.7000	11.5622	12.3604	10.9295
89Q1	12.4100	14.0000	5.9700	*NONE*	12.4314	10.9708
89Q2	13.5900	15.0000	5.9700	*NONE*	12.4960	11.0379
89Q3	13.4400	15.0000	5.9700	*NONE*	12.6420	11.1479
89Q4	14.5000	16.0000	6.5900	*NONE*	12.6900	11.1772
90Q1	14.5900	16.0000	6.5900	*NONE*	12.7135	11.2016
90Q2	14.3200	16.0000	6.5900	*NONE*	12.7435	11.2247
90Q3	14.2300	16.0000	6.5900	*NONE*	12.7544	11.2228
90Q4	12.1100	15.0000	5.1100	*NONE*	12.7845	11.2512
91Q1	11.5600	14.0000	5.1100	*NONE*	12.8060	11.2504
91Q2	10.7500	12.5000	5.1100	*NONE*	12.8314	11.2512
91Q3	9.6600	11.5500	*NONE*	*NONE*	12.8358	11.2290
91Q4	10.1000	11.5000	*NONE*	*NONE*	12.8598	11.2235
92Q1	10.1000	11.5000	*NONE*	*NONE*	12.7932	11.2182
92Q2	9.4200	11.0000	*NONE*	*NONE*	12.7959	11.1880
92Q3	9.1600	9.7700	*NONE*	*NONE*	12.7899	11.1780
92Q4	*NONE*	*NONE*	*NONE*	*NONE*	*NONE*	*NONE*

OBS.	LBACRTO	LRUKYDS
74Q1	10.2174	6.5257
74Q2	10.2547	6.5783
74Q3	10.3236	6.5980
74Q4	10.3499	6.6155
75Q1	10.3837	6.5297
75Q2	10.2827	6.5589
75Q3	10.3076	6.5688
75Q4	10.3137	6.6189
76Q1	10.3112	6.5797
76Q2	10.3434	6.5767
76Q3	10.3944	6.6172
76Q4	10.4606	6.6645
77Q1	10.4683	6.5846
77Q2	10.4901	6.6123
77Q3	10.5350	6.6436
77Q4	10.5481	6.6972
78Q1	10.5707	6.6162
78Q2	10.6180	6.6426
78Q3	10.6324	6.6742
78Q4	10.6592	6.7182
79Q1	10.6971	6.6373
79Q2	10.7347	6.6941
79Q3	10.7683	6.7235
79Q4	10.8106	6.7448
80Q1	10.8510	6.6775
80Q2	10.8967	6.6687
80Q3	10.9763	6.7051
80Q4	10.9829	6.7084
81Q1	11.0048	6.6615
81Q2	11.0369	6.6730
81Q3	11.1250	6.7014
81Q4	11.1817	6.7279
82Q1	11.2942	6.6967
82Q2	11.3506	6.6851
82Q3	11.4057	6.7141
82Q4	11.4601	6.7486
83Q1	11.5252	6.7221
83Q2	11.5360	6.7127
83Q3	11.5856	6.7515
83Q4	11.6411	6.7882
84Q1	11.6822	6.7455
84Q2	11.7286	6.7164
84Q3	11.7679	6.7511
84Q4	11.8445	6.7957
85Q1	11.9259	6.7644
85Q2	11.9246	6.7583
85Q3	11.9277	6.7958
85Q4	11.9517	6.8430
86Q1	11.9775	6.8038
86Q2	12.0306	6.8038

OBS.	LBACRTO	LRUKYDS
86Q3	12.0789	6.8473
86Q4	12.1519	6.8969
87Q1	12.1938	6.8485
87Q2	12.2721	6.8407
87Q3	12.3126	6.8952
87Q4	12.3571	6.9439
88Q1	12.3840	6.8932
88Q2	12.4390	6.8913
88Q3	12.5202	6.9376
88Q4	12.5748	6.9748
89Q1	12.6401	6.9193
89Q2	12.7052	6.9071
89Q3	12.8445	6.9477
89Q4	12.8891	6.9896
90Q1	12.9128	6.9356
90Q2	12.9415	6.9112
90Q3	12.9501	6.9248
90Q4	12.9799	6.9643
91Q1	12.9975	6.8867
91Q2	13.0186	6.8970
91Q3	13.0186	6.9245
91Q4	13.0377	6.9635
92Q1	12.9813	*NONE*
92Q2	12.9785	*NONE*
92Q3	12.9718	*NONE*
92Q4	*NONE*	*NONE*

DATA: GERMANY

OBS.	M1	IPGNP	GGNP	BACREMA	GTRBR	RCRCA
74Q1	132.9000	63.6000	229.1000	114.1000	7.1200	*NONE*
74Q2	140.8000	64.8000	238.9000	117.7000	5.7100	*NONE*
74Q3	141.5000	65.9000	250.8000	119.0000	5.7100	*NONE*
74Q4	158.4000	69.2000	264.9000	120.6000	5.1900	*NONE*
75Q1	149.3000	68.2000	237.8000	117.1000	3.3800	11.5000
75Q2	160.6000	69.1000	249.2000	115.3000	3.3800	10.2800
75Q3	164.4000	69.2000	259.7000	112.7000	3.1300	9.0900
75Q4	179.9000	72.3000	281.0000	114.7000	3.1300	8.8500
76Q1	166.8000	70.5000	260.7000	110.0000	3.1300	8.6800
76Q2	180.2000	71.6000	274.7000	112.9000	3.1300	8.3400
76Q3	176.9000	72.4000	283.0000	114.1000	3.1800	8.3400
76Q4	186.9000	74.4000	305.4000	119.2000	3.1800	8.3200
77Q1	179.7000	72.9000	280.2000	116.6000	3.1800	8.2600
77Q2	190.5000	74.4000	291.1000	119.2000	3.1800	7.9600
77Q3	193.1000	74.7000	296.9000	119.2000	3.1800	7.8300
77Q4	208.1000	77.7000	327.4000	125.2000	2.6700	7.7400
78Q1	204.2000	76.1000	300.0000	118.8000	2.6700	7.3400
78Q2	215.4000	77.4000	314.7000	122.4000	2.6700	7.2700
78Q3	217.5000	78.4000	324.2000	123.0000	2.6700	7.3000
78Q4	237.9000	80.5000	350.5000	128.6000	2.6700	7.2900
79Q1	225.5000	79.1000	322.4000	127.4000	3.6800	7.4200
79Q2	233.1000	80.0000	340.4000	133.1000	3.6800	8.2700
79Q3	230.2000	81.4000	351.2000	134.9000	4.7000	9.2400
79Q4	247.9000	84.2000	379.8000	144.0000	5.7300	10.3900
80Q1	228.7000	82.7000	352.4000	138.5000	6.7600	11.6600
80Q2	237.1000	84.5000	361.8000	144.0000	7.2800	12.5400
80Q3	237.8000	85.4000	369.0000	142.2000	7.2800	12.5300
80Q4	257.3000	88.1000	394.2000	174.0000	7.2800	12.5700
81Q1	232.4000	85.9000	362.6000	175.6000	7.2800	14.2100
81Q2	242.5000	87.5000	373.8000	178.9000	7.2800	15.2900
81Q3	234.3000	88.7000	386.1000	178.1000	7.2800	15.4400
81Q4	255.3000	92.5000	417.1000	181.4000	7.2800	15.0100
82Q1	237.6000	90.2000	377.9000	175.8000	7.2800	14.6100
82Q2	250.7000	91.4000	389.0000	177.6000	7.2800	13.6100
82Q3	248.5000	92.8000	397.0000	179.1000	6.7600	13.0600
82Q4	273.1000	96.1000	426.4000	180.8000	4.7000	11.1300
83Q1	263.4000	93.6000	395.0000	173.1000	3.6800	10.7200
83Q2	277.9000	94.4000	407.5000	176.1000	3.6800	9.7700
83Q3	274.0000	95.9000	417.4000	177.1000	3.6800	9.8000
83Q4	295.8000	99.2000	455.8000	181.9000	3.6800	9.7700
84Q1	272.5000	96.2000	421.8000	178.8000	3.6800	9.7800
84Q2	282.8000	96.6000	422.9000	181.7000	4.1900	9.7800
84Q3	281.5000	97.3000	439.6000	182.5000	4.1900	9.8900
84Q4	314.2000	101.1000	479.0000	186.0000	4.1900	9.7800
85Q1	285.2000	98.0000	428.8000	188.9000	4.1900	9.8000
85Q2	294.4000	98.4000	444.0000	191.9000	4.1900	9.7500
85Q3	297.8000	99.7000	463.3000	188.3000	3.6800	9.1400
85Q4	334.1000	103.6000	498.4000	197.4000	3.6800	9.1300
86Q1	313.4000	100.9000	447.5000	199.4000	3.1800	8.8400
86Q2	329.3000	101.9000	474.0000	202.5000	3.1800	8.6900

OBS.	M1	IPGNP	GGNP	BACREMA	GTRBR	RCRCA
86Q3	326.9000	103.1000	488.6000	201.5000	3.1800	8.6400
86Q4	358.8000	106.9000	526.0000	206.2000	3.1800	8.6300
87Q1	336.8000	103.6000	467.6000	203.7000	2.6700	8.4500
87Q2	358.7000	104.3000	488.3000	204.4000	2.6700	8.2900
87Q3	357.2000	104.4000	502.3000	208.0000	2.6700	8.2800
87Q4	385.2000	108.5000	544.8000	208.9000	2.1600	8.1800
88Q1	369.5000	104.7000	495.3000	208.0000	2.1600	8.0700
88Q2	393.5000	105.9000	511.9000	212.9000	2.6700	8.0600
88Q3	389.1000	106.3000	528.7000	213.9000	3.1800	8.7000
88Q4	427.0000	110.4000	572.1000	221.1000	3.1800	8.6900
89Q1	403.2000	107.4000	530.6000	225.1000	3.6900	9.2600
89Q2	412.0000	108.4000	548.8000	231.6000	4.7000	9.7300
89Q3	408.7000	109.1000	558.8000	237.1000	4.7000	10.1400
89Q4	450.6000	113.7000	607.0000	243.5000	5.7300	11.1000
90Q1	412.8000	110.8000	570.3000	248.8000	5.7300	11.5200
90Q2	483.2000	112.0000	585.9000	254.4000	5.7300	11.6000
90Q3	502.8000	113.4000	612.6000	257.4000	5.7300	11.6900
90Q4	584.2000	117.2000	656.7000	263.0000	5.7300	11.9700
91Q1	530.4000	*NONE*	*NONE*	343.4000	6.2500	12.2200
91Q2	541.0000	*NONE*	*NONE*	354.5000	6.2600	12.2600
91Q3	546.9000	*NONE*	*NONE*	357.9000	7.2800	12.9200
91Q4	604.3000	*NONE*	*NONE*	359.9000	7.8000	12.9500
92Q1	556.6000	*NONE*	*NONE*	356.0000	*NONE*	13.3800
92Q2	576.4000	*NONE*	*NONE*	364.2000	*NONE*	13.4400
92Q3	588.2000	*NONE*	*NONE*	359.4000	*NONE*	14.0500
92Q4	669.6000	*NONE*	*NONE*	339.9000	*NONE*	*NONE*

OBS.	LNM1	LRGGNP	LIPGNP	LBACREMA
74Q1	4.8896	1.2815	4.1526	4.7371
74Q2	4.9473	1.3047	4.1713	4.7681
74Q3	4.9523	1.3365	4.1881	4.7791
74Q4	5.0651	1.3424	4.2370	4.7925
75Q1	5.0060	1.2490	4.2224	4.7630
75Q2	5.0789	1.2827	4.2356	4.7475
75Q3	5.1023	1.3225	4.2370	4.7247
75Q4	5.1924	1.3575	4.2808	4.7423
76Q1	5.1168	1.3078	4.2556	4.7005
76Q2	5.1941	1.3446	4.2711	4.7265
76Q3	5.1756	1.3632	4.2822	4.7371
76Q4	5.2306	1.4122	4.3095	4.7808
77Q1	5.1913	1.3464	4.2891	4.7587
77Q2	5.2497	1.3642	4.3095	4.7808
77Q3	5.2632	1.3799	4.3135	4.7808
77Q4	5.3380	1.4383	4.3529	4.8299
78Q1	5.3191	1.3717	4.3320	4.7774
78Q2	5.3725	1.4026	4.3490	4.8073
78Q3	5.3822	1.4195	4.3618	4.8122
78Q4	5.4719	1.4711	4.3883	4.8567
79Q1	5.4183	1.4051	4.3707	4.8473
79Q2	5.4515	1.4481	4.3820	4.8911
79Q3	5.4389	1.4620	4.3994	4.9045
79Q4	5.5130	1.5064	4.4332	4.9698
80Q1	5.4324	1.4495	4.4152	4.9309
80Q2	5.4685	1.4543	4.4368	4.9698
80Q3	5.4714	1.4635	4.4473	4.9572
80Q4	5.5502	1.4984	4.4785	5.1591
81Q1	5.4485	1.4401	4.4532	5.1682
81Q2	5.4910	1.4521	4.4716	5.1868
81Q3	5.4566	1.4708	4.4853	5.1823
81Q4	5.5424	1.5061	4.5272	5.2007
82Q1	5.4706	1.4326	4.5020	5.1693
82Q2	5.5243	1.4483	4.5152	5.1795
82Q3	5.5154	1.4535	4.5304	5.1879
82Q4	5.6098	1.4900	4.5654	5.1974
83Q1	5.5737	1.4399	4.5390	5.1539
83Q2	5.6273	1.4625	4.5475	5.1711
83Q3	5.6131	1.4707	4.5633	5.1767
83Q4	5.6897	1.5249	4.5971	5.2035
84Q1	5.6076	1.4781	4.5664	5.1863
84Q2	5.6447	1.4766	4.5706	5.2024
84Q3	5.6401	1.5081	4.5778	5.2068
84Q4	5.7500	1.5556	4.6161	5.2257
85Q1	5.6532	1.4760	4.5850	5.2412
85Q2	5.6849	1.5068	4.5890	5.2570
85Q3	5.6964	1.5362	4.6022	5.2380
85Q4	5.8114	1.5709	4.6405	5.2852
86Q1	5.7475	1.4895	4.6141	5.2953
86Q2	5.7970	1.5372	4.6240	5.3107

OBS.	LNM1	LRGGNP	LIPGNP	LBACREMA
86Q3	5.7897	1.5558	4.6357	5.3058
86Q4	5.8828	1.5934	4.6719	5.3288
87Q1	5.8195	1.5071	4.6405	5.3166
87Q2	5.8825	1.5437	4.6473	5.3201
87Q3	5.8783	1.5710	4.6482	5.3375
87Q4	5.9538	1.6137	4.6868	5.3419
88Q1	5.9122	1.5541	4.6511	5.3375
88Q2	5.9751	1.5756	4.6625	5.3608
88Q3	5.9638	1.6042	4.6663	5.3655
88Q4	6.0568	1.6452	4.7041	5.3986
89Q1	5.9994	1.5974	4.6766	5.4165
89Q2	6.0210	1.6219	4.6858	5.4450
89Q3	6.0130	1.6335	4.6923	5.4685
89Q4	6.1106	1.6750	4.7336	5.4951
90Q1	6.0230	1.6384	4.7077	5.5166
90Q2	6.1804	1.6547	4.7185	5.5389
90Q3	6.2202	1.6868	4.7309	5.5506
90Q4	6.3702	1.7233	4.7639	5.5722
91Q1	6.2736	*NONE*	*NONE*	5.8389
91Q2	6.2934	*NONE*	*NONE*	5.8707
91Q3	6.3043	*NONE*	*NONE*	5.8803
91Q4	6.4041	*NONE*	*NONE*	5.8858
92Q1	6.3218	*NONE*	*NONE*	5.8749
92Q2	6.3568	*NONE*	*NONE*	5.8977
92Q3	6.3771	*NONE*	*NONE*	5.8844
92Q4	6.5067	*NONE*	*NONE*	5.8287

CHAPTER 4

IS IT MONEY, CREDIT OR BOTH, OR NEITHER? AN EMPIRICAL INVESTIGATION BASED ON THE FREE LIQUIDITY RATIO FOR COMMERCIAL BANKS.

This chapter is based on my paper "Free Liquidity Ratio for Commercial Banks: an Estimate with Italian Data" published (in English) on the Italian review "*Giornale degli Economisti e Annali di Economia*", vol. L, pp. 399-424, July-August 1991. I am very grateful to Giovanni Amisano, Wiji Narendranathan, and the anonymous referees of the above-mentioned review for their helpful comments. I am also indebted to Norman Ireland and Keith Cowling for their valuable suggestions. None of them is responsible for any mistake that might be found here

IS IT MONEY, CREDIT OR BOTH, OR NEITHER? AN EMPIRICAL INVESTIGATION BASED ON THE FREE LIQUIDITY RATIO FOR COMMERCIAL BANKS.

1. Introduction

The previous chapters have analyzed the macroeconomic implications of oligopsony in the market for credit, and the implications of financial systems' securitization. Since some emphasis has been put on the behaviour of the banking system, it would be interesting, at this point, to have a closer look at the assumptions concerning the behaviour of the banks. In particular, in accordance with Bernanke and Blinder's [1988] model - signalled in chapter 3 as an important theoretical foundation for the "institutional analysis" performed there - the banking system has been assumed to play an important role in the allocation of the financial funds, as argued by the "credit view", in contrast with the traditional orthodox approach that described the banking system as a mere passive "veil" on the economy. The main differences between the two approaches lie, of course, in the relevance of market imperfections and information asymmetries, but also, as a consequence, in the extent to which the autonomous financial investment decisions of the banks affect the aggregate level of physical investment. If the non-remunerated liquid assets in the banks' portfolios reflect a non-investment decision, a decision to postpone an investment decision, then a detailed empirical analysis of the banks' "liquidity preference" could turn out to be an interesting - although only partial - test on the reliability of a few assumptions of the "credit view".

The commercial banks' free liquid reserves have been the object of a few empirical studies in the 1970s and in the early 1980s, in connection with the debate on the stability of the demand for money (for instance Cagan [1969], Bryant [1983], Langhor [1981], Richter and Teigen [1982], Wessels [1982]). Surprisingly, such empirical studies do not seem any longer to be a very central topic, although the free liquid reserves play an important theoretical role for at least two reasons. First of all, the free liquidity ratio contributes to determine the money multiplier, and, therefore, its behaviour directly affects the behaviour of the money stock. Secondly, the free liquid reserves of commercial banks are commonly regarded as a "shock absorber", due to their high degree of liquidity. This implies that, if the bank's willingness to supply funds determines the aggregate level of credit and liquidity, then - given the balance sheet equality between banks' deposits and banks' assets - the level of free liquid reserves must be negatively correlated to the value of less liquid financial assets.

The next section briefly surveys the empirical literature on commercial banks' free reserves and its theoretical foundations. Section 3 contains a brief non-formal description of the literature on (partially) irreversible investments under uncertainty, and a few considerations on how this kind of literature might be used as an interpretative tool to describe the behaviour of free liquid reserves. Section 4 presents a few empirical estimates based on a model that incorporates into the standard approach - based on the portfolio allocation theory - a few theoretical aspects of the literature analyzed in section 3. Section 5 draws a few conclusions. In particular, it will be argued that the empirical results shown in this paper are consistent with the "credit view", such as illustrated in the famous contribution by Bernanke and Blinder [1988].

2. A few comments on some standard empirical works.

The behaviour of the free liquidity ratio for commercial banks has often been related to the availability of liquidity and borrowing from the central bank (Langhor [1981], Wessels [1982], Richter and Teigen [1982]). The traditional background is provided by the portfolio allocation theory. The explanatory variables usually considered are the level of liquidity, such as determined by the public and by the foreign sector, some kind of opportunity cost, and the own yields on liquid assets, all of which summarized by some relevant interest rate. In most empirical contributions, as often happens for the estimates of financial variables, the explanatory power of the equations describing borrowing from the central bank, or commercial banks' free liquidity ratio is not very high. This fact is often justified by the high volatility of financial variables.

The free reserves of commercial banks are in general assumed to depend positively on their own yield, and negatively on the yield on alternative assets, in accordance with the standard wealth allocation theory. In addition, the free liquid reserves can be regarded as a sort of "shock absorber" for commercial banks. In such a context, a new interpretation of the free liquidity ratio is possible, as we will see in the next section.

The rate of interest on riskless alternative liquid assets in Italy is traditionally the rate on short term treasury bills. The own yield on free reserves in Italy has been fixed at 0.5% for more than thirty years: obviously such a variable cannot describe properly the dynamics of the own yield on banks' free reserves. Arguing that free reserves are most required the more frequently the required reserves fluctuate, Richter and Teigen [1982] use the variance of constrained reserves as a proxy variable for the yield on free reserves. Since the required reserves ratio has been subject in Italy only to rare modifications, this solution does not seem to apply to the Italian case, and in any case, the variance of liquid constrained reserves over twelve months turned out to be non significant in preliminary analyses performed with our data.

Some early studies (for example Cagan [1969]) consider the rate of interest on banks' borrowing from the central bank as a proxy for the yield on free reserves, because the higher the free reserves ratio, the less likely it is that the banks need to borrow from the central bank; and the higher the interest rate on banks' borrowing, the more convenient it is to keep reserves. This point could be criticized because the same reasoning could apply to the interbank rate, or to the "call money rate", whose behaviour is closely related to that of the treasury bill rate, which is regarded as an opportunity cost and not as a yield on reserves.

To the extent that the free reserves of commercial banks play the role of "shock absorbers", an empirical specification describing their behaviour should include the information about shocks in the supply of liquidity determined by the public and foreign sectors. For this reason, Richter and Teigen [1982] included two more variables for free liquid reserves of commercial banks in their equation: the first one is the ratio between the variation of the net central bank balances of the state, and the total deposits. The second is the ratio of the variation of the net foreign balances of the central bank and the total deposits. Richter and Teigen point out that the signs of the coefficients referred to these two regressors cannot be established *a priori*, and indeed in their estimates the sign of the coefficient of the latter variable changes throughout two different sample periods. In fact their size and dynamic path might reflect or determine expectations about future policy interventions: if, for example, the net foreign position of the central bank showed a persistent drastic variation, one could expect some intervention of the central bank, meant to affect the liquidity of the system, according to the monetary policy targets. Similarly, the size and dynamic path of the net central bank balances of the state could determine the expectations of some other policy decisions, such as open market operations. All these reasons suggest that the dynamic path of the liquidity created by the state and foreign sectors may be relevant not only for its direct effect, but also because they contribute to determine expectations about policy interventions.

The rate of inflation, and, possibly, its rate of growth, could capture some of the opportunity costs of holding free liquid reserves, especially in a context like the Italian one, where the yield on free reserves has been kept constant at a very low level for a long time.

the setting of our model is only partly similar to that of Richter and Teigen [1982], because the own yield on free liquid reserves has been interpreted here according to the above-mentioned literature on investments with sunk costs under uncertainty. The next section contains a brief explanation of such theoretical approaches.

3. A new possible interpretation of the free liquidity ratio for commercial banks.

A new tool of interpretation for the free liquidity ratio of commercial banks may be provided by the recent literature on investment decisions under conditions of irreversibility and uncertainty (Bertola and Caballero [1991], Dixit [1992a], [1992b], Pindyck [1991]) - which provides a useful framework of interpretation for the decision of "non-investing" - and by a recent "new-keynesian" contribution which applies the conceptual framework of irreversible investment under uncertainty to the case where the decision of "non-investing" corresponds to a decision of investing in liquid assets (Chamley [1993]). The purpose of the discussion of the present section is to provide an alternative theoretical interpretation of the variable "yield" on the free reserves of commercial banks which has always been a weak point of the empirical works on this issue, given the fact that, as is well known, free reserves are usually non-remunerated and, therefore, the yield justifying their existence has to be defined on a more theoretical ground. Since many of the contributions mentioned early in this section provide exhaustive surveys on the literature on investments with sunk costs under uncertainty, only a brief summary of the main points of this approach will be presented in what follows.

The starting point of the literature on irreversible investments under uncertainty is provided by the observation that most models of investment decision are based on the implicit assumption that the investment expenditure is reversible. This is also one of the basic implicit hypotheses of the familiar "net present value" rule, stating that firms should take up a project of investment when the net present value of its cash flow is at least as large as its costs.

In the real world, on the other hand, the investment decision usually takes place under the following conditions:

a) sunk costs, due to the fact that the investment might be firm-specific or industry-specific; in the case of bank loans and financial investments the presence of sunk costs - from the point of view of the bank - is due to the presence of "lemon problems": in other words, the bank invests in financial assets carrying some intrinsic risk of capital losses, due not only to the possible bankruptcy of a borrower, but also to potential unexpected changes in the market interest rates, susceptible to determine a change in the market value of the bank loans and other financial assets;

b) "on-going" uncertainty concerning the future profitability of the specific investment, the latter being only inferred on the basis of some probability calculus;

c) relevance of decision timing: in other words, the investment can be delayed, allowing the firm (in our case the bank) to collect further information on all of the variables affecting the investment profitability, before committing its resources.

The three above-mentioned conditions imply that the investor (i.e., in this case the bank) has to take into account the presence of a potential positive "value of waiting". In this context, the investment decision has been described by using the parallel of the "call option" in financial economics: the financial investment is not undertaken when the financial investment is "only just in the money", while it is undertaken when the option is "well in the money". In other words, the traditional "net present value" rule could be transformed into a rule suggesting that *an investment should be undertaken if the net present value of its cash flow exceeds the purchase and installation cost by an amount at least equal to the value of keeping the option to invest the same resources elsewhere.*

The problem could be simply described as follows.

Let x_t be a variable directly affecting the level of financial profits (for instance, the price of the financial asset under consideration), let $\pi(x_t)$ be an indicator of the profitability of the financial investment, and let $F(x_{t+1}|x_t)$ be the probability distribution of $x_{t+1}|x_t$, i.e. The probability distribution of x_{t+1} given the value of x_t. Then, the value of having in hand a financial investment can be defined as follows:

$$V_1(x^*) = E_0 \{ \sum_{t=0}^{\infty} \beta^t \pi(x_t) | x_0 = x^* \}$$

where β^t is the factor of discount from the (future) time "t" to the present time t_0 and E_0 stands for "expectation at time t_0.

The value V_0 of having the option is given by the value of being free between choosing to invest immediately (by paying a given immediate cost, say "k") and postponing the investment decision by one period. Formally, this could be described as follows.

$$V_0 = \max \{ V_1(x_t) - k, \quad \beta \cdot E[V_0(x_{t+1}) | x_t] \}$$

In the presence of uncertainty, and for given expectations of x_{t+1}, it may be rational for the investor to postpone the investment and wait for new information. It can be proved[12] that the higher the level of "on-going" uncertainty, the higher the value of "keeping alive" the option to invest in the future relative to the value of "having in hand" the investment project. In other words, an increase in the level of "on-going" uncertainty increases the "value of information". Dixit (1989, 1992a, 1992b) has employed this simple idea to formally explain some empirical phenomena, such as the persistence of relatively high profit margins in the absence of barriers to entry. It has also been pointed out (namely in Pindyck [1991] and Dixit [1992b]) that this same theoretical framework can be applied to the cases of financial investments and bank credit, to the extent that the presence of a "lemon premium" may cause financial investments to be partially irreversible. In many cases, the stochastic behaviour of the relevant state variable describing the "on-going" uncertainty (in our case x_t) has been described by a geometric Brownian motion (Bertola and Caballero [1991], Dixit [1992a], Pindyck [1988]).

The implications of these results for our analysis are quite straightforward. To the extent that the future value of the bank assets is uncertain, the investment decision is partially irreversible because it carries some kind of sunk costs. Therefore, it seems reasonable to assume that for some financial investments

12 See, for example Bertola and Caballero [1991]

the "value of waiting" is greater than the value of "having in hand" an investment project (i.e. a financial asset in our case). In such a context, the bank needs a sort of "buffer stock" asset; the investment into a "buffer stock" asset could be assimilated to a "non-investment" decision, taken in order to "wait" for more information about those specific financial investments that contain sunk costs.

Chamley [1993] provides a rigourous formalization of the investment decision in a model where the investment in liquid assets corresponds to "non-investment". In his model, postponing investments enables the agents to gather information and to avoid investments in bad states. Chamley proves (among other results) that "... if the time interval to reverse the no-investment position is sufficiently short, the immediate investment by all agents cannot be an equilibrium outcome, because in this outcome, each agent has an incentive to postpone his investment in order to learn first the impact of aggregate investment on his individual payoff" (Chamley [1993]).

Assuming that the commercial banks' free liquid reserves play the role of temporary liquid assets, their demand will be higher the higher the "value of waiting", i.e. the higher the degree of uncertainty about the future value of financial investments.

Since a big portion of banks' assets is constituted by direct credit to enterprises, it can be argued that the aggregate level of banks' free liquidity ratio (which is an aggregate stock of temporary liquid assets held by the banking system) might be affected by all those variables affecting the general degree of risk of the economy. An approximate measure of the risk of the economy might be given by the rate of variation of the price level, since it typically carries uncertain and asymmetric effects on the economy as a whole. In such a context, if the yield on the free liquid reserves is given by the "value of waiting" for additional information on the financial investments, then the rate of growth of the price level should act as a proxy for the yield on the free liquid reserves. As a consequence, the free liquidity ratio should be positively correlated with the rate of growth of the price level.

Obviously, the size of a temporary asset (like the free liquid reserves) might be affected by the volume of transactions performed by the banks and by the volume of credit intermediated. A variable that might capture the effect of such a "transactionary" motivation on the free liquidity ratio might be the gross margin of banks' intermediation, or a proxy for it.

In the empirical specification that follows, it has been assumed that the free liquid reserves of commercial banks behave at the same time as a financial market "buffer stock" asset (i.e. affected by considerations on the profitability of the financial investments and by the "value of waiting" for further information on the degree of riskiness of financial investments) and as a "transactionary" liquid asset, whose size is affected by the volume of transactions, determined by the margin of intermediation.

4. The model

The *free liquidity ratio* is defined as the ratio between the free reserves held by the commercial banks at the central banks and the total deposits. The estimates are based on quarterly data and have been implemented by following the "general-to-specific" methodology. The definitions of all the variables considered and all the tables with all the estimates and diagnostic tests are shown in the Appendix.

One of the main difficulties in building our model lies in the relevant institutional modifications that affected the Italian context throughout the sample period considered. In particular, among the most relevant phenomena, we can quote the gradual increase of importance of the stock market, and the birth of new kinds of financial intermediaries.

Like in Richter and Teigen, it will be assumed that the free liquidity ratio for commercial banks depends on the level of the required reserves ratio, on the variations of the liquidity stock determined by the State and by the foreign sector, on the opportunity cost of holding reserves, and on the yield of liquid reserves (or on the convenience of holding them). The opportunity cost is typically described by a representative money market interest rate. For what concerns the own yield of liquid reserves, while Richter and Teigen consider that the free liquid reserves are most required the higher the variance of the reserve requirement, in this work it will be assumed - on the basis of the above-mentioned literature on investment under uncertainty and with sunk costs - that the free liquidity ratio depends positively on the degree of uncertainty of the whole economy, summarized by the rate of growth of the price level. On the other hand, as far as a transactionary motivation for the liquid assets is also present, the free liquidity ratio should be positively correlated with the margin of intermediation - acting as a proxy for the volume of banks' financial intermediation - given that the higher the profitability of the bank intermediation, the higher the incentives to increase the existing stock of financial funds intermediated by the banks.

If the financial investment of the banks is regarded as partially irreversible and subject to uncertainty, and is assumed to be alternative to the choice of keeping the funds invested in liquid assets, then the free liquidity ratio should be positively correlated to the "value of waiting " for further information about the new financial investments, as argued above. If the "value of waiting" is a concept associated to the degree of uncertainty in the economy (in the sense that the higher the degree of uncertainty, the higher the value of "waiting for further information"), then the free liquidity ratio should be positively correlated with the rate of growth of the price level, which will be used here as a proxy for the degree of uncertainty of the whole economy. The variable employed for this purpose is the rate of variation of the implicit deflator of the gross domestic product, henceforth DINF. In fact, it is the rate of growth of the price level, rather than the price level itself, that best captures the concept of "on-going uncertainty", since a constant increase on the price level (i.e. a non-stationary trend in the prices time series) could be associated to a situation of constant inflation and static expectations, while, on the other hand, it is reasonable to expect that it is a trend in the *increase* in the price levels (i.e. a trend in the rate of growth of the price index) that more directly and explicitly affects the degree of uncertainty for the agents of the economy, by making more difficult for them to make inferences on the continuously changeable causal links existing among the different variables. Since the rate of growth of the price level is calculated with respect to two consequent periods of time, a qualitatively similar information could be captured by a suitable lag structure of the price level. Therefore, an alternative specification has also been implemented, which includes the price level (whose suitable lag structure will again be determined by following the general-to-specific approach) instead of its rate of growth DINF.

In the present model, the dependent variable is defined, like in Richter and Teigen [1982], as the ratio between the free bank reserves - or unconstrained banks' reserves - and total bank deposits, i.e. the current account, saving deposits, plus the deposit certificates of central banks. In the estimates, such a variable is defined as L3. Like Richter and Teigen, we assume that free reserves are affected by the behaviour of reserves requirements, but, unlike Richter and Teigen, the variance of reserves requirements is not regarded here as a proxy for the yield (or convenience) of holding free reserves, but, like in Richter and Teigen, it is still assumed that higher levels of reserve requirements would reduce the need for free reserves as a liquid asset, given that liquidity would in that case be less scarce (since the banks might be able, in case of need, to temporarily and costly diverge from the reserve requirements). For this reason, it is assumed here that the free liquidity ratio is negatively correlated with the coefficient of reserves requirements (defined as L1). Using the levels of L1 instead of its variance as a regressor constitutes, in our opinion, a more general approach: in fact, since we are following the general-to specific methodology, and our general unrestricted model contains four lags, if it is the variability rather than the level of reserve requirements that matters, this should be evident from the final dynamic structure of the model, which could suggest, if necessary, a re-specification of the whole model, according to the results of the diagnostic tests. However, it is assumed here that the required reserves are relevant also because the higher their level, the more costly (in terms of opportunity cost) it is to keep free liquid reserves, because in this way the banks have to waive a larger amount of potentially profitable financial investments. For this purpose, the variable considered here is defined as L1, and is the ratio between the constrained reserves and the total deposits. As will be pointed out later, and also in the tables of the appendix, the lagged values of L1 are not significant in the general unrestricted model with four lags. This confirms the fact that the variable L1 seems to be significant in its level rather than in its variance.

Like in Richter and Teigen, it is assumed that the free liquidity ratio is affected by the variations in the aggregate liquidity determined by the public sector and the foreign sector. the two variables here considered for this purpose are quite similar to the ones employed by Richter and Teigen: the first is defined as G and is the ratio between the variation of the credits of the Bank of Italy with the Public Sector and the average level of bank deposits over the considered period; the second, defined as FX, is the ratio between the variation of the net foreign position of the bank of Italy and the average level of deposits over the considered period.

As mentioned earlier, and on the basis of the literature on investments irreversibility, we assume that the free liquidity ratio should be higher the higher the degree of uncertainty and risk characterizing the whole economy. Therefore, since in the present model the proxy for the "value of waiting" is (as discussed above) DINF, then the dependent variable L3 is expected to be positively correlated with DINF. However, an alternative specification of a general unrestricted model containing a lag polynomial in the variable P (the implicit GDP deflator) instead of DINF will be considered. The results of such an alternative specification are - as we will see later - analogous to those of the specification with DINF.

Finally, the variable RDIFF3, defined as the difference between the rate of interest on the bonds issued by special credit institutions (RBCI) and the rate of discount (RD), has been considered. There are several reasons that justify a variable so defined. First of all, RBCI can be regarded as a representative medium-long term interest rate, while RD is - obviously - a typical money market interest rate. Therefore RDIFF3 contains information on the time structure of the interest rate, whose modifications may determine re-allocations of the banks' assets. To the extent that the free reserves are a temporary liquid asset, their relative size should be positively correlated to the volume of funds re-allocations performed by the banks.

Secondly, RDIFF3 could be regarded as a proxy for banks' profitability because, being determined by the difference between a long run and a short run interest rate (and containing therefore information on the term structure of the interest rates), it provides information about one of the most typical roles of the banking system: transforming the maturity and degree of risk of financial assets. In addition, in Italy, for a large part of the time series here considered, many small banks operating only locally had been investing most of their funds in assets issued by special credit institutions operating in the medium and long run. This situation gave rise to the phenomenon known in the Italian context as "double intermediation".

To the extent that RDIFF3 contains information on banks' profitability, it should be regarded as an opportunity cost of holding free reserves, and should be expected to be negatively correlated with L3. On the other hand, if the free liquid reserves are mainly a temporary liquid asset, determined by the process of funds re-allocation, we should expect the variations of RDIFF3 to be positively correlated with L3, because changes in the term structure of the interest rate should determine a re-allocations of the banks' financial funds.

The signs of the various coefficients of the lag polynomial of RDIFF3 can tell us whether free liquid reserves have to be interpreted as a temporary asset held in the process of transactions and re-allocations, or according to the wealth allocation theory, which would suggest that RDIFF3 plays the role of an opportunity cost, and should therefore be negatively correlated with L3.

The time series considered for the estimates start in 1975, in order to exclude the year of the first oil shock, 1974. Since quarterly data have been employed for the estimates, a general unrestricted model with four lags has been defined, since, as argued by the econometric literature, such a number of lags is sufficient to "capture" the dynamic behaviour of a model defined over quarterly data.

In some preliminary analyses, a lag polynomial of the three months treasury bill, which is one of the most relevant money market interest rates in the Italian context (and which had been successfully employed in a previous version of the present model, estimated over a shorter sample period), turned out to be non significant in a general model including lag polynomials in L1, FX, G, RDIFF3, or in L1, FX, G, RDIFF3, or in L1, FX, G, DINF.

Other variables (as the treasury bills rate, the call money rate, the interbank rate, the interest rate on long term government bonds, the stock market index and its variance over the last twelve months, or its variation weighted with the variance over the last twelve months) that have been regarded as proxies for the opportunity costs in other empirical works on banks' liquid reserves turned out to be non significant or less significant.

The package MICROFIT version 3.0 has been employed for the estimates.

The appendix contains the definition of all the variables and the tables containing the results of the estimates and the tests in detail.

Following the general-to-specific methodology, the following general unrestricted model with four lags has been estimated.

$$L3 = const + \sum_{i=1}^{4} \alpha_i\, L3_{t-i} + \sum_{i=0}^{4} \mu_i\, FX_{t-i} + \sum_{i=0}^{4} \tau_i\, G_{t-i} + $$

$$+ \sum_{i=0}^{4} \Omega_i\, RDIFF3_{t-i} + \sum_{i=0}^{4} \theta_i\, DINF_{t-i} + e_t; \quad \text{with } e \sim N(o,\sigma^2) \qquad (1$$

The data employed for the estimates start from 1975, first quarter, but, since the model employed for the estimates contains four lags, the period covered by the estimates starts in 1976, first quarter. The estimates have been run over the sample period 1976 QI-1991 QIV, and over the sample period 1976 QI - 1989 QIV, both for the general unrestricted model and for the restricted one. The latter sample period has been considered in order to be able to perform the predictive failure test, although this implies a loss of degrees of freedom.

Table 1 in the appendix contains the results of the estimates and diagnostic tests of the general unrestricted model over the sample period 1976 QI - 1989 QIV. In the Chi-square version of the functional form test, H_0 is rejected both at the level of confidence of 0.95 and 0.99; in the F-version of the same test, H_0 is marginally rejected at the level of confidence of 0.95, while it is not rejected at the level of confidence of 0.99. The failure of the functional form test, which usually indicates that the function is not properly specified, might be due, in this case, to the fact that the general unrestricted model has a low number of degrees of freedom over the sample period 1976 QI - 1989 QIV, since the results in this regard are much better in the restricted model. and over the sample period 1976 QI - 1991 QIV, both for the general unrestricted and for the restricted model.

The general unrestricted model estimated over the sample period 1976 QI - 1989 QIV also marginally fails, at the level of confidence of 0.95, both the Chi-square and the F version of the heteroscedasticity test, while H_0 is rejected at the level of confidence of 0.99. This, again, might be caused by the low number of the degrees of freedom, since the general unrestricted model, when estimated over the complete sample period, largely passes the

Heteroscedasticity tests both in the Chi-square and in the F version, at the level of confidence of 0.95.

However, Table 1 shows that the remaining diagnostic tests (serial correlation, normality, predictive failure) do not present any problem over the sample period 1976 QI -1989 QIV.

Table 2 shows the variable deletion test on the restrictions on the general model that determines the final "parsimonious" specification, shown in detail in table 3 and briefly reported here.

$$L3 = 0.019335 - 0.085682\ L1 + 0.067034\ FX + 0.099713\ G +$$

$$+0.0010731\ RDIFF3 + 0.10260\ DINF_{-3} - 0.0015241\ RDIFF3_{-4} +$$

$$+0.25831\ L3_{-4} \qquad (2$$

$$R^2 = 0.65962$$

Table 3 shows that the specification suggested in the restricted model largely passes all the diagnostic tests at the level of confidence of 0.95.

A first look at the dynamic specification obtained suggests that the behaviour of the free liquidity ratio is inconsistent with the assumption (made also by Richter and Teigen [1982] *a priori*) of instantaneous adjustment of the free liquid reserves. Such an assumption was motivated by the hypothesis of rational expectation in financial markets. This does not mean that the rational expectation hypothesis must necessarily be rejected, but it suggests that some delays in the adjustment of the variables (consistent with some form of rationality of the agents) exist.

Equation 2 can be reparametrized according to the following pattern:

$$L3 = const + \beta_0\ L1 + \beta_1\ FX + \beta_2\ G + \beta_3\ RDIFF3 + \\ +\beta_4\ DINF_{-4} + \beta_5\ (RDIFF3-RDIFF3_{-4}) + \beta_6\ L3_{-4} \qquad (3$$

Equation 4 yields the following equation, estimated over the sample period 1976 QI - 1989 QIV:

$$L3 = 0.019335 -0.085682\ L1 +0.067034\ FX +0.099713\ G + \\ -0.0004511\ RDIFF3 +0.10260\ DINF_{-3} \\ +0.25831\ L3_{-4} + 0.0015241\ (RDIFF3-RDIFF3_{-4}); \qquad (4$$

According to the theoretical background presented in the previous (and partly in the present) section, the coefficient β_3 of the variable RDIFF3 is expected to be negative, since it may be regarded as an opportunity cost for holding liquid assets. On the other hand, the coefficient β_5 of the term ($RDIFF3-RDIFF3_{-4}$) is expected to be positive, since it could be associated to a variation in the potential bank profitability, or in the term structure of the interest rate. In fact, such phenomena would determine a re-allocation of the bank's financial assets, which could increase the amount of liquidity necessary for the bank's transactionary purpose.

The lagged value of L3 appearing in all of the restricted specifications may be determined by adjustment costs.

The sign of the coefficient referred to DINF is positive. This suggests that the increase in the price level may not be regarded as an opportunity cost, but can rather be interpreted in accordance to the literature on investments with sunk costs and under uncertainty. In fact, if the bank credit and some kinds of financial assets are regarded as (partially) irreversible investments, the higher the level of uncertainty and risk of the whole economy - signaled by the rate of growth of the price level DINF - and the higher the "value of waiting", the higher the incentives for the banks to keep some funds in perfectly liquid temporary (and costlessly reversible) assets, such as the free liquid reserves held at the central bank.

Intuitively, one could think of a "transactionary" component of the demand for banks' liquid reserves, positively correlated with the term (RDIFF3-RDIFF3-4), and a "speculative" component positively correlated with DINF. On the other hand, the present level of the variable RDIFF3 could be regarded as an opportunity cost for holding reserves.

Table 4 shows the general unrestricted model estimated over the complete sample period 1976 QI - 1991 QIV, which yields satisfactory results in almost all of the diagnostic tests, except the Chi-square version of the functional form test, at the level of confidence of 0.95 (while for the same test H_0 is rejected at the level of confidence of 0.99), and the f version of the same test, at the level of confidence of 0.95.

Table 5 contains the variable deletion test which determines the final specification, and shows that the general unrestricted model estimated over the sample period 1976 QI - 1991 QIV supports the same restrictions as the one estimated over the sample period 1976 QI - 1989 QIV. Table 6 shows the final specification of the model, the same as the one obtained for the sample period 1976 QI - 1989 QIV, which yields satisfactory results in all of the diagnostic tests.

The values of the parameters of the restricted model seem to be very close in the estimates performed in the two different sample periods. Even in the estimates using the whole sample (i.e. 1976 QI

- 1991 QIV), the restricted model can be reparametrized according to the pattern of equation 3, obtaining the following estimate.

$$L3 = 0.023203 - 0.114752\ L1 + 0.076871\ FX + 0.078367\ G + -0.0008477\ RDIFF3 + 0.10131\ DINF_{-3} + 0.30852\ L3_{-4} + 0.0016986\ (RDIFF3 - RDIFF3_{-4}); \quad (5$$

$$R^2 = 0.68225$$

Since the variable DINF is defined as the rate of variation of the price level, a similar kind of information - as far as the dynamic behaviour of the price level is concerned - should be obtained by introducing in an ADL model a lag polynomial in the price level P, instead of a lag polynomial in the variable DINF. Table 7 shows a model of this kind estimated over the sample period 1976 QI - 1989 QIV, and table 10 over the sample period 1976 QI - 1991 QIV. In both cases the general unrestricted model yields satisfactory results for almost all of the diagnostic tests, excepting the functional form test. Table 8 (for the sample period 1976 QI - 1989 QIV) and table 11 (for the sample period 1976 QI 1991 QIV) show the variable deletion tests performed in order to test a restricted model containing P_{-3} and P_{-4} instead of the three-period-lagged rate of variation of the prices ($DINF_{-3}$).

Table 9 (for the sample period 1976 QI - 1989 QIV) and table 12 (for the sample period 1976 QI - 1991 QIV) show the final specification containing the two lagged variables P_{-3} and P_{-4} instead of $DINF_{-3}$. As is shown in both tables, the restricted model passes almost all of the diagnostic tests, excepting (marginally) the functional form test, over the sample period 1976 QI - 1989 QIV. The better performances of the model containing the variable DINF could suggest that this variable better captures the "on-going uncertainty", associated to the "value of waiting" that could be imagined as the original motivation for the liquidity preference of the bank. However, apart from the functional form diagnostic test, the results of table 9 are very similar to those of table 3, and those of table 12 are very similar to those of table 6, as expected. This suggests that the specification obtained from a model including a lag polynomial in the variable DINF is analogous and consistent with the specification obtained from a general unrestricted model with a lag polynomial in the price level.

5. Conclusions.

The empirical results presented here suggest that the behaviour of the banks' free liquidity ratio can be interpreted according to a theoretical framework based on the implications of the recent literature on investments under uncertainty and with sunk costs. Such a framework justifies - for the banks - a particular concept of "speculative" and "transactionary" demand for money, which shows many similarities with the Keynesian liquidity preference theory. In fact, in this context, the free liquid reserves could be interpreted as temporary and liquid assets that the banks hold in the process of collecting information about (partially) irreversible financial investments, or in the process of reallocating their funds. According to the theoretical framework followed in this paper, the amount of free liquid reserves depends on the "value of waiting" for new information about the possible investments in (less liquid) financial assets. Increases in the "value of waiting" may be due to the increase in the degree of uncertainty and riskiness of the whole economy such as perceived by the banks. In this model it has been assumed that the rate of growth of the price level (the variable DINF) or, alternatively, some measure of variation of the price level - obtained form the general-to-specific methodology can be regarded as a proxy for the degree of uncertainty and risk of the aggregate economy.

The "value of waiting" may also be correlated with the increase in the profitability of the banks (summarized in our specific case by the difference RDIFF3-RDIFF3-4,), to the extent that this might generate a process of reallocation of the financial investments of the banks, requiring a temporary "transactionary" liquid asset. In our specific case, the difference RDIFF3-RDIFF3-4, such as determined by the general-to-specific methodology, may be regarded as the variation of the banks' potential profitability, since the variable RDIFF3 is a proxy for the banks' gross margin of intermediation.

The theoretical approach to the banks' behaviour followed in this chapter and supported by the empirical analysis carries some relevant macroeconomic implications. In particular, the results are consistent with the "credit view" and with those macroeconomic models (like Bernanke and Blinder [1988], described in the chapter 1 of this thesis) which emphasize the willingness of banks to invest and their perception of the degree of risk and uncertainty of the whole economy, and attribute to these factors a key role in the determination of the aggregate level of credit, liquidity and output.

Bibliography of Chapter 4

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APPENDIX

List and description of the variables

BLIQ = Commercial Banks free reserves held at the Bank of Italy (also defined as BLIQ = BRES - REQRES);
BRES = BLIQ + REQRES;
DBITE = FBITES-FBITES-1;
DEP = Current account, saving deposits and certificates of deposit of commercial banks;
DEPAV = (DEP + DEP-1)/2;
DFX = FXBI - FXBI-1;
DINF = (P - P-1)/P-1;
DBITE = Credits of the Italian Central Bank with the Italian Treasury;
G = DBITE/DEPAV;
FXBI = net foreign position of the Italian Central Bank;
L1 = REQRES/DEP;
L3 = BLIQ/DEP;
P = implicit deflator of the Italian GDP;
RBCI = rate of interest on the bonds of special credit institutions;
RD = official rate of discount;
RDIFF3 = RBCI-RD;
REQRES = required reserves of the commercial banks;

The source of the data is "*Supplemento al Bollettino Statistico della Banca d'Italia*", with the exception of the variables P and RBCI, whose time series have been provided by DATASTREAM Services (at the Univewrsity of Warwick), on the basis of OECD and Bank of Italy data.

Diagnostic Tests

The diagnostic test performed in the tables that follows are those provided by the package MICROFIT 3.0, briefly described in the appendix to the third chapter.

TABLE 1

Dependent Variable : L3 (ordinary least squares)
56 Observations : 76Q1 - 89Q4

Regressor	Coefficient	Std.Error	t-ratio
CONST	-.0037698	.025605	-.14723
L1	-.31016	.17114	-1.8123
FX	.064257	.041937	1.5322
G	.18029	.059156	3.0478
RDIFF3	.0010357	$.6947E^{-3}$	1.4909
DINF	-.12189	.083007	-1.4684
$L3_{-1}$	-.086127	.19064	-.45178
$L1_{-1}$	.094389	.10124	.93320
FX_{-1}	.023941	.038019	.62970
G_{-1}	.092621	.060976	1.5190
$RDIFF3_{-1}$	$.1067E^{-3}$	$.7204E^{-3}$	.14815
$DINF_{-1}$	-.10944	.082970	-1.3190
$L3_{-2}$	.083835	.15496	.54100
$L1_{-2}$	.015078	.10908	.13823
FX_{-2}	.062467	.040045	1.5599
G_{-2}	.014034	.062966	.22289
$RDIFF3_{-2}$	$.7158E^{-3}$	$.7266E^{-3}$	.98512
$DINF_{-2}$	.13966	.079568	1.7553
$L3_{-3}$	.22209	.16504	1.3457
$L1_{-3}$	-.062563	.10775	-.58065
FX_{-3}	-.057762	.038407	-1.5039
G_{-3}	-.069076	.053503	-1.2911
$RDIFF3_{-3}$	$-.9141E^{-3}$	$.7106E^{-3}$	-1.2864
$DINF_{-3}$	.26125	.080241	3.2559
$L3_{-4}$	.39815	.15193	2.6206
$L1_{-4}$	.28406	.18816	1.5096
FX_{-4}	-.047411	.038738	-1.2239
G_{-4}	-.066266	.052619	-1.2594
$RDIFF3_{-4}$	-.0015988	$.7358E^{-3}$	-2.1729
$DINF_{-4}$	-.010158	.072631	-.13986

R-squared	.80569	F - test(29,26)	3.7175
Residual sum of sq.	$.2902E^{-3}$	Regression S. E.	.0033409
S.D.of dep.var..	.0052110	Mean of dep. var.	.013338
DW - stat.	1.7622	Max. log-likelihood	261.3076

Diagnostic tests

Test statistics	LM version		F version	
Serial correlation	Chi-sq(4)	8.3230	F(4,22)	.96014
Functional form	Chi-sq(1)	8.2662	F(1,25)	4.3294
Normality	Chi-sq(2)	2.7169	not applicable	
Heteroscedasticity	Chi-sq(1)	4.3516	F(1,54)	4.5498
Predictive failure	Chi-sq(8)	8.3876	F(8,26)	1.0484

TABLE 2: Variable Deletion Test (OLS)

Dependent Variable : L3 (ordinary least squares)

List of the variables to be deleted from the regression:

					DINF
$L3_{-1}$	$L1_{-1}$	FX_{-1}	G_{-1}	$RDIFF3_{-1}$	$DINF_{-1}$
$L3_{-2}$	$L1_{-2}$	FX_{-2}	G_{-2}	$RDIFF3_{-2}$	$DINF_{-2}$
$L3_{-3}$	$L1_{-3}$	FX_{-3}	G_{-3}	$RDIFF3_{-3}$	
	$L1_{-4}$	FX_{-4}	G_{-4}		$DINF_{-4}$

56 Observations used for estimation from 76Q1 to 89Q4

Regressor	Coefficient	Std.Error	t-ratio
CONST	.019335	.011803	1.6381
L1	-.085682	.061803	-1.3864
FX	.067034	.030737	2.1809
G	.099713	.035553	2.8046
RDIFF3	.0010731	$.3833E^{-3}$	2.7999
$DINF_{-3}$	.10260	.051390	1.9966
$RDIFF3_{-4}$	-.0015241	$.3806E^{-3}$	-4.0045
$L3_{-4}$	.25831	.094211	2.7418

Joint test of zero restrictions on the coefficients of the deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(22):	24.0317
Likelihood Ratio Statistic	CHI-SQ(22):	31.3940
F Statistic	F(22,26) :	.88842

Table 3

Dependent Variable : L3 (ordinary least squares)			
56 Observations : 76Q1 - 89Q4			
Regressor	**Coefficient**	**Std.Error**	**t-ratio**
CONST	.019335	.011803	1.6381
L1	-.085682	.061803	-1.3864
FX	.067034	.030737	2.1809
G	.099713	.035553	2.8046
RDIFF3	.0010731	$.3833E^{-3}$	2.7999
$DINF_{-3}$	.10260	.051390	1.9966
$RDIFF3_{-4}$	-.0015241	$.3806E^{-3}$	-4.0045
$L3_{-4}$	.25831	.094211	2.7418

R-squared	.65962	F - test(7,48)	13.2887
Residual sum of sq.	$.5084E^{-3}$	Regression S. E.	.0032543
S.D.of dep.var..	.0052110	Mean of dep. var.	.013338
DW - stat.	2.0719	Max. log-likelihood	245.6106

Diagnostic tests

Test statistics	LM version		F version	
Serial correlation	Chi-sq(4)	5.9674	F(4,44)	1.3120
Functional form	Chi-sq(1)	2.7788	F(1,47)	2.4540
Normality	Chi-sq(2)	2.4170	not applicable	
Heteroscedasticity	Chi-sq(1)	3.1793	F(1,54)	3.2502
Predictive failure	Chi-sq(8)	7.6287	F(8,48)	.95359

TABLE 4

Dependent Variable : L3	(ordinary least squares)		
64 Observations	: 76Q1 - 91Q4		

Regressor	Coefficient	Std.Error	t-ratio
CONST	.015878	.019723	.80504
L1	-.20250	.13861	-1.4608
FX	.089845	.039545	2.2720
G	.12392	.053117	2.3330
RDIFF3	.4820E-3	.6231E-3	.77354
DINF	-.085172	.074139	-1.1488
$L3_{-1}$	-.015069	.16242	-.092777
$L1_{-1}$	.026848	.091035	.29492
FX_{-1}	.0063814	.036042	.17705
G_{-1}	.034838	.050171	.69439
$RDIFF3_{-1}$	-.3810E-4	.6737E-3	-.056555
$DINF_{-1}$	-.046302	.074278	-.62337
$L3_{-2}$	.10135	.13861	.73119
$L1_{-2}$	-.022660	.089866	-.25209
FX_{-2}	.037804	.036066	1.0482
G_{-2}	-.014769	.051956	-.28427
$RDIFF3_{-2}$	.2243E-3	.6777E-3	.33101
$DINF_{-2}$	.11549	.072098	1.6019
$L3_{-3}$	.32542	.14593	2.2299
$L1_{-3}$	-.035279	.086196	-.40929
FX_{-3}	-.051524	.034605	-1.4889
G_{-3}	-.093654	.046633	-2.0083
$RDIFF3_{-3}$	-.9606E-3	.6983E-3	-1.3756
$DINF_{-3}$	.19516	.069629	2.8028
$L3_{-4}$	.37860	.13897	2.7243
$L1_{-4}$	.12062	.14188	.85014
FX_{-4}	-.040350	.036806	-1.0963
G_{-4}	-.090393	.046476	-1.9449
$RDIFF3_{-4}$	-.0019906	.6784E-3	-2.9342
$DINF_{-4}$	-.014627	.064359	-.22711

R-squared	.79299	F - test(29,34)	4.4912
Residual sum of sq.	.3838E-3	Regression S. E.	.0033599
S.D.of dep.var..	.0054250	Mean of dep. var.	.012533
DW - stat.	1.8960	Max. log-likelihood	293.9631

Diagnostic tests

Test statistics	LM version		F version	
Serial correlation	Chi-sq(4)	5.4641	F(4,30)	.70009
Functional form	Chi-sq(1)	5.8889	F(1,33)	3.3442
Normality	Chi-sq(2)	5.1442	not applicable	
Heteroscedasticity	Chi-sq(1)	2.2943	F(1,62)	2.3053

TABLE 5: Variable Deletion Test (OLS)

Dependent Variable : L3 (ordinary least squares)
List of the variables to be deleted from the regression:

					DINF
$L3_{-1}$	$L1_{-1}$	FX_{-1}	G_{-1}	$RDIFF3_{-1}$	$DINF_{-1}$
$L3_{-2}$	$L1_{-2}$	FX_{-2}	G_{-2}	$RDIFF3_{-2}$	$DINF_{-2}$
$L3_{-3}$	$L1_{-3}$	FX_{-3}	G_{-3}	$RDIFF3_{-3}$	
	$L1_{-4}$	FX_{-4}	G_{-4}		$DINF_{-4}$

64 Observations used for estimation from 76Q1 to 91Q4

Regressor	Coefficient	Std.Error	t-ratio
CONST	.023203	.0098608	2.3530
L1	-.11475	.050595	-2.2680
FX	.076871	.029799	2.5797
G	.078367	.031487	2.4888
RDIFF3	$.8509E^{-3}$	$.3498E^{-3}$	2.4326
$DINF_{-3}$	.10131	.048108	2.1060
$RDIFF3_{-4}$	-.0016986	$.3699E^{-3}$	-4.5919
$L3_{-4}$	.30852	.086850	3.5523

Joint test of zero restrictions on the coefficients of the deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(22):	22.3052
Likelihood Ratio Statistic	CHI-SQ(22):	27.4245
F Statistic	F(22,34) :	.82676

Table 6

Dependent Variable : L3	(ordinary least squares)		
64 Observations	: 76Q1 - 91Q4		
Regressor	**Coefficient**	**Std.Error**	**t-ratio**
CONST	.023203	.0098608	2.3530
L1	-.11475	.050595	-2.2680
FX	.076871	.029799	2.5797
G	.078367	.031487	2.4888
RDIFF3	$.8509E^{-3}$	$.3498E^{-3}$	2.4326
$DINF_{-3}$	.10131	.048108	2.1060
$RDIFF3_{-4}$	-.0016986	$.3699E^{-3}$	-4.5919
$L3_{-4}$	.30852	.086850	3.5523

R-squared	.68225	F - test(29,34)	17.1771
Residual sum of sq.	$.5891E^{-3}$	Regression S. E.	.0032435
S.D.of dep.var..	.0054250	Mean of dep. var.	.012533
DW - stat.	1.9467	Max. log-likelihood	280.2508

Diagnostic tests

Test statistics	LM version		F version	
Serial correlation	Chi-sq(4)	6.5191	F(4,52)	1.4744
Functional form	Chi-sq(1)	.46637	F(1,55)	.40373
Normality	Chi-sq(2)	5.1661	not applicable	
Heteroscedasticity	Chi-sq(1)	2.9345	F(1,62)	2.9794

TABLE 7

Dependent Variable : L3 (ordinary least squares)
56 Observations : 76Q1 - 89Q4

Regressor	Coefficient	Std.Error	t-ratio
CONST	-.088081	.054782	-1.6078
L1	-.019680	.21159	-.093008
FX	.045630	.046148	.98879
G	.18519	.060375	3.0673
RDIFF3	.0010022	.7014E-3	1.4288
P	-.5119E-3	.0012622	-.40556
L3-1	.071497	.18747	.38138
L1-1	.32218	.15231	2.1153
FX-1	.029063	.038270	.75943
G-1	.080636	.061162	1.3184
RDIFF3-1	.1226E-3	.7592E-3	.16149
P-1	.2297E-3	.0016815	.13662
L3-2	.15190	.16786	.90493
L1-2	.13172	.14056	.93712
FX-2	.050455	.039503	1.2772
G-2	-.013772	.57196	-.24079
RDIFF3-2	.4703E-3	.7348E-3	.64007
P-2	.0030587	.0018026	1.6969
L3-3	.19322	.17076	1.1315
L1-3	.085022	.12049	.70566
FX-3	-.059549	.037958	-1.5688
G-3	-.082098	.052031	-1.5779
RDIFF3-3	-.0013316	.7432E-3	-1.7917
P-3	.0015483	.0017813	.86924
L3-4	.32562	.16212	2.0085
L1-4	.17166	.18877	.90938
FX-4	-.060466	.039796	-1.5194
G-4	-.045978	.050575	-.90910
RDIFF3-4	-.0012928	.7808E-3	-1.6558
P-4	-.0047610	.0015283	-3.1153

R-squared	.79099	F - test(29,26)	3.3929
Residual sum of sq.	.3122E-3	Regression S. E.	.0034650
S.D.of dep.var..	.0052110	Mean of dep. var.	.013338
DW - stat.	1.8073	Max. log-likelihood	259.2647

Diagnostic tests

Test statistics	LM version		F version	
Serial correlation	Chi-sq(4)	4.4100	F(4,22)	.47015
Functional form	Chi-sq(1)	15.7970	F(1,25)	9.8233
Normality	Chi-sq(2)	.80449	not applicable	
Heteroscedasticity	Chi-sq(1)	2.0559	F(1,54)	2.0580
Predictive failure	Chi-sq(8)	8.4959	F(5,26)	1.0620

TABLE 8: Variable Deletion Test (OLS)

Dependent Variable : L3 (ordinary least squares)
List of the variables to be deleted from the regression:

					P
$L3_{-1}$	$L1_{-1}$	FX_{-1}	G_{-1}	$RDIFF3_{-1}$	P_{-1}
$L3_{-2}$	$L1_{-2}$	FX_{-2}	G_{-2}	$RDIFF3_{-2}$	P_{-2}
$L3_{-3}$	$L1_{-3}$	FX_{-3}	G_{-3}	$RDIFF3_{-3}$	
	$L1_{-4}$	FX_{-4}	G_{-4}		

56 Observations used for estimation from 76Q1 to 89Q4

Regressor	Coefficient	Std.Error	t-ratio
CONST	.022851	.011802	1.9362
L1	-.069551	.078939	-.88107
FX	.076169	.031505	2.4177
G	.092573	.035773	2.5878
RDIFF3	.97577E^{-3}	.4035E^{-3}	2.4179
P_{-3}	.0010826	.7893E^{-3}	1.3715
P_{-4}	-.0011457	.8115E^{-3}	-1.4119
$RDIFF3_{-4}$	-.0016866	.4163E^{-3}	-4.0513
$L3_{-4}$	.22610	.093781	2.4109

Joint test of zero restrictions on the coefficients of the deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(21):	22.4504
Likelihood Ratio Statistic	CHI-SQ(21):	28.6902
F Statistic	F(21,26) :	.82849

Table 9

Dependent Variable : L3	(ordinary least squares)		
56 Observations	: 76Q1 - 89Q4		
Regressor	**Coefficient**	**Std.Error**	**t-ratio**
CONST	.022851	.011802	1.9362
L1	-.069551	.078939	-.88107
FX	.076169	.031505	2.4177
G	.092573	.035773	2.5878
RDIFF3	$.97577E^{-3}$	$.4035E^{-3}$	2.4179
P_{-3}	.0010826	$.7893E^{-3}$	1.3715
P_{-4}	-.0011457	$.8115E^{-3}$	-1.4119
$RDIFF3_{-4}$	-.0016866	$.4163E^{-3}$	-4.0513
$L3_{-4}$	.22610	.093781	2.4109

R-squared	.65112	F - test(7,48)	10.9646
Residual sum of sq.	$.5211E^{-3}$	Regression S. E.	.0033296
S.D.of dep.var..	.0052110	Mean of dep. var.	.013338
DW - stat.	2.0608	Max. log-likelihood	244.9196

Diagnostic tests

Test statistics	LM version		F version	
Serial correlation	Chi-sq(4)	5.2847	F(4,43)	1.1202
Functional form	Chi-sq(1)	5.9604	F(1,46)	5.4793
Normality	Chi-sq(2)	1.4179	not applicable	
Heteroscedasticity	Chi-sq(1)	2.3787	F(1,54)	2.3955
Predictive failure	Chi-sq(8)	4.0846	F(8,47)	.51058

TABLE 10

Dependent Variable : L3	(ordinary least squares)
64 Observations	: 76Q1 - 91Q4

Regressor	Coefficient	Std.Error	t-ratio
CONST	-.027609	.035760	-.77208
L1	-.13364	.14692	-.909618
FX	.062601	.044485	-.90961
G	.11718	.052976	2.2120
RDIFF3	.7645E-3	.6298E-3	1.2139
P	-.8587E-3	.9488E-3	-.90501
L3-1	.0013699	.16293	.0084079
L1-1	.11704	.11454	1.0218
FX-1	.0084395	.036263	.23273
G-1	.039619	.053049	.74685
RDIFF3-1	.9685E-3	.7091E-3	.13658
P-1	.0011425	.0013807	.82745
L3-2	.071539	.13782	.51908
L1-2	.048689	.10574	.46045
FX-2	.027483	.036561	.75171
G-2	-.0038531	.050140	-.076846
RDIFF3-2	.1221E-3	.6928E-3	.17625
P-2	.0014074	.0014722	.95597
L3-3	.22319	.14767	1.5114
L1-3	.088914	.10468	.84938
FX-3	-.044169	.035229	-1.2538
G-3	-.075577	.045169	-1.6732
RDIFF3-3	-.0012158	.7317E-3	-1.6615
P-3	.9361E-3	.0014937	.62666
L3-4	.31198	.14413	2.1645
L1-4	.16089	.15120	1.0641
FX-4	-.052233	.038418	-1.3596
G-4	-.054721	.045103	-1.2132
RDIFF3-4	-.0014132	.7362E-3	-1.9197
P-4	-.0028906	.0011715	-2.4673

R-squared	.77662	F - test(29,34)	4.0762
Residual sum of sq.	.4142E-3	Regression S. E.	.0034902
S.D.of dep.var..	.0054250	Mean of dep. var.	.012533
DW - stat.	1.8245	Max. log-likelihood	291.5277

Diagnostic tests

Test statistics	LM version		F version	
Serial correlation	Chi-sq(4)	5.6936	F(4,30)	.73237
Functional form	Chi-sq(1)	11.4200	F(1,33)	7.1674
Normality	Chi-sq(2)	1.6863	not applicable	
Heteroscedasticity	Chi-sq(1)	1.7314	F(1,62)	1.7239

TABLE 11: Variable Deletion Test (OLS)

Dependent Variable : L3 (ordinary least squares)
List of the variables to be deleted from the regression:

					P
$L3_{-1}$	$L1_{-1}$	FX_{-1}	G_{-1}	$RDIFF3_{-1}$	P_{-1}
$L3_{-2}$	$L1_{-2}$	FX_{-2}	G_{-2}	$RDIFF3_{-2}$	P_{-2}
$L3_{-3}$	$L1_{-3}$	FX_{-3}	G_{-3}	$RDIFF3_{-3}$	
	$L1_{-4}$	FX_{-4}	G_{-4}		

64 Observations used for estimation from 76Q1 to 91Q4

Regressor	Coefficient	Std.Error	t-ratio
CONST	.020968	.0095354	2.1989
L1	-.050117	.064032	-.78269
FX	.081942	.029312	2.7955
G	.083338	.031282	2.6641
RDIFF3	$.83547E^{-3}$	$.6880E^{-3}$	1.3681
P_{-3}	$.94138E^{-3}$	$.6880E^{-3}$	1.3681
P_{-4}	-.0010241	$.7027E^{-3}$	-1.4574
$RDIFF3_{-4}$	-.0018415	$.3734E^{-3}$	-4.9314
$L3_{-4}$	.25501	.084727	3.0097

Joint test of zero restrictions on the coefficients of the deleted variables:

Lagrange Multiplier Statistic	CHI-SQ(21):	17.1962
Likelihood Ratio Statistic	CHI-SQ(22):	20.0268
F Statistic	F(22,26) :	.59485

Table 12

Dependent Variable : L3 (ordinary least squares)
64 Observations : 76Q1 - 91Q4

Regressor	Coefficient	Std.Error	t-ratio
CONST	.020968	.0095354	2.1989
L1	-.050117	.064032	-.78269
FX	.081942	.029312	2.7955
G	.083338	.031282	2.6641
RDIFF3	.83547E-3	.6880E-3	1.3681
P-3	.94138E-3	.6880E-3	1.3681
P-4	-.0010241	.7027E-3	-1.4574
RDIFF3-4	-.0018415	.3734E-3	-4.9314
L3-4	.25501	.084727	3.0097

R-squared	.69455	F - test(8,55)	15.6330
Residual sum of sq.	.5663E-3	Regression S. E.	.0032089
S.D.of dep.var..	.0054250	Mean of dep. var.	.012533
DW - stat.	2.0484	Max. log-likelihood	281.5144

Diagnostic tests

Test statistics	LM version	F version
Serial correlation	Chi-sq(4) 5.2806	F(4,51) 1.1466
Functional form	Chi-sq(1) 2.84264	F(1,54) 2.5099
Normality	Chi-sq(2) 3.1569	not applicable
Heteroscedasticity	Chi-sq(1) 3.0690	F(1,62) 3.1229

OBS.	BLIQ	DEP	FBITES	FXBI	P	RBCI
75Q1	2459.0	82485.0	21642.9	391.2000	22.5000	10.4800
75Q2	2636.0	85676.0	23063.6	441.4000	22.9000	10.7800
75Q3	3861.0	90621.0	24995.9	-633.3000	23.4000	10.8000
75Q4	3414.0	99854.0	29533.0	-1366.6	24.0000	10.6600
76Q1	1993.0	103828.0	32561.7	-3161.4	25.0000	12.6000
76Q2	1865.0	105436.0	36003.6	-3318.8	26.7000	13.8700
76Q3	1398.0	109025.0	37168.2	-2726.4	28.0000	13.7100
76Q4	2383.0	121569.0	39511.0	5205.9	29.6000	14.1800
77Q1	2444.0	125453.0	38733.0	5683.6	31.2000	14.8800
77Q2	1683.0	129355.0	35035.4	7870.5	31.9000	14.6000
77Q3	2346.0	133667.0	34436.0	9986.1	33.1000	14.4400
77Q4	3236.0	149886.0	35217.0	11899.6	34.2000	13.9800
78Q1	4238.0	154717.0	38354.1	13242.5	35.4000	13.6000
78Q2	2389.0	159981.0	35599.8	15707.6	36.3000	13.2300
78Q3	1972.0	165802.0	34251.1	18952.5	37.8000	12.9300
78Q4	5059.0	185027.0	40026.0	19659.9	38.9000	13.3900
79Q1	2339.0	185895.0	35316.7	24811.8	40.2000	13.4400
79Q2	1793.0	191252.0	33883.2	28465.5	42.0000	13.4200
79Q3	1699.0	197757.0	34245.6	28465.5	43.7000	13.4100
79Q4	3875.0	221879.0	40692.0	30538.0	46.0000	14.2700
80Q1	2582.0	216952.0	41554.6	36932.0	47.8000	14.7600
80Q2	2823.0	219232.0	44460.9	45771.5	50.3000	15.2000
80Q3	2971.0	221608.0	46678.9	52004.6	52.4000	15.9600
80Q4	4958.0	251264.0	50262.0	55068.1	54.6000	16.3000
81Q1	3681.0	245411.0	56604.3	54548.1	57.0000	17.6700
81Q2	4057.0	242977.0	58947.3	56968.4	59.3000	20.9500
81Q3	5061.0	242296.0	61510.7	55597.4	62.3000	21.3300
81Q4	6150.0	274127.0	64179.0	58058.4	65.4000	21.0000
82Q1	3358.0	266007.0	66406.0	50926.9	67.8000	20.4300
82Q2	5410.0	270194.0	67349.0	48003.7	69.9000	20.7500
82Q3	4785.0	279505.0	67024.0	50371.0	73.0000	19.8000
82Q4	4455.0	325080.0	75751.0	51166.0	75.8000	19.8600
83Q1	4834.0	313167.0	82012.0	58064.0	78.6000	18.2800
83Q2	5679.0	318257.0	75787.0	67666.0	80.8000	17.9000
83Q3	2490.0	329890.0	75280.0	71889.0	83.4000	17.4700
83Q4	3931.0	368389.0	80181.0	76089.0	86.4000	17.3300
84Q1	2851.0	354292.0	85252.0	71999.0	89.1000	15.2500
84Q2	3637.0	354612.0	81368.0	74815.0	91.0000	14.7300
84Q3	2293.0	365653.0	82467.0	79801.0	92.7000	14.4500
84Q4	5008.0	411862.0	90101.0	81813.0	94.6000	13.8400
85Q1	2302.0	404952.0	100235.0	76337.0	97.4000	12.7800
85Q2	3594.0	407547.0	99824.0	82401.0	99.2000	13.4200
85Q3	2790.0	418497.0	103329.0	60960.0	101.0000	13.0800
85Q4	7968.0	454170.0	117563.0	61435.0	102.3000	13.2700
86Q1	4040.0	436713.0	128705.0	66826.0	104.7000	12.5500
86Q2	4433.0	437883.0	117894.0	66260.0	107.4000	9.8000
86Q3	3662.0	447918.0	121062.0	60960.0	109.1000	9.5400
86Q4	4699.0	496101.0	128503.0	61435.0	110.2000	9.0500
87Q1	4782.0	482944.0	130153.0	66826.0	111.2000	9.1300
87Q2	3727.0	490784.0	132631.0	65871.0	114.0000	9.9200
87Q3	4527.0	494098.0	141973.0	65318.0	115.0000	11.0200
87Q4	5647.0	531819.0	137223.0	74305.0	117.0000	11.1900
88Q1	5582.0	509205.0	137680.0	74829.0	118.7000	10.8400
88Q2	4932.0	519164.0	137192.0	74128.0	120.7000	10.8500

OBS.	BLIQ	DEP	FBITES	FXBI	P	RBCI
88Q3	6151.0	531417.0	140600.0	78782.0	123.4000	11.0800
88Q4	4899.0	571564.0	139446.0	82823.0	124.9000	11.0500
89Q1	7829.0	555000.0	139103.0	88890.0	126.5000	11.5700
89Q2	4239.0	565720.0	131363.0	91306.0	128.4000	11.7700
89Q3	4458.0	570320.0	131321.0	98938.0	130.2000	11.6700
89Q4	5453.0	625348.0	145469.0	92875.0	132.7000	12.0800
90Q1	8159.0	598021.0	145104.0	98003.0	135.8000	12.1500
90Q2	4072.0	607436.0	124856.0	110079.0	137.8000	12.0700
90Q3	4105.0	619686.0	130429.0	109929.0	139.8000	12.0500
90Q4	4471.0	686279.0	146388.0	103335.0	143.3000	11.2900
91Q1	5227.0	649292.0	148311.0	111080.0	145.2000	12.1600
91Q2	1854.0	662288.0	137574.0	109322.0	148.0000	11.2400
91Q3	2926.0	670060.0	144041.0	108950.0	151.2000	11.5100
91Q4	4849.0	746907.0	163898.0	95342.0	152.9000	11.4300
92Q1	*NONE*	*NONE*	*NONE*	*NONE*	*NONE*	11.1400

OBS.	RD	REQRES
75Q1	8.0000	11159.0
75Q2	7.0000	11508.0
75Q3	6.0000	12032.0
75Q4	6.0000	12040.0
76Q1	12.0000	14382.0
76Q2	12.0000	14755.0
76Q3	12.0000	15167.0
76Q4	15.0000	16622.0
77Q1	15.0000	18383.0
77Q2	13.0000	19081.0
77Q3	11.5000	19571.0
77Q4	11.5000	20262.0
78Q1	11.5000	22774.0
78Q2	11.5000	23678.0
78Q3	10.5000	24389.0
78Q4	10.5000	25281.0
79Q1	10.5000	27816.0
79Q2	10.5000	28653.0
79Q3	10.5000	29513.0
79Q4	15.0000	30671.0
80Q1	15.0000	32527.0
80Q2	15.0000	32434.0
80Q3	16.5000	33009.0
80Q4	16.5000	33749.0
81Q1	19.0000	36924.0
81Q2	19.0000	36113.0
81Q3	19.0000	35844.0
81Q4	19.0000	36654.0
82Q1	19.0000	40982.0
82Q2	19.0000	40379.0
82Q3	18.0000	42226.0
82Q4	18.0000	45184.0
83Q1	18.0000	50979.0
83Q2	17.0000	49955.0
83Q3	17.0000	52905.0
83Q4	17.0000	54108.0
84Q1	16.0000	60042.0
84Q2	15.5000	58555.0
84Q3	16.5000	60306.0
84Q4	16.5000	62838.0
85Q1	15.5000	71656.0
85Q2	15.5000	70726.0
85Q3	15.5000	73125.0
85Q4	15.0000	74890.0
86Q1	14.0000	79583.0
86Q2	12.0000	78582.0
86Q3	12.0000	79200.0
86Q4	12.0000	83858.0
87Q1	11.5000	89626.0
87Q2	11.5000	90740.0
87Q3	12.0000	91107.0
87Q4	12.0000	92438.0
88Q1	12.0000	96198.0
88Q2	12.0000	96201.0

OBS.	RD	REQRES
88Q3	12.5000	99516.0
88Q4	12.5000	101822.0
89Q1	13.5000	106250.0
89Q2	13.5000	107413.0
89Q3	13.5000	110452.0
89Q4	13.5000	111370.0
90Q1	13.5000	117756.0
90Q2	12.5000	116793.0
90Q3	12.5000	119399.0
90Q4	12.5000	124322.0
91Q1	12.5000	128756.0
91Q2	11.5000	122010.0
91Q3	11.5000	121804.0
91Q4	12.0000	127762.0
92Q1	12.0000	*NONE*

CHAPTER 5

OPTIMAL PHYSICAL CAPITAL AND FINANCIAL STRUCTURE OF THE FIRM: TWO FACES OF THE SAME DECISION?

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OPTIMAL PHYSICAL CAPITAL AND FINANCIAL STRUCTURE OF THE FIRM: TWO FACES OF THE SAME DECISION?

1. Introduction.

The present chapter and the next one are closely related, since they constitute two different parts of the same investigation. The analysis has been divided into two parts in order to simplify the exposition and in the attempt of making it less tedious. The introductory comments contained in this section refer therefore both to this chapter and chapter 6.

The purpose of the analysis is to provide a simplified dynamic framework in which the decisions concerning the firm's investment and financial structure take place simultaneously, in the presence of bankruptcy and adjustment costs and with imperfect competition in the goods market. The assumption of imperfect competition has been introduced in order to capture a few strategic effects of the investment decision, although with a few simplifying assumptions.

However there are a few relevant differences between the approach followed in this chapter and in chapter 6.

The theoretical part of this chapter uses - as a tool of interpretation - a model by Bernstein and Nadiri [1986], with a few modifications, mainly consisting in the introduction of imperfect competition in the goods market, while some more substantial modifications have been introduced in the empirical implementation of the model.

In the model by Bernstein and Nadiri [1986] the cost of financial capital is a function of the leverage ratio and the decisions concerning the firm's financial structure and investments take place at the same time, but the variables affecting the leverage ratio are assumed to be exogenous. In this way the profits do not interact with the leverage ratio and with the cost of financial capital.

In the model of chapter 6, the firm chooses simultaneously the level of investments as well as the optimal financial structure, and the cost of financial capital still depends on the financial structure of the firm, but, in this case, the cost of capital, the optimal financial structure and the profits are assumed to interact, because of a few possible causal links suggested by various theoretical contributions (from finance and industrial economics) briefly analyzed in chapter 6. If, under a given set of assumptions (that will be discussed in this chapter and in the next one), a link between the profits and the leverage ratio of the firm exists, then - to the extent that the profits are affected by the degree of concentration and other strategic variables - the simultaneous decision problem of investment and optimal financial structure is also affected by those market strategic interactions that characterize a context of imperfect competition. While this last point is one of the main concerns of chapter 6, the present chapter will follow the theoretical part of the contribution by Bernstein and Nadiri [1986], as a simplified starting point for the empirical analysis based on firms data.

The empirical analysis includes a few estimates of an investment function based on three industrial samples of data of Italian firms operating respectively in the chemical, electronic, and clothing sectors. The source of the data is the survey provided by Mediobanca (an Italian credit institution), a reliable and commonly employed source of firm's data.

The relevance of the firm's financial structure for the investment decision, with asymmetric information on financial markets, has been the subject of many contributions both in finance and in industrial economics, although most of them do not raise the problem of simultaneity between investment and financial structure.

In industrial economics, the relevance of firms' financial structure has been pointed out - within the context of predatory pricing models - by the literature concerned with the "deep pocket argument" (Telser [1966], Benoît [1984], Poitervin [1989a]) and by the models based on the assumption of "limited liability effect" (Brander and Lewis [1986], Poitervin [1989b]). In the former, it is assumed that "strong" firms can afford a long-during price war because they can rely on large financial resources. In the latter, a high level of debt is regarded as a pre-commitment for an aggressive policy. The signalling game of entry deterrence yields - as a result - the optimal financial structure for the incumbent and the entrant.

Following the famous contribution by Fazzari, Hubbard and Petersen [1988] that shows the significance of cash flow for the firm investment decision, the relevance of the firm financial structure has been analyzed in many neoclassical studies by introducing some form of market imperfection and/or transaction costs within a Tobin's Q framework. The focus was often on R&D investments (Bernstein and Nadiri [1986] and [1993]), or, in another class of investment models, on a hierarchy of finance funds, resulting from transaction costs in placing new shares and taxes (see for example Bond and Meghir [1992]).

A causal and recursive link between financial structure and investments decision had already been pointed out in the past by the "radical economics" literature, and, more recently, by some "new-Keynesian" contributions in a macroeconomic framework (like for instance Greenwald and Stiglitz [1988], [1989], [1990a], [1990b], Bernanke and Gertler [1989]).

Regarding the internally generated flow of profits as the main source of finance, as a result of the imperfect substitutability between internal and external funds for the firm, the radical economists often envisage a causal link between the flow of profits for the firm and the investment decision.

Finally, a link between financial structure and investment decision may simply be based on an incentive argument which can be summarized by considering that with asymmetric information "...*the greater the debt-equity ratio, the more the incentives of managers who act in the interest of equity holders diverge from the interests of creditors*" (Fazzari, Hubbard and Petersen, [1988], p.151). This last argument has led to many other contributions, even based on different theoretical approaches, to formalize the cost of financial capital (and, as a consequence the rate of discount of future incomes for the representative firm) as an increasing function of the leverage ratio or the gearing ratio (for example Bernstein and Nadiri [1986], Ganoulis [1991], Bond and Meghir [1992]), or to include managerial costs depending on the amount of borrowing in the profit function (Bernstein and Nadiri [1993]).

The recent new-Keynesian contributions aim at formalizing the role of asymmetric information and risk in affecting the willingness of financial intermediaries to supply credit and its cost.

Most of the empirical analyses on firm investment decision that are based on some version of Tobin's Q theory rely on stock market data and assume perfect competition on the goods market. A model that might be potentially adapted to describe an imperfectly competitive framework is the one by Abel and Eberly [1993], which introduces a stochastic variable in the firm's profits, and is meant to provide a framework that incorporates fixed cost investments in a stochastic context with investment irreversibility.

Another purpose of this paper is to attempt to overcome a limitation of the empirical works based on Tobin's Q theory, which rely on small samples mainly composed by firms issuing shares on the stock market: such firms usually enjoy a well established reputation, and may not always be regarded as representative for the entire population. In Italy (like in all of the non-securitized financial systems) the firms operating in the stock market only constitute a very small minority. In order to use the data from the Mediobanca sample (mainly accounting data) some restrictions will have to be made. However, for what concerns the general issue of the use of accounting data, this paper follows Martin [1993], who, objecting to Benston's [1982] criticism on the reliability of accounting data, argues as follows:

> "...If this argument were correct, the consequences would be severe indeed. It would mean that industrial economists could not carry out empirical research. It would mean that a wide spectrum of government publications describing economic activity ought to be discontinued, since they are based on what is, originally, accounting data."
>
> (Martin, 1993, p. 517).

The next section (and its subsections) contains the first model, mainly based on Bernstein and Nadiri [1986]. Section 3 contains the comments on the empirical analysis, section 4 contains the conclusions. A few drawbacks and limitations of Bernstein and Nadiri's framework are illustrated in the next chapter, which contains a brief digression on a few issues concerning the financial decisions of the firm.

2. *A model of financing and investment with asymmetric information and bankruptcy costs*

This model resembles, in its theoretical part, the one by Bernstein and Nadiri [1986], with a few modifications mainly consisting in two aspects: the first aspect is the above-mentioned introduction of imperfect competition in the goods market. The second is the introduction of a distinction between "purely technological" adjustment costs of investment, and "strategic" costs of investments. Such a distinction is not very relevant for the theoretical part of the analysis (since a few simplifying assumptions are made on the conjectures of the different firms), but is going to carry some significant consequences for the empirical analysis that will be implemented in this paper.

The model provides a framework to formalize the interaction between financial structure and investment decisions. Following Bernstein and Nadiri [1986], it is assumed that financial and real decisions are connected in the sense that in each moment in time the firm chooses the financial structure that minimizes the cost of capital. It is the minimized cost of capital that affects in its turn the investment decision of the firm. As in Bernstein and Nadiri [1986], the decision of each firm is assumed to take place in continuous time, but, unlike in Bernstein and Nadiri, it is revealed to other firms and outsiders only at discrete intervals. This last assumption will carry some relevant implications for the empirical analysis, as we will see later. Again as opposed to Bernstein and Nadiri [1986], the firms act in a context of imperfect competition.

Let us define the variable profits as:

var.profits of firm i = $u^\circ(k,w|\mu_i)$ (1

where k= physical capital;

w = variable inputs cost;

μ_i = profit margin, determined by the demand elasticity, product differentiation, conjectures, and other aspects affecting the market power of the firms.

It is assumed that in each moment the firm is optimizing the quantity of variable inputs employed, whose price is w. The mark up μ_i is assumed to depend on the conjectures of the firms and on the demand elasticity. As a first approximation, it is assumed that the conjectures of different firms are symmetrical. It is assumed that increasing levels of k always increase the variable profits, i.e. the variable profits depend positively on the capital stock. This means that the *marginal profitability* of capital is positive even when the *average profitability* of capital is negative.

Let us also assume that the following budget constraint holds:

$k(t) = S(t) + B(t)$ (2

where K is the physical capital, S the value of shares, B the debt. Broadly speaking, this is equivalent to saying that the short run assets equal the short run liabilities, or that the payments are implemented instantaneously. The firm accumulates capital according to the following rule:

$\dot{k} = I - gk, \quad k(0)>0 \quad \text{and} \lim_{t\to\infty} k(t)\geq 0$ (3

where g is the rate of depreciation of capital stock, I is the investment level. The rate of depreciation is assumed to be fixed, and it is also assumed that $0\leq g\leq 1$. A dot over a variable stands for differentiation with respect to time. The flow of funds, which must hold at any moment in time, is defined as follows:

$$u^{\circ}(k,w|\mu_i) - A[I(t)] - [r_f(t) + \phi(\Omega(t))]\cdot B(t) + \dot{B}(t) + + \dot{S}(t) - D(t) = 0 \qquad (4$$

where $u^{\circ}(k,w|\mu_i)$ is the same as defined earlier, $A[I(t)]$ is the function of (purely technological) adjustment costs of investments, $D(t)$ the dividends, $r_f(t)$ the interest rate on risk free borrowing, $\Omega(t)=B(t)/S(t)$ the leverage ratio, $\phi(\Omega(t))$ a risk premium on borrowing, which is a monotonically increasing function of the leverage ratio, $B(t)$ is the level of borrowing, $\dot{S}(t)$ the value of the new shares issues. $A[I(t)]$ is twice continuously differentiable, with $A(0)=0$, $A'>0$, $A''>0$, according to the standard assumptions. $A[I(t)]$ is also assumed to be increasing, monotonic and invertible. As in Bernstein and Nadiri, the function $\phi(\Omega(t))$ represents the premium paid to bondholders, which depends on the leverage ratio, such that $\phi(\Omega)$ is twice continuously differentiable and $\phi(0)=0$, $\phi'>0$. The function of the risk premium $\phi(\Omega)$ recognises the fact that the cost of debt increases as the firm increases its leverage. Bernstein and Nadiri's assumption that the firm operates in the interests of its shareholders is kept (in contrast with the model of the next chapter). Therefore, like in Bernstein and Nadiri, in each period, the shareholders equate their rate of return to the flow of funds accruing to them. Formalizing:

$$r_s = D(t)/S(t) + \dot{S}(t)/S(t) \qquad (5$$

where r_s is the rate of return on shares and S is the value of the shares. This means that the rate of return on shares includes the dividends per share plus the capital gain. Bernstein and Nadiri define then V=B+S as the value of the financial capital of the firm. Departing from Bernstein and Nadiri, in this paper the value of shares S is not defined on the basis of stock market data, since in the sample employed for the empirical analysis we are dealing mainly with firms not issuing shares on the stock markets, and operating in a country (Italy) where the stock market is of very little relevance, since the magnitude of the transactions concerning securities is very small compared to the magnitude of intermediated financial funds. However this distinction is only relevant for what concerns the empirical analysis, and will be explained later in more detail.

Using equations 4, 5, and the definition V=B+S, following Bernstein and Nadiri [1986], we get:

$$\dot{V} = [(r_s + r_f \cdot \Omega + \phi(\Omega) \cdot \Omega) / (1 + \Omega)]V - \Gamma \qquad (6$$

where $\Gamma = u^{\circ}(k, w | \mu_i) - A(I)$ (7

Equation 6 shows that the financial capital value of the firm may increase due to the cost of capital and the variable profits net of "purely technological" adjustment costs of investments.

Bernstein and Nadiri, by integrating equation 6 obtain the following general solution:

$$V(t) = \exp\left[\int_0^t \Phi(\tau)d\tau\right] \{ c - \int_0^t \Gamma(\tau)\exp\left[-\int_0^t \Phi(s)ds\right]d\tau\} \qquad (8$$

where "c" is the constant of integration and $\Phi=[(r_s+r_f\Omega+\phi(\Omega)\Omega)/(1+\Omega)]$ is the cost of financial capital. In order to have

$$\lim_{t\to\infty} V(t)>0 \qquad \text{with } \Phi>0$$

Bernstein and Nadiri impose that

$$c = \int_0^\infty \Gamma(\tau)\exp\left[-\int_0^t \Phi(s)ds\right]d\tau \qquad (9$$

Therefore, at time t=0, equation 8 becomes the following

$$V(0) = \int_0^\infty \exp\left[-\int_0^\tau \Phi(s)ds\right]\cdot[\Gamma(\tau)d\tau] \qquad (10$$

The firm, in order to maximize the value of the initial financial capital, minimizes Φ by selecting the optimal financial structure, and maximizes V(0) by choosing the optimal level of investments, given the optimal variable profits. The right-hand side of equation 10 is the objective functional. In this framework, the procedure is recursive: first, the unit cost of financial capital is minimized, second, by using the minimized unit cost of financial capital, the initial present value of the variable profits, net of the "purely technological" adjustment costs of investments, is maximized. The "financial' decision is described as follows:

$$\Phi^\circ = \min_{\Omega} [(r_S + r_f\cdot\Omega + \phi(\Omega)\cdot\Omega) / (1 + \Omega)] \qquad (11$$

hence:

$$\frac{d\Phi}{d\Omega} = [-r_S + r_f + \phi'\Omega(1+\Omega) + \phi] / (1+\Omega)^2 = 0 \qquad (12$$

In this framework the value of the shares and its instantaneous variation are exogenous, as well as the interest rate on the risk free debt r_f, while the risk premium ϕ depends on the leverage ratio Ω. the optimal financial structure corresponds to a situation where the marginal rate of return to shareholders equates the marginal cost of debt, which is determined by the interest rate on risk free assets and the marginal premium required by lenders. By substituting equation 12 into equation 11, we get:

$$\Phi^{\circ} = r_f + \phi'\Omega + \phi(\Omega) \qquad (13$$

The minimized cost of financial capital Φ° such as defined in equation 13, is the rate of discount of variable profits, net of "purely technological" adjustment costs. Therefore, the problem of determining the optimal level of investments may be redefined as follows:

$$J^{\circ} = \max_{I} \int_{0}^{\infty} \exp\left[-\int_{0}^{\tau} \Phi(s)ds\right] \cdot [u^{\circ}(\tau) - A(I)]d\tau \qquad (14$$

subject to conditions 3.

The optimal conditions can be obtained from the following Hamiltonian:

$$H = u^{\circ}(t) - A(I(t)) + q(I - gk) \qquad (15$$

Assuming that the second order conditions are satisfied, the first order conditions are the following:

$$\delta H/\delta I = -A' + q = 0 \qquad (16$$

$$\dot{q} = (\Phi^{\circ} + g)q - \delta u^{\circ}/\delta k \qquad (17$$

where q is the shadow price of the constraint, defined by using the current marginal valuations. Conditions 16 and 17, must hold together with conditions 3. The transversality conditions will be the following:

$$\lim z(t) \geq 0, \qquad [k^{*}(t) - k(t)]z(t) = 0 \qquad (18$$

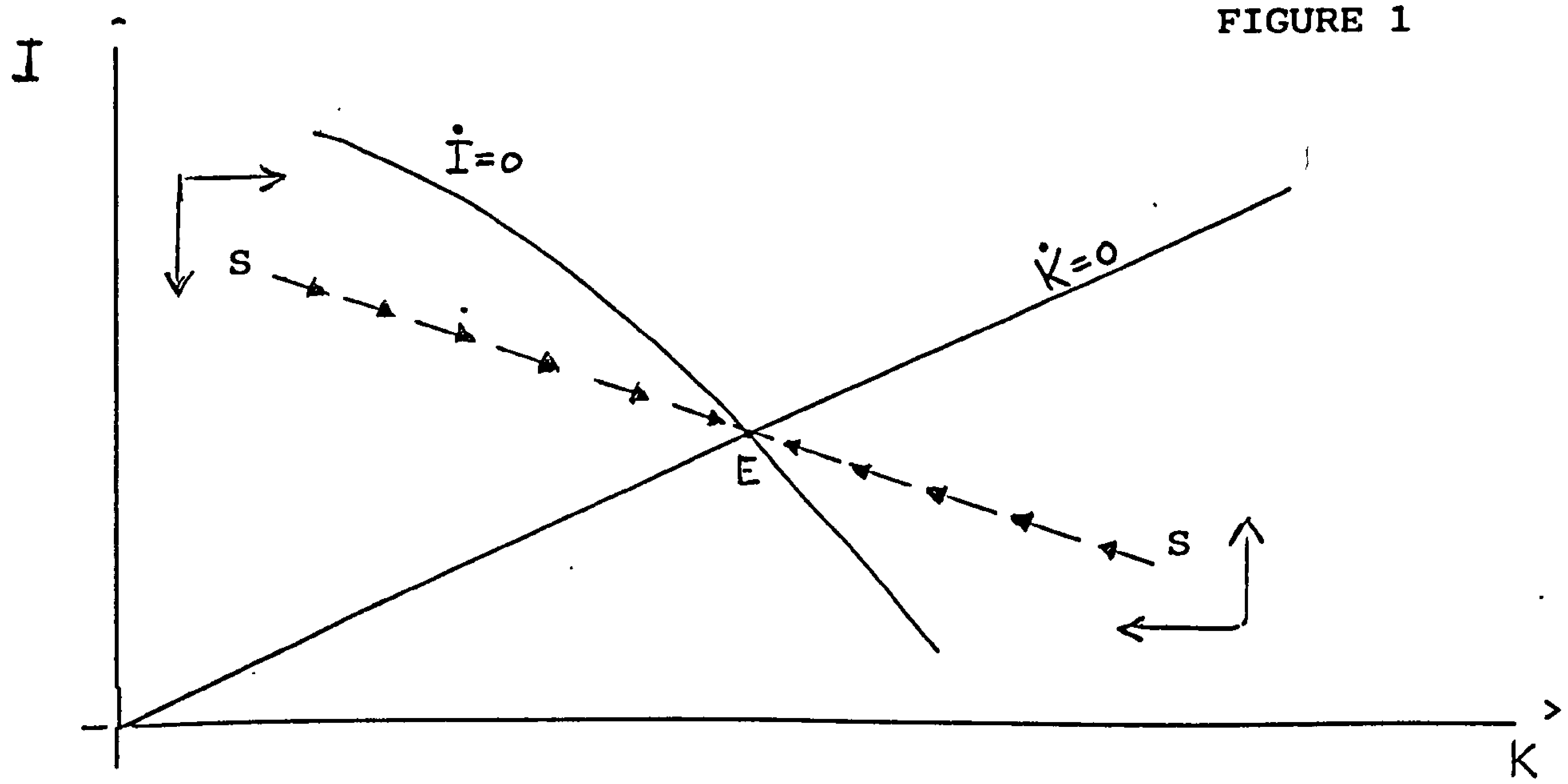
where $z(t) = e^{-\Phi^\circ t}q(t)$. Assuming that the transversality conditions are satisfied, equations 16 and 17 can be solved by obtaining the following:

$$A''\dot{I} = (\Phi^\circ + g)A' - \delta u^\circ/\delta k \qquad (19$$

Condition 19 corresponds exactly to the standard results of the neoclassical models on firm's investment decision, with the only difference that here the rate of discount Φ° depends on the leverage ratio, which, in its turn, depends on a few exogenous variables summarizing the information concerning the financial markets.

Graphically, the equilibrium may be represented as follows:

FIGURE 1



In the graphic, SS is the stable saddlepath. It is important to note that $\delta u^\circ/\delta k$ in this case is not the *marginal productivity of* *capital* of the standard neoclassical perfectly competitive models of investment decision, but it is the *marginal profitability of capital,* which is conditional on the (exogenous) conjectures. Therefore, in this framework, disturbances in the optimal level of investments may be caused not only by exogenous technological shocks, but also by changes in the conjectures, market shares, demand elasticity, as well as in the (exogenous) "financial" variables, like the value of shares and the interest rates on risk free assets.

2.1 The empirical implementation

Figure 1 shows that in the long run equilibrium E both conditions 3 and 19 are satisfied. From equation 19, we get:

$$A' = (\delta u°/\delta k)/(\Phi°+g)$$

hence:

$$I^* = G[(\delta u°/\delta k)/(\Phi°+g)] \quad (20$$

where I^* is the optimal level of investments, and $G = A'^{-1}$. The function G is monotonic and increasing, since the same has been assumed about A(I(t)). I^* is conditional on the exogenous mark up (which, in its turn, might depend on the demand elasticity, and market power) as well as the interest rate on risk free assets and the (exogenous) rate of return and value of shares. We assume that for each firm the decisions are taken in continuous time, but made known to outsiders at discrete intervals. In other words, each firm reveals to the others its investment (and financial structure) decision only when the balance sheet and profits and losses account are published. Nevertheless, the investment decision is taken in continuous time, although the information on the rivals' behaviour is founded on the latest available accounting data, which constitute the information source for conjectures. Following Cowling's [1982] approach, one can interpret the values of the firms' conjectures as an interval whose lower bound is given by the total absence of collusion, and the higher bound by the situation of collusion. We assume therefore that the conjectures of the firm appearing in equations 3 and 4 are consistent with a game admitting a sequential equilibrium, corresponding to a situation of collusion. If a firm deviates from its observable levels of investments of the previous periods (which is assumed to be a source of information for the conjectures of the other firms), it might cause the other firms to revise their strategy and, as a consequence, their conjectures. A deviation from the path of investments might induce the rival to change their behaviour, and possibly follow a less collusive and more aggressive policy. Therefore, it might be possible to think of a particular category of investments' adjustment costs - defined here as "strategic" adjustment costs of investments' for convenience - as those costs deriving from the fact that when a firm modifies its level of investments, it might have to bear the costs determined by changes in the rivals' strategy. In analogy with other empirical specifications (mainly the ones with partial adjustment, containing the lagged dependent variable among the regressors) we can think of the "costs of being out of the optimal level of investment" as opposed to the "strategic costs of adjustment", that, in this framework, would be proportional to the deviation of the investments at time "t" from the previous level, at time "t-1".

At this point we need a few approximations and simplifying assumptions in order to perform the empirical analysis. First of all, we will indicate analytical forms for the function A(I) (describing the "purely technological" adjustment costs of investments) and formalize the functional link between the *marginal profitability of capital* and the *average profitability of capital*. Both formalizations need to be consistent with all of the assumptions of the model. What we need is simply a monotonically increasing one-to-one function between the marginal profitability of capital and the average profitability of capital. For what concerns the "purely technological" adjustment cost of investments we need a function with the following characteristics: $A(0)=0$, $A'>0$, $A''>0$. A fairly general approximation for the function A(I), could be the following, which also has the advantage of being easy to handle on the algebraic point of view:

$$A=\theta_0 \cdot I^{\alpha} \qquad \text{with} \quad \alpha>1; \quad \theta_0>0 \qquad (21.$$

For what concerns the functional link between $\delta u/\delta k$ and u/k, it has to be consistent with the assumption, previously expressed, that the *marginal profitability of capital* is always positive, even when the *average profitability of capital* is negative. This is because the marginal profitability of capital is not empirically observable, unlike the average profitability of capital. Therefore, a condition for the latter to be employed as an approximation for the former is the existence of a one-to-one invertible functional link between them. The following analytical form shows the properties of having a positive marginal profitability of capital - even when the average profitability of capital is negative - and, at the same time, of showing an invertible one-to-one functional link between the average profitability of capital and the marginal profitability of capital:

$$\delta u/\delta k = \exp(\alpha_1 \cdot u/k) \qquad (22.$$

Substituting definitions 21 and 22 in equation 20, taking logs and rearranging yields the following equation:

$$\ln I^* = \frac{1}{\alpha - 1} \ln(1/\theta_0 \cdot \alpha) + \frac{\alpha_1}{\alpha - 1} \cdot \frac{u}{k} - \frac{1}{\alpha - 1} \ln(\Phi° + g) \qquad (23$$

The variable $\Phi°$ is not observable and equation 13 expresses $\Phi°$ as a function of the exogenous rate of return on shares and the leverage ratio Ω. Given that g is assumed to be constant and fixed, the leverage ratio Ω could be used as a proxy for the two variables in the bracket on the right-hand side of equation 23. In particular, we will use $\theta_1 \cdot \Omega^\beta$ as a proxy for the variable $(\Phi°+g)$. Substituting then $\theta_1 \cdot \Omega^\beta$ for $(\Phi°+g)$ in equation 23, we obtain the following:

$$\ln I^* = \frac{1}{\alpha-1} [\ln(1/\theta_0\alpha) + \ln\theta_1] + \frac{\alpha_1}{\alpha-1} \cdot \frac{u}{k} - \frac{\beta}{\alpha-1} \cdot \ln(\Omega) \qquad (24$$

Where β depends on the relation between $\theta_1 \cdot \Omega^\beta$ and $(\Phi°+g)$. The size of the parameter β is not stated a *priori*, and will be determined by the data. In this way, the data themselves will specify whether the variable defined as $(\Phi°+g)$ is concave or convex in $\theta_1 \cdot \Omega^\beta$. Such a formulation allows us not to rule out a *priori* neither a risk averse nor a risk lover attitude of the lenders.

We need now to take into account the "non-technological" adjustment costs of investments. It is assumed that, as in the model of partial adjustment, the firm minimizes a quadratic cost function including the *cost of being out of equilibrium* as well as the strategic cost of deviating from the level of investment signalled at the previous time. The problem for the firm may be formalized as follows:

$$\min C = a(I_t - I^*)^2 + b(I_t - I_{t-1})^2 \qquad (25$$

C is the total "non-technological" cost. The variables written in italic (the investments) are expressed in logs, "a" represents the "cost of being out of equilibrium", "b" represents the "non technological cost of deviating from the previous level of investments". Assuming that the second order conditions for the optimization problem described by equation 25 are satisfied, we obtain the following first order conditions:

$$\delta C/\delta I_t = 2a(I_t - I^*) + 2b(I_t - I_{t-1}) = 0 \qquad (26$$

$$I_t = [a/(a+b)]\cdot I^* + [b/(a+b)]\cdot I_{t-1} = \mu\, I^* + (1 - \mu)I_{t-1} \qquad (27$$

where $\mu=a/(a+b)$. Substituting equation 27 into equation 24, we get:

$$\ln I_t = \beta_0 + \beta_1 \frac{u}{k} - \beta_2\cdot\ln(\Omega) + \beta_3 \ln I_{t-1} \qquad (28$$

where

$$\beta_0=\frac{\mu}{\alpha - 1}[\ln(1/\theta_0\alpha)+\ln\theta_1]; \quad \beta_1=\frac{\mu\ \alpha_1}{\alpha - 1}; \cdot\ \beta_2=(\beta\cdot\mu)/(\alpha-1); \quad \beta_3=1-\mu \quad .$$

Equation 28 represents the specification employed for the econometric estimations. The value of the coefficients of equation 29 might be interpreted in economic terms. Looking at equations 27 and 28, it could be said that, at time "t", the higher the "non-technological" cost of deviating from the "t-1" level of investments, the lower the value of the parameter μ of equation 27, which must be, in any case, greater than 0 and smaller than 1. To give an example, in an industry characterized by a high degree of collusion among the firms, and an extremely high expected cost of breaking the collusion, the parameter μ should be positive and close to 0. In the extreme case, it should be equal to 0. This would imply that the coefficient β_3 of the lagged investments in equation 28 should be equal to 1, and equation 28 could be reformulated in the following way

$$\Delta \ln I_t = \beta_0 + \beta_1 \frac{u}{k} - \beta_2 \cdot \ln(\Omega) + \qquad (28'$$

but the regressors should be (in this extreme case) non significant. A negative value, or a value greater than one for the coefficient β_3, would in any case contradict the theoretical framework of this paper. No particular restrictions can be made on the value of the coefficient of (u/k) and $\ln(\Omega)$, apart from the fact that the former has to be positive, the latter negative, and their absolute value should be smaller, the larger β_3 (i.e. the closest to 1 is β_3).

2.2 The dataset and the use of the data

The dataset has been constructed by using all of the available firms' data from the Mediobanca sample, for three industries: the chemical, the electronics and the clothing. The appendix contains a report on the methodology followed in processing the data and the list of all of the firms included in the sample.

A few comments concerning the definition of B(t) and k(t) are necessary at this point. Most empirical work on investments and firms' financial structure employ data obtained from the stock market and tend not to use accounting data. Often, in those cases, the samples include only a small number of firms, usually the ones issuing securities in the stock and bond markets. It must be said, however, that these firms represent a small minority, both in terms of their number and their volume of trade, in a country with a non-securitized financial system. Since one of the purposes of this paper was to perform estimates on a very large and representative sample of firms operating in a few given industries, a different approach had to be followed. The sample provided by Mediobanca is one of the most complete sources of information. It was therefore a natural choice for the present purpose.

For the sake of the empirical analysis we have to consider that our data refer to an institutional context (Italy) where the overwhelmingly larger amount of credit is provided by the banking system, usually at a variable interest rate. Therefore, to the extent that the interest rate is flexible and adjusts, the balance sheet value could be a reasonable approximation for the "market value" of debt, although some distortion might derive from the absence of a measure for the risk of insolvency. In addition, if banks are regarded as institutions obtaining economies of scale in collecting information and monitoring the performances of the borrowers, then the information they have about the quality of their customers is not only private, but it is also part of the entrepreneurial skills of the banks' managers. To the extent that banks are agents seeking to maximize their profits by allocating their portfolio, the information they can get about the reliability of their customers is the main point of bank competition.

Since one of the purposes of this analysis is to investigate the relevance of the financial structure and flow of profits for the firm's investment decision, and test it for a very large sample of firms, proper valuations of the market value of debt for firms not operating on the stock and bond markets is not available, and, again, we argue that the book value should be an acceptable approximation.

Even for what concerns physical capital it might be difficult to define a "market value" for capital coming from firm specific investments. In other words, the physical capital k might not have a market value at all if considered apart from its original production unit, while it could be extremely productive when employed within the firm's specific technology. The concept of market value of physical capital becomes even more ambiguous if we take into account strategic interaction among firms. Aoki and Leijohnufvud [1988] point out that the value of the endowment of physical capital of a firm is not independent from the endowment of physical capital of the competitors. Therefore, the market value of physical capital may become a very ambiguous concept in a context of imperfect competition, when the various competitors are able to adjust it according to strategic needs. These considerations could suggest that, to the extent that we are interested in explaining investments, the variation of the net book value of physical capital might be a reasonable approximation, since such variation reflects the cost of capital goods in the period under consideration. This argument becomes stronger if we think that for a very large sample of firms, like the one we are using here, there might not be a better approximation and measure for the investment expenditure. However, a price index of capital goods will be employed when the capital stock has to be expressed at different prices from those determining the book value. Moreover, distortions might be a problem even for alternative definitions of the empirical data. In particular, empirical works where the so-called "market value" of physical capital is properly defined (in a non-securitized country), only refer to small samples of relatively big firms, for which data determined from the stock market, or detailed surveys (usually provided by the firms themselves, very rarely by independent institutions) are available. In the paper by Bernstein and Nadiri [1986], for example, the data set considered is a panel of forty-nine firms for the period 1959-64. In this regard it is very important to observe that the Bernstein and Nadiri model puts the emphasis on the market value of the financial assets of the firm and on the market value of R&D capital (as well as R&D expenditures), such as reported in surveys based on data provided by the firms themselves, and for what concerns the value of financial capital, by stock market data. Moreover, there is empirical evidence showing that the firms performing high levels of expenditure in R&D are raising a significant part of financial funds on the share market. As is well known, the share market is subject to several distortions such as speculative bubbles, and, according to the findings of the literature on share prices excess volatility (for example Shiller [1984], [1989]), they might not correctly reflect the net present value of dividends, and not, as a consequence, the proper value of the assets of the firms. Therefore, even the use of data obtained from share markets impose some form of prior restrictive assumption, often violated by the empirical evidence, and for this reason it is argued that the kind of approximation taken here might not contain more elements of distortion than the empirical works based on the usual mainstream approach. Finally, it might be worth mentioning that firms whose data appears in the Mediobanca survey, are usually subject to some form of monitoring (such as official auditing), where criteria for data collecting might be no less rigorous and strict that the ones of the official statistical institutions.

All the above considerations might lead us to conclude that, on one hand, the models emphasizing the "market values" of financial assets and physical capital might rely on suitable data only when they refer to very small and specific categories of firms, and that on the other hand, the book values of the variable considered in the gearing ratio might be, in our specific case, an acceptable approximation for the market values, given that any of these choices contains a degree of approximation.

Since the data used here mainly concern firms not issuing securities, if we define "k" and "B" at their book values, then the leverage ratio, with regard to the balance sheet constraint 9, will be defined as

$$\Omega(t) = \frac{B(t)}{E(t) + R(t)} \qquad (29$$

Since the balance sheet constraint 9 holds at any moment in time, if k(t) and B(t) are defined at book values, the value of the own capital will be defined as E(t)+R(t), again at book value.

The variable profits have been calculated, on the basis of Mediobanca data, as the value added minus the labour costs. Other details, such as the use of appropriate deflators for the prices of capital goods are explained in the appendix. The empirical results will be considered in the next section.

3. The empirical results

The tables enclosed in the appendix contain some estimations made by following the technique of unbalanced panel data.

The data have been obtained from the "Mediobanca" sample and refer to three sectors: the chemical sector (tables 1-8), the electronic sector (tables 9-20) and the clothing sector (21-32).

We start with equation 28 for the empirical specification of the investment function. Since in all of the three sectors the coefficient of the lagged dependent variable is close to one, the parameter restriction $\beta 3=1$ has been tested. Such restriction would yield equation 28' as an empirical specification :

The usual F-test on parameter restrictions has not been employed in this case, for two main reasons. First of all, in the case of panel data, it is necessary to make use of some testing procedure robust to heteroscedasticity, and the usual F-test based on the residual sum of squares is not robust to heteroscedasticity. Secondly, as it is well known, in the case of instrumental variables, the power of the test depends on the fact of having good instruments. In our case, looking at the unrestricted model (equation 28) the instruments for u/k and $\ln(\Omega)$ are their respective lagged variables, while for the lagged dependent value (i.e. $\ln I_{t-1}$) the instrument is a variable here defined as "LNKHLAG". This variable corresponds to the lagged value of the book value of the physical capital, gross of the accumulated depreciation (instrument for "LAGLOGIN", as defined below). This value includes all of the costs of purchase and installation of all of the pieces of physical capital that have not become obsolete and are still in use in the production process of the firm. Those which become obsolete earlier than expected are liquidated or eliminated from the balance sheet. The operation of liquidation originates an atypical or non-operative profit or loss. In this sense, the variable LNKHLAG can be thought of as the cumulated sum of the "purely technological" adjustment cost of investment implemented in the past and still in use in the firm. The kind of instrument employed for the lagged dependent variable is different from the one employed for the other regressors. Therefore, in contrasting the residual sum of squares of the restricted and unrestricted models, not only is there a problem of power of the test, but also a problem of homogeneity of the set of instruments employed. In fact, the "atypical" instrument LNKHLAG is only employed in the unrestricted model.

Therefore, in order to test for the parameter restriction $\beta_3=1$, the following procedure has been implemented. First of all, the following regression has been implemented:

$$\Delta \ln I_t = \beta_0 + \beta_1 \frac{u}{k} - \beta_2 \cdot \ln(\Omega) + (1-\beta_3) \cdot \ln I_{t-1} \qquad (28"$$

Secondly, using the white (robust to heteroschedasticity) t-statistics the following null hypothesis has been tested:

H_0 : $(1-\beta_3) = 0$

In case the null hypothesis is rejected, equation 28 is still regarded as the best one. In case the null hypothesis is not rejected, then equation 28' is adopted as an empirical specification. However, the implications of the theoretical model here adopted require that if the parameter restriction $\beta_3=1$ holds, then, in equation 28' the regressors have to be non significant, as explained in the previous section.

It might be interesting to note that the empirical specification 28 would be likely to yield satisfactory results even if the "Kaleckian" interpretation of investment behaviour (such as formulated, for example, in Henley [1990]) is true. In fact, although the Kaleckian theory of investments is formulated in aggregated terms, it argues that the investments depend positively on the rate of profits and on the non-utilized production capacity. If one accepted that the leverage ratio could capture the effects of an unexpected negative shock in the profits, then it could be argued that the leverage ratio is correlated with the "unexpectedly non-utilized" production capacity. Another way of seeing a connection with the "Kaleckian" investment theory lies in the implications of the "deep pocket argument", or, in other words, the signalling use of the financial structure, mentioned in the introductory section. According to this approach, the signalling use of the financial structure leads the incumbent firms to choose a financial structure too expensive for the potential entry, in order to deter entry. Furthermore, by observing that the higher the level of investments at time t-1, the higher is likely to be the "non-utilized" production capacity (especially in the presence of an "entry-deterrence" use of investment), it could be observed that, loosely speaking, the explanatory power of the "non-utilized" production capacity could be jointly captured by the variables $\ln I_{t-1}$ and $\ln(\Omega)$, while the rate of profits on physical capital is an explanatory cause of investment already present in the Kaleckian formulation.

The estimations have been run using the package DPD (a routine of Gauss developed by Arellano and Bond [1988]).

Since the years employed for the estimations, for what concerns Italy, are in general regarded as years of uniform economic growth without any particular shock, the estimations for all of the equations have been implemented both with and without dummies.

Appendix 1 contains the definition of the variables employed in the estimates and the tables with the estimates.

Appendix 2 contains the list of all of the data for all of the firms and a detailed description of the way the data have been processed.

The joint significance of the variables is assessed on the basis of the Wald test of joint significance, while the individual significance of the variables is assessed on the basis of the t-statistics.

Table 1 shows the estimation of equation 28 for the chemical sector without annual dummies. The variables are jointly significant (at the level of confidence of 95%), and seem to be also individually significant, although lnmu is less significant than the others (the null hypothesis is only rejected with a level of confidence of .61 in the "one-step estimates with robust test statistics"). Table 2 only shows some descriptive statistics and the asymptotic variance matrices. Table 3 shows the estimate for equation 28 with the time dummies, which are only significant with a level of confidence of 0.75. Apart from the dummies, both the value of the coefficients and their significance are analogous to the ones shown in table 1, representing equation 28 without dummies.

Table 4 again shows some descriptive statistics and the asymptotic variance matrices of the equation estimated in table 3.

Having noticed that in equations 1 and 3 the coefficient for the lagged dependent variable (lnI_{t-1}) is close to one, the parameter restriction $\beta_3=1$ for equation 28 has been tested. For this purpose, equation 28 has been reparametrized in the form of equation 28", where the null hypothesis $H_0:(1-\beta_3)=0$ has been tested. Tables 5 and 7 show the estimates of equation 28" without time dummies and with time dummies respectively. For the reasons explained at the beginning of this section, the test implemented for this purpose is the robust t-statistics on the significance of the coefficient of lnI_{t-1}. Both in the case of table 5 and table 7, the null hypothesis $H_0:(1-\beta_3)=0$ is rejected at the level of confidence of 0.99. This means that the equations that better describe the behaviour of investments for the firms of the chemical sector are the ones of table 1 and 3, reported as follows (the numbers in brackets refer to the robust t-statistics, and the definitions of the variables are reported in appendix 1):

Chemical sector: estimate without time dummies.

$$\underset{}{loginv} = \underset{(2.98282)}{.777427} + \underset{(29.579329)}{.922032}\ laglogin + \underset{(8.337532)}{.001551}\ prorat \underset{(-.871038)}{-.174732}\ lnmu$$

Wald (robust) test of joint significance = 1100.341505

$R^2 = .739$

Chemical sector: estimate with time dummies.

$$loginv = \underset{(3.238360)}{.850922} + \underset{(29.868663)}{.922766}\ laglogin + \underset{(8.978494)}{.001655}\ prorat \underset{(-.899436)}{-.180182}\ lnmu +$$

$$\underset{(-.383689)}{-.034625}\ D89 \underset{(-1.796919)}{-.200129}\ D90$$

Wald (robust) test of joint significance = 1071.366471

Wald (robust) test of joint significance of time dummies = 3.419619

$R^2 = .743$

Tables 9 and 11 show the estimate of equation 28 for the electronics sector without time dummies, and with time dummies respectively. Table 10 shows some descriptive statistics and the asymptotic variance matrices for the estimates of table 9, while table 12 provides the same information for the estimates of table 11. The time dummies are only significant at the level of confidence of 0.75. The variables are jointly significant, but in this case some variables are individually less significant than in the estimates for the chemical sector. Both in the estimate of table 9 and 11, the variable lnmu is not significant, while the variable "prorat" is only significant at the level of confidence of 0.55 in table 9 and 0.61 in table 11.

In this case also the null hypothesis $H_0: (1-\beta_3)=0$ has been tested following the same procedure as in the chemical sector. Table 13 shows the estimate for equation 28" without time dummies (while table 14 shows again the same descriptive statistics and asymptotic variances) and equation 15 shows the estimates for equation 28" with time dummies (and again table 16 shows the respective descriptive statistics and variance matrices). Both in table 13 and 15 H_0 is not rejected, although only at the level of confidence of 0.90. This leads to a reformulation of the model according to equation 28' (table 17 for the specification without time dummies and table 19 for the specification with time dummies, while tables 18 and 20 show the respective descriptive statistics and variance matrices). As explained at the beginning of this section and at the end of section 2.1, this result could be interpreted as a situation where, for the firms, the fact of deviating from the previously signalled behaviour determines a very high level of "non-technological" or "strategical" adjustment costs of investments. In other words, the cost of being out of the (theoretically) optimal level of investments is neglectable compared to the cost of deviating from the (possibly collusive) level of investments previously signalled. This implies (in order that our theoretical framework should be consistent with the theory) that the regressors of equation 28' must be non-significant. This seems to be the case, since the Wald test of joint significance for tables 17 and 19 yield a very low value (excepting for the test of joint significance of the time dummies) suggesting that all of the regressors of equation 28' are in this case non-significant. In the case of the electronic sector, although the results do not contrast with the theory, they yield a set of equations that do not contain very much information on the behaviour of the firms' investments, apart from the fact that the "strategic" cost of deviating from the previously signalled level of investments seems to be very costly. This yields a situation where only the past level of investments is strongly significant for the explanation of the present level of investments, while a certain degree of ambiguity is still present for what concerns the other variables. However, a situation where the firms' behaviour is strongly affected by the rivalry and/or collusion among the different firms and by a large use of signals, seems to fit with the characteristics of the electronics sector.

Electronics sector: estimate in levels without time dummies.

```
loginv = .123611 +.997099 laglogin +.013059 prorat -.012975 lnmu
         (0.32456) (23.729008)       (0.756941)    (-.080122)
```

Wald (robust) test of joint significance = 656.280974

R^2= .815

Electronics sector: estimate in levels with time dummies.

$$\text{loginv} = \underset{(0.669812)}{.246333} + \underset{(24.053351)}{.997998}\ \text{laglogin} + \underset{(0.872424)}{.014465}\ \text{prorat} - \underset{(-.006415)}{.001043}\ \text{lnmu}\ +$$

$$-\underset{(-1.356358)}{.178303}\ D89 - \underset{(-1.840832)}{.219409}\ D90$$

Wald (robust) test of joint significance = 725.725731

Wald (robust) test of joint significance of time dummies = 3.711439

R^2= .818

Electronics sector: estimate with the parameter restriction β_3=0 and without time dummies.

$$\text{dogin} = \underset{(1.46291)}{.066896} + \underset{(1.464071)}{.013419}\ \text{prorat} - \underset{(-.125758)}{.013873}\ \text{lnmu}$$

Wald (robust) test of joint significance = 0.757294

R^2= .012

Electronics sector: estimate with the parameter restriction β_3=0 and with time dummies.

$$\text{dogin} = \underset{(2.06872)}{.228658} + \underset{(0.825006)}{.014714}\ \text{prorat} - \underset{(-.012991)}{.001651}\ \text{lnmu} - \underset{(-1.246084)}{.178467}\ D89\ +$$

$$-\underset{(-2.025493)}{.219552}\ D90$$

Wald (robust) test of joint significance = 0.841852

Wald test of joint significance of time dummies = 5.042572

R^2= .032

A result that seems to contrast with the theory has been obtained in the case of the clothing sector.

Table 21 shows the estimate of equation 28 without time dummies, table 22 shows its descriptive statistics and asymptotic variance matrices. Table 23 shows the estimates of equation 28 with time dummies, and table 24 shows its descriptive statistics and asymptotic variance matrices. The regressors are jointly significant, and the time dummies are significant at the level of confidence of 0.95, therefore the equation of table 23 is the most reliable. In this equation, the coefficient for the variable lnmu has a wrong sign, but the variable itself is not significant. However, the results of the estimate of table 23 seem to contradict the theoretical framework of this paper, since the coefficient of the lagged dependent variable is greater than one. The null hypothesis $H_0:(1-\beta_3)=0$ has been tested in tables 25 and 27 by running regression 28" and looking at the robust t-statistics for the lagged dependent variable. Table 25 shows the estimate for equation 28" without time dummies, table 26 shows its relative descriptive statistics and variance matrices, table 27 shows the estimate for equation 28" with time dummies and table 28 shows its descriptive statistics and variance matrices. In the estimate of table 25, H_0 is not rejected at the level of confidence of 0.90, while in table 27 the situation is more ambiguous, since H_0 is not rejected only at the level of confidence of 0.80. If the null hypothesis is not rejected, and the estimate of equation 28' is implemented (table 29 for equation 28' without time dummies and table 31 for equation 28' with time dummies), the results do not seem to be consistent with the theoretical framework followed here, since the regressors in the estimates of equation 28' are jointly significant at the level of confidence of 0.95. In fact, as it has been pointed out at the beginning of this section and at the end of section 2.1, the theory followed in this paper implies that when the null hypothesis is not rejected, then in equation 28' the regressor must not be significant, as in the case of the electronics sector. Therefore, the results of the estimates for the clothing sector do not seem to fit with the theory described in this paper, although a certain degree of ambiguity remains due to the fact that the null hypothesis in table 27 has not been rejected only at the level of confidence of 0.80. However, it might be interesting to note that theoretical framework of this paper, designed to describe the investment behaviour with imperfect competition, yields the worst results in the clothing sector, which is, among the three considered here, the closest to the perfectly competitive configuration.

Since the time dummies turned out to be significant, while the null hypothesis $H_0:(1-\beta_3)=0$ has not been rejected, with a slightly higher degree of ambiguity than in the case of the electronics sector, only the estimates of table 23 and 31 (i.e. equation 28 and 28" both with time dummies) are reported in what follows:

Clothing sector: estimate in levels with time dummies.

loginv = .107130 +1.032241 laglogin +.056679 prorat +.107080 lnmu +
(0.078584) (5.489028) (1.552927) (.444283)

-.633829 D89 -.275820 D90
(-2.302265) (-.978829)

Wald (robust) test of joint significance = 37.181121

Wald (robust) test of joint significance of time dummies = 6.854276

R^2= .200

Clothing sector: estimate with the parameter restriction β_3=0 and with time dummies.

dogin = .340421 +.055356 prorat .095473 lnmu -.613535 D89 +
(1.86353) (5.579749) (.599836) (-2.586558)

-.254475 D90
(-1.000071)

Wald (robust) test of joint significance = 32.403434

Wald (robust) test of joint significance of time dummies = 7.494676

R^2= .129

We can conclude, therefore, that the empirical results seem to be consistent with the theoretical framework of this paper for what concerns the chemical and electronics sectors, while they show some inconsistency with the theoretical framework of this paper (apart from showing low explanatory power and very scarce significance of the regressors) for what concerns the clothing sector. In this last sector, the estimates of tables 29 and 31 show a certain degree of statistical correlation between the term dlogin (difference of the logs of the investments) and the term prorat (rate of profits on physical capital). It might be interesting to note that the worst results have been obtained in a sector (clothing) whose market structure is much closer to the perfectly competitive one (at least for what concerns the presence of technological know-how, barriers to entry and average size of the firms) than the other two sectors analyzed here. In this sense, the clothing sector is more distant from the theoretical framework employed, which justifies the presence of a lagged dependent variable on the basis of the effect of stability vs. modifications in the conjectures of the different firms operating in an imperfectly competitive context.

4. Conclusions.

The purpose of this paper is to provide and test empirically a simplified dynamic framework where the decision concerning investments and the financial structure of the firm take place simultaneously, in the presence of bankruptcy and adjustment costs and with imperfect competition on the goods market. An important feature of this model is the presence of non-technological adjustment costs of investments, determined by a deviation from the level of investments such as signalled at discrete intervals.

In section 3 an empirical analysis has been implemented on the basis of the theoretical model presented in section 2. The empirical analysis is based on three samples of firms' data from three different industries: the chemical, the electronics and the clothing industries. The results, obtained through panel data techniques, seem to be consistent with the predictions of our theoretical framework for what concerns the chemical and the electronics sectors, while they show a few inconsistencies for what concerns the clothing sector, i.e. the sector whose market configuration seems to be closest to the perfectly competitive one.

A possible explanation for such inconsistencies might be found in the simplifying assumptions made on the very complex relations between the cost of capital, the profitability of the firm, and the strategic interactions among the different competitors. A big number of theoretical contributions in industrial economics and in finance point out many different relations of causality and possible functional links among these variables. These issues, as well as an alternative interpretation of the investment behaviour, constitute the purpose of the analysis of the next chapter.

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APPENDIX 1

In what follows the symbols of the Variables Included in the Estimations and in the equations are reported. The first section refers to the instruments, the second

1.INSTRUMENTS:

CONST = (constant) intercept term;

LNKHLAG = lagged value of the book value of the physical capital, gross of the accumulated depreciation (instrument for "laglogin", as defined below). This value includes all of the costs of purchase and installation of all of the pieces of physical capital that have not become obsolete and are still in use in the production process of the firm. Those which become obsolete earlier than expected are liquidated or eliminated from the balance sheet. The operation of liquidation originates an extraordinary profit or loss. In this sense, the variable lnkhlag can be thought of as the cumulated sum of the "purely technological" adjustment cost of investment implemented in the past and still in use in the firm.

PRORATLA = lagged value of "prorat", as defined below;

LNMULA=log of the lagged value of $(1+\Omega)$, (where the debt only include log term financial debt).$(1+\Omega)$ has been employed instead of Ω, since Ω is often null, and could not have been calculated in logs.

2.DEPENDENT VARIABLES

LOGINV = lnI(t) as defined in equation 37.

DLOGINV = lnI(t) - lnI(t-1)

D89 = dummy variable for year 1989.

D90 = dummy variable for year 1990.

3.REGRESSORS:

LAGLOGIN = lnI(t-1) as defined in equation 37;

lnmu = $\ln(1+\Omega)$

$$\text{PRORAT} = \frac{u(t)}{k}$$

however, u(t)/k, determines some problems of approximation. u(t) is a flow variable determined between t-1 and t, while k has to be defined either at time t or at time t-1. Its price, again, has to be defined either at time t or t-1. Any choice would contain some degree of approximation. The choice made here, analogous to the one made by Bernstein and Nadiri [1986], is the following:

$$\text{PRORAT} = \frac{\text{var.prof.}(t)}{p_k(t)k(t-1)}$$

where

VAR.PROF.= variable profits, i.e., from Mediobanca data, the difference between the value added and the labour cost. The implicit simplifying assumption here is that it is the capital stock at time t-1 that contributes to determine the variable profits at time t. However, the capital stock, although considered at time t-1 for the sake of simplification, has to be valuated at a price level calculated at the same time when the variable profits are calculated, i.e. time t.

pk = implicit price deflator of capital goods (source DATASTREAM services at the University of Warwick, on the basis of OECD data); in particular the data are the following:

year	price at time t / price at time t-1
1986	1.05688
1987	1.06135
1988	1.05066
1989	1.06159
1990	1.0549
1991	1.041

4."RAW" DATA AND VARIABLES:

ACC.D.(t) = Accumulated depreciations at time "t";

DEPR(t) = Depreciations at time "t";

I(t) = gross investment (INV. in the tables of the data), defined as follows:

I(t) = K(t) - ACC.D.(t) - K(t-1) + ACC.D.(t-1) + DEPR(t)

u(t) = variable profits (**VAR.PROF.** in the tables of the data) , defined as the difference between the value added (**V.ADD.**) and the labor cost (**LAB.C.**);

EQ. = Equities (Book Value);

RES. = balannce sheet reserves and accumulated profits;

L.T.F.D. = long term financial debt;

mu = (EQ.+RES.)/L.T.F.D. ; this ratio has been earlier defined as Ω; the variable lnmu is not actually the log of mu, but its proxy.

++

TABLE 1 CHEMICAL SECTOR

D.P.D. RESULTS

LEVELS IV

Number of firms: 124 Sample period is 1988 to 1990
Observations: 274 Degrees of freedom: 270

Dependent variable is: loginv

Instruments used are:
CONST lnkhlag proratla lnmula

ONE-STEP ESTIMATES

RSS = 136.145185 TSS = 521.925911
Estimated sigma-squared (levels) = 0.504241

Wald test of joint significance: 713.365013 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.777427	0.287009	2.708721	0.006754
laglogin	0.922032	0.034794	26.499427	0.000000
prorat	0.001551	0.000695	2.230373	0.025723
lnmu	-0.174732	0.209604	-0.833627	0.404491

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -1.808 [89]
Test for second-order serial correlation: -2.434 [61]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 1100.341505 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.777427	0.260635	2.982820	0.002856
laglogin	0.922032	0.031171	29.579329	0.000000
prorat	0.001551	0.000186	8.337532	0.000000
lnmu	-0.174732	0.200602	-0.871038	0.383734

Robust test for first-order serial correlation: -1.084 [89]
Robust test for second-order serial correlation: -1.621 [61]

Estimated serial correlation matrix

1.000		
0.013	1.000	
-0.247	-0.266	1.000

Number of observations available to sample covariances

86		
76	97	
61	74	91

Model just identified - two-step estimates and one-step estimates coincide

TABLE 2 CHEMICAL SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
loginv	8.29173	1.38268	3.80666	11.43889
laglogin	8.18781	1.39863	2.94444	11.23452
prorat	5.60625	64.72126	-0.54212	1070.34302
lnmu	0.25076	0.25699	0.00000	1.52245

Correlation Matrix

loginv	laglogin	prorat	lnmu
1.00			
0.86	1.00		
-0.07	-0.15	1.00	
0.11	0.12	-0.06	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
8237.406			
-970.297	121.065		
-3.612	0.380	0.048	
-352.984	-92.076	0.927	4393.389

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
6793.052			
-794.295	97.166		
-3.445	0.374	0.003	
-391.501	-42.124	0.625	4024.107

D.P.D. RESULTS

LEVELS IV

Number of firms: 124 Sample period is 1988 to 1990
Observations: 274 Degrees of freedom: 268

Dependent variable is: loginv

Instruments used are:
CONST lnkhlag proratla lnmula TIM DUMS

ONE-STEP ESTIMATES

RSS = 134.188713 TSS = 521.925911
Estimated sigma-squared (levels) = 0.500704

Wald test of joint significance: 718.765907 df = 3
Wald test - jt sig of time dums: 4.080675 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.850922	0.291546	2.918658	0.003515
laglogin	0.922766	0.034681	26.607521	0.000000
prorat	0.001655	0.000696	2.378346	0.017390
lnmu	-0.180182	0.208825	-0.862841	0.388225
D89	-0.034625	0.104818	-0.330339	0.741144
D90	-0.200129	0.106813	-1.873648	0.060979

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -1.813 [89]
Test for second-order serial correlation: -2.266 [61]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 1071.366471 df = 3
Wald test - jt sig of time dums: 3.419619 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.850922	0.262763	3.238360	0.001202
laglogin	0.922766	0.030894	29.868663	0.000000
prorat	0.001655	0.000184	8.978494	0.000000
lnmu	-0.180182	0.200328	-0.899436	0.368421
D89	-0.034625	0.090243	-0.383689	0.701209
D90	-0.200129	0.111374	-1.796919	0.072348

Robust test for first-order serial correlation: -1.112 [89]
Robust test for second-order serial correlation: -1.629 [61]

Estimated serial correlation matrix

1.000		
0.002	1.000	
-0.233	-0.260	1.000

Number of observations available to sample covariances

86		
76	97	
61	74	91

Model just identified - two-step estimates and one-step estimates coincide

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
loginv	8.29173	1.38268	3.80666	11.43889
laglogin	8.18781	1.39863	2.94444	11.23452
prorat	5.60625	64.72126	-0.54212	1070.34302
lnmu	0.25076	0.25699	0.00000	1.52245

Correlation Matrix

loginv	laglogin	prorat	lnmu
1.00			
0.86	1.00		
-0.07	-0.15	1.00	
0.11	0.12	-0.06	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
8499.897					
-959.771	120.275				
-3.446	0.384	0.048			
-322.892	-91.582	0.931	4360.777		
-574.327	0.062	-0.013	-34.140	1098.675	
-467.075	-12.728	-0.607	-41.846	582.659	1140.894

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
6904.459					
-773.526	95.445				
-3.138	0.359	0.003			
-502.517	-48.320	0.404	4013.145		
-258.264	-24.767	-0.030	93.552	814.384	
-604.220	9.038	-0.592	389.434	434.822	1240.407

+++

TABLE 5 CHEMICAL SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 124 Sample period is 1988 to 1990
Observations: 274 Degrees of freedom: 270

Dependent variable is: dloginv

Instruments used are:
CONST lnkhlag proratla lnmula

ONE-STEP ESTIMATES

RSS = 136.145185 TSS = 147.403211
Estimated sigma-squared (levels) = 0.252121

Wald test of joint significance: 20.239797 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.777427	0.204538	3.800901	0.000144
laglogin	-0.077968	0.024736	-3.152046	0.001621
prorat	0.001551	0.000683	2.269625	0.023230
lnmu	-0.174732	0.159402	-1.096172	0.273004

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -1.882 [89]
Test for second-order serial correlation: -2.448 [61]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 191.495887 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.777427	0.286724	2.711415	0.006700
laglogin	-0.077968	0.034015	-2.292135	0.021898
prorat	0.001551	0.000195	7.937991	0.000000
lnmu	-0.174732	0.172805	-1.011148	0.311946

Robust test for first-order serial correlation: -1.343 [89]
Robust test for second-order serial correlation: -1.624 [61]

Estimated serial correlation matrix

1.000		
0.013	1.000	
-0.247	-0.266	1.000

Number of observations available to sample covariances

86		
76	97	
61	74	91

Model just identified - two-step estimates and one-step estimates coincide

TABLE 6 CHEMICAL SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.10392	0.73481	-3.58269	2.76505
laglogin	8.18781	1.39863	2.94444	11.23452
prorat	5.60625	64.72126	-0.54212	1070.34302
lnmu	0.25076	0.25699	0.00000	1.52245

Correlation Matrix

dloginv	laglogin	prorat	lnmu
1.00			
-0.28	1.00		
0.16	-0.15	1.00	
-0.02	0.12	-0.06	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
4183.560			
-491.340	61.186		
-2.338	0.248	0.047	
-287.520	-41.739	0.582	2540.893

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
8221.048			
-960.425	115.705		
-3.987	0.442	0.004	
-356.808	-30.050	0.620	2986.166

+++

TABLE 7 CHEMICAL SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 124 Sample period is 1988 to 1990
Observations: 274 Degrees of freedom: 268

Dependent variable is: dloginv

Instruments used are:
CONST lnkhlag proratla lnmula TIM DUMS

ONE-STEP ESTIMATES

RSS = 134.188713 TSS = 147.403211
Estimated sigma-squared (levels) = 0.250352

Wald test of joint significance: 21.120679 df = 3
Wald test - jt sig of time dums: 18.490814 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.850922	0.217426	3.913627	0.000091
laglogin	-0.077234	0.024657	-3.132315	0.001734
prorat	0.001655	0.000684	2.418750	0.015574
lnmu	-0.180182	0.158791	-1.134716	0.256494
D89	-0.034625	0.124695	-0.277681	0.781257
D90	-0.200129	0.106666	-1.876220	0.060625

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -1.888 [89]
Test for second-order serial correlation: -2.279 [61]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 212.232895 df = 3
Wald test - jt sig of time dums: 9.381470 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.850922	0.291524	2.918873	0.003513
laglogin	-0.077234	0.033557	-2.301539	0.021361
prorat	0.001655	0.000186	8.880043	0.000000
lnmu	-0.180182	0.173496	-1.038541	0.299018
D89	-0.034625	0.090164	-0.384027	0.700958
D90	-0.200129	0.119150	-1.679641	0.093027

Robust test for first-order serial correlation: -1.367 [89]
Robust test for second-order serial correlation: -1.646 [61]

Estimated serial correlation matrix

1.000		
0.002	1.000	
-0.233	-0.260	1.000

Number of observations available to sample covariances

86		
76	97	
61	74	91

Model just identified - two-step estimates and one-step estimates coincide

TABLE 8 CHEMICAL SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.10392	0.73481	-3.58269	2.76505
laglogin	8.18781	1.39863	2.94444	11.23452
prorat	5.60625	64.72126	-0.54212	1070.34302
lnmu	0.25076	0.25699	0.00000	1.52245

Correlation Matrix

dloginv	laglogin	prorat	lnmu
1.00			
-0.28	1.00		
0.16	-0.15	1.00	
-0.02	0.12	-0.06	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
4727.385					
-493.377	60.797				
-2.265	0.249	0.047			
-259.151	-41.429	0.578	2521.450		
-882.083	9.873	0.213	-37.851	1554.877	
-598.587	3.018	-0.544	-27.834	597.461	1137.768

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
8498.642					
-942.051	112.610				
-3.579	0.405	0.003			
-407.754	-41.518	0.455	3010.079		
-328.169	-15.461	0.037	75.519	812.951	
-1007.960	48.375	-0.384	353.130	414.646	1419.674

++

TABLE 9 ELECTRONICS SECTOR

D.P.D. RESULTS

LEVELS IV

Number of firms: 73 Sample period is 1988 to 1990
Observations: 163 Degrees of freedom: 159

Dependent variable is: loginv

Instruments used are:
CONST lnkhlag proratla lnmula

ONE-STEP ESTIMATES

RSS = 72.782900 TSS = 392.534262
Estimated sigma-squared (levels) = 0.457754

Wald test of joint significance: 699.198213 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.123611	0.378417	0.326654	0.743930
laglogin	0.997099	0.042020	23.729008	0.000000
prorat	0.013059	0.013967	0.935046	0.349765
lnmu	-0.012975	0.154067	-0.084216	0.932885

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -3.564 [52]
Test for second-order serial correlation: 1.789 [38]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 656.280794 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.123611	0.380848	0.324569	0.745508
laglogin	0.997099	0.043560	22.889978	0.000000
prorat	0.013059	0.017253	0.756941	0.449085
lnmu	-0.012975	0.161940	-0.080122	0.936140

Robust test for first-order serial correlation: -2.076 [52]
Robust test for second-order serial correlation: 1.699 [38]

Estimated serial correlation matrix

1.000		
-0.230	1.000	
0.259	-0.485	1.000

Number of observations available to sample covariances

50		
42	52	
38	48	61

Model just identified - two-step estimates and one-step estimates coincide

TABLE 10 ELECTRONICS SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
loginv	8.81888	1.55662	5.84644	13.92139
laglogin	8.69317	1.54594	5.48894	13.92139
prorat	2.50357	4.82378	-1.41262	46.03984
lnmu	0.41392	0.42540	0.00000	1.91044

Correlation Matrix

loginv	laglogin	prorat	lnmu
1.00			
0.91	1.00		
-0.33	-0.38	1.00	
0.22	0.22	-0.19	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
14319.978			
-1541.109	176.570		
-264.279	23.414	19.507	
47.383	-126.749	28.744	2373.667

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
14504.557			
-1613.254	189.752		
-323.165	27.247	29.766	
311.210	-154.356	61.602	2622.449

++

D.P.D. RESULTS

LEVELS IV

Number of firms: 73 Sample period is 1988 to 1990
Observations: 163 Degrees of freedom: 157

Dependent variable is: loginv

Instruments used are:
CONST lnkhlag proratla lnmula TIM DUMS

ONE-STEP ESTIMATES

RSS = 71.356743 TSS = 392.534262
Estimated sigma-squared (levels) = 0.454502

Wald test of joint significance: 704.188013 df = 3
Wald test - jt sig of time dums: 3.163735 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.246333	0.383129	0.642951	0.520256
laglogin	0.997998	0.041849	23.847676	0.000000
prorat	0.014465	0.013781	1.049584	0.293909
lnmu	-0.001043	0.153039	-0.006814	0.994564
D89	-0.178303	0.133653	-1.334077	0.182179
D90	-0.219409	0.128708	-1.704703	0.088250

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -3.540 [52]
Test for second-order serial correlation: 1.703 [38]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 725.725731 df = 3
Wald test - jt sig of time dums: 3.711439 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.246333	0.367765	0.669812	0.502978
laglogin	0.997998	0.041491	24.053351	0.000000
prorat	0.014465	0.016580	0.872424	0.382977
lnmu	-0.001043	0.162555	-0.006415	0.994882
D89	-0.178303	0.131457	-1.356358	0.174985
D90	-0.219409	0.119190	-1.840832	0.065646

Robust test for first-order serial correlation: -2.024 [52]
Robust test for second-order serial correlation: 1.688 [38]

Estimated serial correlation matrix

1.000		
-0.222	1.000	
0.257	-0.492	1.000

Number of observations available to sample covariances

50		
42	52	
38	48	61

Model just identified - two-step estimates and one-step estimates coincide

TABLE 12 ELECTRONICS SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
loginv	8.81888	1.55662	5.84644	13.92139
laglogin	8.69317	1.54594	5.48894	13.92139
prorat	2.50357	4.82378	-1.41262	46.03984
lnmu	0.41392	0.42540	0.00000	1.91044

Correlation Matrix

loginv	laglogin	prorat	lnmu
1.00			
0.91	1.00		
-0.33	-0.38	1.00	
0.22	0.22	-0.19	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
14678.793					
-1518.178	175.133				
-260.795	23.003	18.992			
43.610	-127.023	26.264	2342.093		
-811.273	-14.631	3.526	44.791	1786.304	
-824.376	-12.352	3.431	29.789	911.825	1656.582

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
13525.079					
-1451.431	172.150				
-279.743	24.206	27.489			
287.264	-165.761	51.855	2642.417		
-945.312	7.512	2.134	346.529	1728.099	
-593.291	-12.755	-30.465	132.884	725.937	1420.635

++

TABLE 13 ELECTRONICS SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 73 Sample period is 1988 to 1990
Observations: 163 Degrees of freedom: 159

Dependent variable is: dloginv

Instruments used are:
CONST lnkhlag proratla lnmula

ONE-STEP ESTIMATES

RSS = 72.782900 TSS = 73.795977
Estimated sigma-squared (levels) = 0.228877

Wald test of joint significance: 2.579555 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.123611	0.269935	0.457930	0.647003
laglogin	-0.002901	0.029827	-0.097272	0.922510
prorat	0.013059	0.010154	1.286158	0.198388
lnmu	-0.012975	0.112252	-0.115587	0.907980

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -3.464 [52]
Test for second-order serial correlation: 1.789 [38]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 0.829524 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.123611	0.272793	0.453133	0.650453
laglogin	-0.002901	0.029697	-0.097698	0.922172
prorat	0.013059	0.019252	0.678333	0.497560
lnmu	-0.012975	0.125432	-0.103442	0.917612

Robust test for first-order serial correlation: -1.940 [52]
Robust test for second-order serial correlation: 1.710 [38]

Estimated serial correlation matrix

1.000		
-0.230	1.000	
0.259	-0.485	1.000

Number of observations available to sample covariances

50		
42	52	
38	48	61

Model just identified - two-step estimates and one-step estimates coincide

TABLE 14 ELECTRONICS SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.12571	0.67493	-2.26800	2.44715
laglogin	8.69317	1.54594	5.48894	13.92139
prorat	2.50357	4.82378	-1.41262	46.03984
lnmu	0.41392	0.42540	0.00000	1.91044

Correlation Matrix

dloginv	laglogin	prorat	lnmu
1.00			
-0.20	1.00		
0.11	-0.38	1.00	
-0.01	0.22	-0.19	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
7286.503			
-779.971	88.964		
-148.707	13.079	10.310	
86.732	-75.324	20.274	1260.060

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
7441.586			
-769.965	88.190		
-257.883	16.173	37.065	
-180.341	-68.071	93.711	1573.325

++

TABLE 15 ELECTRONICS SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 73 Sample period is 1988 to 1990
Observations: 163 Degrees of freedom: 157

Dependent variable is: dloginv

Instruments used are:
CONST lnkhlag proratla lnmula TIM DUMS

ONE-STEP ESTIMATES

RSS = 71.356743 TSS = 73.795977
Estimated sigma-squared (levels) = 0.227251

Wald test of joint significance: 3.009473 df = 3
Wald test - jt sig of time dums: 3.191340 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.246333	0.281894	0.873849	0.382200
laglogin	-0.002002	0.029695	-0.067434	0.946236
prorat	0.014465	0.009917	1.458512	0.144700
lnmu	-0.001043	0.111320	-0.009367	0.992526
D89	-0.178303	0.158610	-1.124160	0.260945
D90	-0.219409	0.128458	-1.708031	0.087631

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -3.448 [52]
Test for second-order serial correlation: 1.703 [38]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 0.900979 df = 3
Wald test - jt sig of time dums: 4.974831 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.246333	0.266984	0.922650	0.356190
laglogin	-0.002002	0.028929	-0.069219	0.944815
prorat	0.014465	0.018432	0.784743	0.432604
lnmu	-0.001043	0.128440	-0.008119	0.993522
D89	-0.178303	0.143126	-1.245774	0.212848
D90	-0.219409	0.108533	-2.021591	0.043219

Robust test for first-order serial correlation: -1.938 [52]
Robust test for second-order serial correlation: 1.715 [38]

Estimated serial correlation matrix

1.000		
-0.222	1.000	
0.257	-0.492	1.000

Number of observations available to sample covariances

50		
42	52	
38	48	61

Model just identified - two-step estimates and one-step estimates coincide

TABLE 16 ELECTRONICS SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.12571	0.67493	-2.26800	2.44715
laglogin	8.69317	1.54594	5.48894	13.92139
prorat	2.50357	4.82378	-1.41262	46.03984
lnmu	0.41392	0.42540	0.00000	1.91044

Correlation Matrix

dloginv	laglogin	prorat	lnmu
1.00			
-0.20	1.00		
0.11	-0.38	1.00	
-0.01	0.22	-0.19	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
7946.438					
-772.217	88.180				
-140.582	12.647	9.835			
147.064	-77.374	17.745	1239.207		
-1213.429	-6.157	-1.988	-4.168	2515.715	
-1015.105	14.452	1.185	-46.751	929.083	1650.134

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
7128.069					
-704.159	83.691				
-234.033	14.787	33.974			
-26.904	-83.186	83.935	1649.682		
-859.015	-9.891	18.656	18.120	2048.515	
-276.275	-30.589	-16.186	-48.255	415.799	1177.942

TABLE 17 ELECTRONICS SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 73 Sample period is 1988 to 1990
Observations: 163 Degrees of freedom: 160

Dependent variable is: dloginv

Instruments used are:
CONST proratla lnmula

ONE-STEP ESTIMATES

RSS = 72.937946 TSS = 73.795977
Estimated sigma-squared (levels) = 0.227931

Wald test of joint significance: 2.489874 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.097862	0.066896	1.462909	0.143492
prorat	0.013419	0.009165	1.464071	0.143175
lnmu	-0.013873	0.110314	-0.125758	0.899923

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -3.470 [52]
Test for second-order serial correlation: 1.795 [38]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 0.757294 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.097862	0.085144	1.149370	0.250404
prorat	0.013419	0.018641	0.719857	0.471613
lnmu	-0.013873	0.124524	-0.111407	0.911294

Robust test for first-order serial correlation: -1.915 [52]
Robust test for second-order serial correlation: 1.711 [38]

Estimated serial correlation matrix

1.000		
-0.231	1.000	
0.260	-0.485	1.000

Number of observations available to sample covariances

50		
42	52	
38	48	61

Model just identified - two-step estimates and one-step estimates coincide

TABLE 18 ELECTRONICS SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.12571	0.67493	-2.26800	2.44715
prorat	2.50357	4.82378	-1.41262	46.03984
lnmu	0.41392	0.42540	0.00000	1.91044

Correlation Matrix

dloginv	prorat	lnmu
1.00		
0.11	1.00	
-0.01	-0.19	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	prorat	lnmu
447.501		
-33.678	8.400	
-576.415	30.114	1216.908

Robust AVM of one-step estimates (x100000)

CONST	prorat	lnmu
724.952		
-116.944	34.748	
-786.171	104.774	1550.615

++

TABLE 19 ELECTRONICS SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 73 Sample period is 1988 to 1990
Observations: 163 Degrees of freedom: 158

Dependent variable is: dloginv

Instruments used are:
CONST proratla lnmula TIM DUMS

ONE-STEP ESTIMATES

RSS = 71.462719 TSS = 73.795977
Estimated sigma-squared (levels) = 0.226148

Wald test of joint significance:	2.953471	df =	2
Wald test - jt sig of time dums:	5.042572	df =	3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.228658	0.108565	2.106194	0.035187
prorat	0.014714	0.008952	1.643639	0.100251
lnmu	-0.001651	0.109294	-0.015105	0.987949
D89	-0.178467	0.158212	-1.128027	0.259309
D90	-0.219552	0.128243	-1.712004	0.086896

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -3.455 [52]
Test for second-order serial correlation: 1.710 [38]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance:	0.841852	df =	2
Wald test - jt sig of time dums:	5.761961	df =	3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.228658	0.110555	2.068272	0.038614
prorat	0.014714	0.017835	0.825006	0.409368
lnmu	-0.001651	0.127076	-0.012991	0.989635
D89	-0.178467	0.143222	-1.246084	0.212734
D90	-0.219552	0.108394	-2.025493	0.042817

Robust test for first-order serial correlation: -1.914 [52]
Robust test for second-order serial correlation: 1.717 [38]

Estimated serial correlation matrix

1.000		
-0.222	1.000	
0.257	-0.492	1.000

Number of observations available to sample covariances

50		
42	52	
38	48	61

Model just identified - two-step estimates and one-step estimates coincide

TABLE 20 ELECTRONICS SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.12571	0.67493	-2.26800	2.44715
prorat	2.50357	4.82378	-1.41262	46.03984
lnmu	0.41392	0.42540	0.00000	1.91044

Correlation Matrix

dloginv	prorat	lnmu
1.00		
0.11	1.00	
-0.01	-0.19	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	prorat	lnmu	D89	D90
1178.629				
-29.572	8.014			
-531.433	27.751	1194.520		
-1261.127	-1.080	-10.130	2503.090	
-882.801	-0.494	-45.741	925.826	1644.618

Robust AVM of one-step estimates (x100000)

CONST	prorat	lnmu	D89	D90
1222.247				
-108.698	31.808			
-755.730	96.284	1614.837		
-945.623	20.590	11.484	2051.260	
-545.047	-11.815	-59.876	413.112	1174.934

++

D.P.D. RESULTS

LEVELS IV

Number of firms: 53 Sample period is 1988 to 1990
Observations: 123 Degrees of freedom: 119

Dependent variable is: loginv

Instruments used are:
CONST lnkhlag proratla lnmula

ONE-STEP ESTIMATES

RSS = 115.218683 TSS = 142.480903
Estimated sigma-squared (levels) = 0.968224

Wald test of joint significance: 52.000751 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.184326	1.163379	0.158440	0.874110
laglogin	0.985627	0.145428	6.777400	0.000000
prorat	0.049803	0.026546	1.876129	0.060638
lnmu	0.054561	0.305055	0.178856	0.858051

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -2.213 [41]
Test for second-order serial correlation: -1.770 [29]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 43.785445 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.184326	1.297000	0.142117	0.886987
laglogin	0.985627	0.167070	5.899492	0.000000
prorat	0.049803	0.035182	1.415579	0.156899
lnmu	0.054561	0.237616	0.229617	0.818389

Robust test for first-order serial correlation: -2.026 [41]
Robust test for second-order serial correlation: -1.491 [29]

Estimated serial correlation matrix

1.000		
-0.277	1.000	
-0.405	-0.382	1.000

Number of observations available to sample covariances

39		
34	41	
29	36	43

Model just identified - two-step estimates and one-step estimates coincide

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
loginv	7.65923	1.08068	5.40268	10.71250
laglogin	7.42861	1.20292	2.56495	10.71250
prorat	2.64756	5.10037	-0.98204	35.68221
lnmu	0.38876	0.37268	0.00000	1.54872

Correlation Matrix

loginv	laglogin	prorat	lnmu
1.00			
0.61	1.00		
-0.02	-0.24	1.00	
-0.02	0.05	-0.27	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
135345.176			
-16738.811	2114.944		
-1895.034	212.774	70.467	
-13362.277	1194.543	328.883	9305.879

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
168220.923			
-21481.590	2791.231		
-3027.811	347.631	123.779	
-4821.920	216.211	390.165	5646.156

TABLE 23 CLOTHING SECTOR

D.P.D. RESULTS

LEVELS IV

Number of firms: 53 Sample period is 1988 to 1990
Observations: 123 Degrees of freedom: 117

Dependent variable is: loginv

Instruments used are:
CONST lnkhlag proratla lnmula TIM DUMS

ONE-STEP ESTIMATES

RSS = 113.975244 TSS = 142.480903
Estimated sigma-squared (levels) = 0.974147

Wald test of joint significance: 49.259641 df = 3
Wald test - jt sig of time dums: 7.130057 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.107130	1.194270	0.089703	0.928523
laglogin	1.032241	0.156853	6.580951	0.000000
prorat	0.056679	0.027194	2.084238	0.037139
lnmu	0.107080	0.311662	0.343577	0.731164
D89	-0.633829	0.242712	-2.611448	0.009016
D90	-0.275820	0.242481	-1.137491	0.255333

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -1.815 [41]
Test for second-order serial correlation: -1.854 [29]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 37.181121 df = 3
Wald test - jt sig of time dums: 6.854276 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.107130	1.363247	0.078584	0.937363
laglogin	1.032241	0.188055	5.489028	0.000000
prorat	0.056679	0.036498	1.552927	0.120441
lnmu	0.107080	0.241017	0.444283	0.656838
D89	-0.633829	0.275307	-2.302265	0.021320
D90	-0.275820	0.281786	-0.978829	0.327664

Robust test for first-order serial correlation: -1.458 [41]
Robust test for second-order serial correlation: -1.512 [29]

Estimated serial correlation matrix

1.000		
-0.170	1.000	
-0.412	-0.391	1.000

Number of observations available to sample covariances

39		
34	41	
29	36	43

Model just identified - two-step estimates and one-step estimates coincide

TABLE 24 CLOTHING SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
loginv	7.65923	1.08068	5.40268	10.71250
laglogin	7.42861	1.20292	2.56495	10.71250
prorat	2.64756	5.10037	-0.98204	35.68221
lnmu	0.38876	0.37268	0.00000	1.54872

Correlation Matrix

loginv	laglogin	prorat	lnmu
1.00			
0.61	1.00		
-0.02	-0.24	1.00	
-0.02	0.05	-0.27	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
142628.019					
-18446.934	2460.280				
-2063.751	246.829	73.953			
-15132.398	1543.899	364.137	9713.319		
9327.897	-1552.567	-156.218	-1517.842	5890.888	
9829.961	-1618.166	-157.702	-1633.009	3562.866	5879.716

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
185844.190					
-25289.736	3536.478				
-3446.292	430.535	133.214			
-8153.932	761.835	475.023	5808.941		
19079.191	-3003.345	-434.152	-2275.677	7579.367	
20136.788	-3261.441	-335.687	-968.921	5976.377	7940.323

TABLE 25 CLOTHING SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 53 Sample period is 1988 to 1990
Observations: 123 Degrees of freedom: 119

Dependent variable is: dloginv

Instruments used are:
CONST lnkhlag proratla lnmula

ONE-STEP ESTIMATES

RSS = 115.218683 TSS = 125.947474
Estimated sigma-squared (levels) = 0.484112

Wald test of joint significance: 12.739973 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.184326	0.928495	0.198522	0.842637
laglogin	-0.014373	0.114487	-0.125544	0.900093
prorat	0.049803	0.019788	2.516802	0.011843
lnmu	0.054561	0.220024	0.247977	0.804152

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -2.103 [41]
Test for second-order serial correlation: -1.762 [29]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 41.830350 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.184326	0.814687	0.226254	0.821004
laglogin	-0.014373	0.103902	-0.138334	0.889976
prorat	0.049803	0.011571	4.304151	0.000017
lnmu	0.054561	0.153087	0.356405	0.721538

Robust test for first-order serial correlation: -1.778 [41]
Robust test for second-order serial correlation: -1.407 [29]

Estimated serial correlation matrix

1.000		
-0.277	1.000	
-0.405	-0.382	1.000

Number of observations available to sample covariances

39		
34	41	
29	36	43

Model just identified - two-step estimates and one-step estimates coincide

TABLE 26 CLOTHING SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.23062	1.01605	-2.04157	4.07362
laglogin	7.42861	1.20292	2.56495	10.71250
prorat	2.64756	5.10037	-0.98204	35.68221
lnmu	0.38876	0.37268	0.00000	1.54872

Correlation Matrix

dloginv	laglogin	prorat	lnmu
1.00			
-0.54	1.00		
0.27	-0.24	1.00	
-0.09	0.05	-0.27	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
86210.325			
-10548.960	1310.729		
-1303.348	150.095	39.158	
-9249.823	916.771	200.839	4841.057

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu
66371.430			
-8412.892	1079.554		
-698.506	84.619	13.389	
-2265.295	165.849	55.635	2343.560

TABLE 27 CLOTHING SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 53 Sample period is 1988 to 1990
Observations: 123 Degrees of freedom: 117

Dependent variable is: dloginv

Instruments used are:
CONST lnkhlag proratla lnmula TIM DUMS

ONE-STEP ESTIMATES

RSS = 113.975244 TSS = 125.947474
Estimated sigma-squared (levels) = 0.487074

Wald test of joint significance: 13.491017 df = 3
Wald test - jt sig of time dums: 5.503526 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.107130	0.946258	0.113214	0.909861
laglogin	0.032241	0.122079	0.264096	0.791706
prorat	0.056679	0.020402	2.778069	0.005468
lnmu	0.107080	0.226397	0.472974	0.636232
D89	-0.633829	0.277427	-2.284670	0.022332
D90	-0.275820	0.232893	-1.184322	0.236286

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -1.761 [41]
Test for second-order serial correlation: -1.860 [29]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 57.487634 df = 3
Wald test - jt sig of time dums: 7.239915 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.107130	0.948545	0.112941	0.910077
laglogin	0.032241	0.129759	0.248465	0.803775
prorat	0.056679	0.013807	4.105135	0.000040
lnmu	0.107080	0.177697	0.602599	0.546775
D89	-0.633829	0.274422	-2.309683	0.020906
D90	-0.275820	0.287353	-0.959867	0.337122

Robust test for first-order serial correlation: -1.334 [41]
Robust test for second-order serial correlation: -1.453 [29]

Estimated serial correlation matrix

1.000		
-0.170	1.000	
-0.412	-0.391	1.000

Number of observations available to sample covariances

39		
34	41	
29	36	43

Model just identified - two-step estimates and one-step estimates coincide

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.23062	1.01605	-2.04157	4.07362
laglogin	7.42861	1.20292	2.56495	10.71250
prorat	2.64756	5.10037	-0.98204	35.68221
lnmu	0.38876	0.37268	0.00000	1.54872

Correlation Matrix

dloginv	laglogin	prorat	lnmu
1.00			
-0.54	1.00		
0.27	-0.24	1.00	
-0.09	0.05	-0.27	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
89540.345					
-11343.550	1490.326				
-1394.370	171.814	41.626			
-10198.819	1134.684	225.571	5125.580		
4555.634	-1041.267	-133.167	-1195.355	7696.559	
4898.542	-947.547	-112.507	-1261.218	3245.061	5423.909

Robust AVM of one-step estimates (x100000)

CONST	laglogin	prorat	lnmu	D89	D90
89973.781					
-12069.998	1683.742				
-1115.750	150.670	19.063			
-5296.271	650.077	106.594	3157.621		
10038.545	-1862.169	-168.293	-1470.038	7530.764	
8642.627	-1731.074	-158.446	-1299.568	5528.482	8257.151

++

TABLE 29 CLOTHING SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 53 Sample period is 1988 to 1990
Observations: 123 Degrees of freedom: 120

Dependent variable is: dloginv

Instruments used are:
CONST proratla lnmula

ONE-STEP ESTIMATES

RSS = 117.227401 TSS = 125.947474
Estimated sigma-squared (levels) = 0.488448

Wald test of joint significance: 9.149326 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.074526	0.124237	0.599873	0.548591
prorat	0.050326	0.017389	2.894093	0.003803
lnmu	0.058787	0.211064	0.278527	0.780608

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -2.121 [41]
Test for second-order serial correlation: -1.745 [29]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 30.392975 df = 2

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.074526	0.092239	0.807970	0.419108
prorat	0.050326	0.009302	5.409971	0.000000
lnmu	0.058787	0.157939	0.372214	0.709734

Robust test for first-order serial correlation: -1.923 [41]
Robust test for second-order serial correlation: -1.387 [29]

Estimated serial correlation matrix

1.000		
-0.279	1.000	
-0.402	-0.376	1.000

Number of observations available to sample covariances

39		
34	41	
29	36	43

Model just identified - two-step estimates and one-step estimates coincide

TABLE 30 CLOTHING SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.23062	1.01605	-2.04157	4.07362
prorat	2.64756	5.10037	-0.98204	35.68221
lnmu	0.38876	0.37268	0.00000	1.54872

Correlation Matrix

dloginv	prorat	lnmu
1.00		
0.27	1.00	
-0.09	-0.27	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	prorat	lnmu
1543.473		
-138.463	30.239	
-2107.492	138.602	4454.795

Robust AVM of one-step estimates (x100000)

CONST	prorat	lnmu
850.798		
-46.845	8.654	
-986.191	37.939	2494.469

++

TABLE 31 CLOTHING SECTOR

D.P.D. RESULTS

FIRST DIFFERENCES IV

Number of firms: 53 Sample period is 1988 to 1990
Observations: 123 Degrees of freedom: 118

Dependent variable is: dloginv

Instruments used are:
CONST proratla lnmula TIM DUMS

ONE-STEP ESTIMATES

RSS = 109.693020 TSS = 125.947474
Estimated sigma-squared (levels) = 0.464801

Wald test of joint significance: 11.396426 df = 2
Wald test - jt sig of time dums: 5.784191 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.340421	0.180379	1.887252	0.059126
prorat	0.055356	0.016929	3.269843	0.001076
lnmu	0.095473	0.207265	0.460631	0.645063
D89	-0.613535	0.258015	-2.377903	0.017411
D90	-0.254475	0.214522	-1.186241	0.235527

NOTE: Standard errors and test statistics not robust to heteroskedasticity

Test for first-order serial correlation: -1.823 [41]
Test for second-order serial correlation: -1.920 [29]

ONE-STEP ESTIMATES WITH ROBUST TEST STATISTICS

Wald test of joint significance: 32.403434 df = 2
Wald test - jt sig of time dums: 7.494676 df = 3

Var	Coef	Std. Error	T-Stat	P-Value
CONST	0.340421	0.182675	1.863532	0.062387
prorat	0.055356	0.009921	5.579749	0.000000
lnmu	0.095473	0.159165	0.599836	0.548616
D89	-0.613535	0.237201	-2.586558	0.009694
D90	-0.254475	0.254457	-1.000071	0.317276

Robust test for first-order serial correlation: -1.435 [41]
Robust test for second-order serial correlation: -1.471 [29]

Estimated serial correlation matrix

1.000		
-0.170	1.000	
-0.423	-0.405	1.000

Number of observations available to sample covariances

39		
34	41	
29	36	43

Model just identified - two-step estimates and one-step estimates coincide

TABLE 32 CLOTHING SECTOR

DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev	Min	Max
dloginv	0.23062	1.01605	-2.04157	4.07362
prorat	2.64756	5.10037	-0.98204	35.68221
lnmu	0.38876	0.37268	0.00000	1.54872

Correlation Matrix

dloginv	prorat	lnmu
1.00		
0.27	1.00	
-0.09	-0.27	1.00

ASYMPTOTIC VARIANCE MATRICES

Non-robust AVM of one-step estimates (x100000)

CONST	prorat	lnmu	D89	D90
3253.665				
-122.305	28.660			
-1705.112	132.803	4295.874		
-3178.852	-19.834	-423.680	6657.182	
-2221.899	-0.345	-500.110	2462.323	4601.967

Robust AVM of one-step estimates (x100000)

CONST	prorat	lnmu	D89	D90
3337.020				
-29.619	9.842			
-590.283	47.395	2533.342		
-3254.020	-38.155	-666.936	5626.443	
-3665.682	-34.560	-610.556	3742.469	6474.824

APPENDIX 2

The data set has been obtained from the volumes of years 1988, 1989, 1990, 1991 of Mediobanca survey on the accounting data of the main Italian enterprises. This choice is due to the fact that since 1988 the lower bond of the sample has been raised to 25 billion Italian lire. Since each volume contains the data of the two previous years, the observations refer to years 1986, 1987, 1988, 1989, 1990, i.e. 5 years.

Since the variable I(t) has to be constructed with the stock values of K (capital) and "accumulated depreciations" for t and t-1, plus the flow variable "depreciations" at time "t", the number of available years for the estimates would reduce to 4, but since the empirical specification employed here contains the lagged dependent variable, then the number of years available is 3. Furthermore, given that the dependent variable has to be constructed by using the values of consecutive stock values, and given that this same variable appears (lagged) as a regressor, then for each firm to be included in the dataset, it is necessary to have at least three data referred to three consecutive years. Therefore the three industrial samples (chemical, electronics and clothing sectors) have been constructed by considering all of the firms appearing in the Mediobanca survey, for which at least three years of consecutive observations (between 1986 and 1990) were available. For this purpose an unbalanced panel data sample has been created. Unlike the balanced sample, which only includes the "survivors" over the sample period, and, for this reason, might contain some bias and lose the information referred to the firms that exit an to the new entrants during the time under consideration, the unbalanced sample yields more complete information, although at the cost of using a more complex econometric methodology.

In any case, some limitations have been necessary in order to overcome a few problems that have arisen.

First of all, we have to keep in mind that the purpose of this paper is to analyze the investment in physical capital. Therefore any kind of financial investment has not been taken into account for the estimates of the investment function. For the same reason, it has been necessary to exclude from the dataset those firms that, during the period under consideration, have modified their nature from industrial firms to financial holdings. In any case, the information relative to their behaviour has been kept, by including in the samples (when it was possible) all of the firms belonging to the old and new born financial holdings and operating in the industries under consideration. Obviously, each individual firm has to keep its individual nature over the time under consideration, and for this reason, mergers have been regarded as events that modify the individual nature of each firm. The unbalanced panel technique allows in fact to consider as separate individuals the firms before the mergers and the new-born firms that are determined by mergers. Such an approach has also some common sense validity, to the extent that the individual determined by the merger is actually different - in its behaviour and in its conjectures - from the different individuals that contribute to determine the merger. Furthermore, a merger introduces, in general, an unpredictable piece of information in the information set of the different agents. In each different year under consideration the conjectures might be modified, and this is consistent with the argument that justifies the "partial adjustment" empirical specification employed in this paper for the investment function. A last point to mention is the fact that the process of liquidation that precedes mergers or failures might actually start before the merger and/or the failure of the firm under consideration takes place in legal terms. In other words, the data of the firms under consideration showed, in the years just before the liquidation or the merger, the typical aspects that characterize the processes of liquidation or merger. Such processes (which in any case refer to events reported in the original volumes of Mediobanca survey) typically involve drastic changes in the balance sheet structure of the firm, like a dramatic increase in the "financial assets" or in the "other assets" associated to a very large reduction in the physical capital. Obviously for each unity of observation, the years where such phenomena took place could not be taken into account, while the unity of observation itself could still be considered for the rest of the period, where no mergers or liquidations took place. However, in all of the three samples, the number of firms involved in phenomena of mergers and/or liquidation is very small and neglectable, compared to size of the sample[13]. The mere changes of name or denomination that do not affect the

13 In any case, the raw data (unfortunately not available on diskette) of the original volumes of Mediobanca survey on the Italian firms with more than 25 billion of lira sales may be obtained by contacting the research office of Mediobanca at the following address:

Ufficio Studi di Mediobanca
via Filodrammatici
20100 Milano Italy - tel. (+)39 (0)2 88291

Alternatively, the same volumes may be obtained by the author of this thesis.

structure, the main business and the characteristics of the individual firms will obviously not be regarded as mergers.

The industry classification in the Mediobanca sample does not always correspond to the standard NACE, although this should not constitute a problem for the chemical sector.

In order to simplify the exposition of the dataset, the list of the firms included in the sample is reported separately; each firm is associated to a number, that will be used to identify the data in the tables of the dataset. Since the econometric analysis has been performed with panel data techniques, each firm (i.e. each firm number) refers to several years (corresponding to a line in the data tables), and each year contain its relative values for the different variables. In what follows the firms included in the industry samples are listed and associated to their reference number appearing in the tables of the data.

Chemical Sector:

1 Procter & Gamble Italia; 2 Exxon Chemical Mediterranea; 3 Henkel Sud; 4 Agfa Gevaert; 5 Alusuisse Italia; 6 Colgate-Palmolive; 7 Industrie Vernici Italiane; 8 Chimet; 9 Hoechst Italia; 10 Elettrocarbonium; 11 SIAPA - Italo Americana Prodotti Antiparassitari; 12 Henkel Chimica; 13 Italiana Coke; 14 SPAD - Piemontese Amidi e Derivati; 15 Caffaro; 16 ACNA Chimica Organica; 17 Snia Tecnopolimeri; 18 Grace Italiana; 19 Johnson Wax; 20 Sorin Biomedica; 21 Maxmeyer-Duco; 22 Annunziata; 23 General Electric Plastics-Italia; 24 Monsanto Italiana; 25 Istituto delle Vitamine; 26 Abet Laminati; 27 Marchon Italiana; 28 Rivoira; 29 Dobfar; 30 Comind Sud; 31 Liri Industriale; 32 Zanussi Componenti Plastica; 33 Uniroyal Chimica; 34 Giovanni Crespi; 35 Tillmanns; 36 Italesplosivi; 37 Vitrofil; 38 Oxon Italia; 39 Salchi; 40 Engelhard; 41 Baslini Industrie Chimiche; 42 PCBI; 43 Carbochimica Italiana; 44 SIPE Nobel - Italiana Prodotti Esplodenti; 45 Degussa Prodotti Ceramici; 46 Mapei; 47 Hoechst Sara; 48 Marchon Sud; 49 Novacrome; 50 Mas Industriale; 51 Laminati Plastici e Rivestimenti; 52 Baldini; 53 Ilford Photo; 54 FIAP - Fabbrica Italiana Articoli Plastici; 55 Vifan; 56 Simel; 57 Diversey; 58 Vernici Lalac; 59 Ecofuel; 60 sun Chemical Inchiostri (called Baglini Inchiostri until 1988); 61 ICI Italia; 62 Enichem Augusta (from 1990 called Enimonst Augusta); 63 Kodak; 64 Enichem Tecnoresine; 65 Sandoz Prodotti Chimici; 66 SIAC -

Società Italiana Additivi per Carburanti; 67 Terni Industrie Chimiche; 68 COMET S.A.R.A.; 69 Union Carbide Italia; 70 Sikkens Linvea; 71 Miles Italiana; 72 Veneziani; 73 Autoadesivitalia; 74 Sarma; 75 Alta; 76 Atochem Italia; 77 BASF Vernici; 78 Paraffine Sarde; 79 Nuova Pansac; 80 Boston; 81 FAR - Fabbrica Adesivi Resine; 82 SIAD - Italiana Acetilene e Derivati; 83 Brill; 84 Henkel Italiana; 85 Fotoindustria; 86 Gorlex; 87 Flexa Films; 88 Romana Chimici; 89 Vedril; 90 Dow Italia; 91 SIO - Industria Ossigeno Altri Gas; 92 Mazzucchelli Celluloide; 93 Bristol Europe; 94 Italiana Keller; 95 LATI - Industria Termoplastici; 96 Orsa; 97 NALCO Italiana; 98 Boero Colori; 99 Silo; 100 3M Italia; 101 Agrimont; 102 Erba Biochimica; 103 Fanini Fain - Fabbrica Italiana Articoli Novità; 104 Luigi Stoppani; 105 AKZO Chemicals; 106 Cartochimica Valpellice; 107 IMEXCO Specialties; 108 BASF Italia; 109 Enichem Synthesis; 110 CERESTAR Italia; 111 DSM Italia; 112 Manitoba Italia; 113 Samatec; 114 Casco Nobel; 115 Industrie generali; 116 Seeber; 117 Roussel Hoechst Agrovet; 118 Alfatherm Industriale; 119 Giuseppe Olmo Superflexite Italiana; 120 Ovatex; 121 ITB; 122 Crion; 123 Zobele Industrie Chimiche; 124 Flexa.

Electronics Sector:

1 ITALTEL SIT; 2 BULL HN Information System Italia (called until 1987 Honeywell Bull Italia); 3 ELSAG Elettronica San Giorgio; 4 Digital Equipment; 5 Robert Bosch; 6 Siemens Telecomunicazioni; 7 Texas Instruments Italia; 8 Italtel Telematica; 9 UNISYS Italia; 10 SOGEI; 11 Nuova Magrini Galileo; 12 Siemens Data; 13 Contraves Italiana; 14 ITALSIEL - Italiana Sistemi Informativi Elettronici; 15 Elettronica; 16 Canon Italia; 17 Selenia Spazio (from 1990 Alenia Spazio); 18 Telemecanique; 19 Arcotronics Italia; 20 Hantarex; 21 DEA Digital Electronics Automation; 22 Honeywell; 23 Marposs; 24 SIES Peterlongo; 25 Marelli Autronica; 26 Italtel Tecnoelettronica; 27 CSELT Centro Studi e Laboratori Telecomunicazioni; 28 Dataconsyst; 29 Onceas; 30 Teknecomp; 31 Italdata; 32 Apple Computer; 33 SAFNAT - Fabbrica Nazionale Apparecchi Telefonici; 34 Data Management; 35 Elettronica Industriale; 36 ARE - Applicazioni Radio Elettroniche; 37 Hartmann & Braun Italia; 38 OSAI A-B; 39 IBM Italia; 40 Siemens; 41 Selenia - Industrie Elettroniche Associate; 42 ASEM; 43 Industrie Magneti Marelli; 44 Marconi Italiana; 45 Hitachi Sales Italiana; 46 Plessey; 47 SMA Segnalamento Marino ed Aereo; 48 Compugraphics Italia (from 1989 Agfa Compugraphic); 49 Varian; 50 Procond Elettronica; 51 GTE Sylvania; 52 Fabbrica Accumulatori York; 53 Industrie Face Standard; 54 Hewlett-Packard Italiana; 55 Landis & Gyr; 56 OLTECO - Olivetti Telecomunicazioni; 57 Bonfiglioli Riduttori; 58 Dial Telecomunicazioni; 59 Fracarraro Radioindustrie; 60 Nuova Industrie Elettriche di Legnano; 61 Telettra; 62 SGS Thomson Microelectronics; 63 Sony Italia; 64 Olivetti Canon Industria; 65 Elmer; 66 Bailey Esacontro; 67 Esaote Biomedica; 68 AROS; 69 Nashua Reprographics; 70 Necsy - Network Control Sytem; 71 SEPA - Società di Elettronica per l'Automazione; 72 Philips Automation; 73 Olivetti Prodotti Industriali.

Clothing Sector:

1 Benetton; 2 GFT; 3 Stefanel; 4 Levi Strauss Italia; 5 Prenatal; 6 Maglificio Bellia; 7 Maglificio Calzificio Torinese; 8 Byblos; 9 Sanremo Moda Uomo; 10 Golden Lady; 11 Fila Sport; 12 Fratelli Claudio e Carlalberto Corneliani; 13 Belfe; 14 Giole; 15 Forall Confezioni; 16 Calze Malerba; 17 SICEM; 18 Dalmas; 19 IME - Industria Maglieria Europea; 20 Cagi Maglierie; 21 Sandys; 22 Lubiam Moda per l'Uomo; 23 Calzificio di Parabiago Mario Re Depaolini; 24 Belvest; 25 Confezioni F.G.; 26 GM; 27 Sima; 28 Industria Adriatica Confezioni; 29 Facib di Cortesi & C.; 30 Max Mara; 31 Carrera; 32 Marina Rinaldi; 33 Manifatture del Nord; 34 La Matta; 35 Genny Moda; 36 CP Company; 37 Samar; 38 Maska; 39 Columbia; 40 Confar Confezioni Aretine; 41 La Granda Confezioni; 42 Incom - Industria Confezioni Montecatini; 43 Commerciale Abbigliamento; 44 Maglieria ragno; 45 Ligron; 46 Ball; 47 GFT Donna; 48 Luisa Spagnoli; 49 Lovable Italiana; 50 Filodoro Calze; 51 Luck; 52 Hitman Industria Confezioni; 53 Calzificio Fratelli Carabelli.

Chemical sector

firm no.	year	K	ACC.D.	DEPR.	K(−1)	t−1 ACC.D.	INV.	V.ADD.	LAB.C.	VAR.PR.
1	1987	163397	127710	32908	151106	99852	17341	140297	62090	78207
	1988	175998	142314	24143	163397	127710	22140	121024	70803	50221
	1989	195694	155397	22748	175998	142314	29361	171486	86963	84523
	1990	300011	196865	30015	195694	155397	92864	201923	102673	99250
2	1987	43596	30188	4555	38458	28659	8164	29221	22190	7031
	1988	58393	31390	3585	43596	30188	17180	36047	26204	9843
	1989	69223	33009	4373	58393	31390	13584	39984	29369	10615
	1990	76549	34885	4965	69223	33009	10415	41204	31669	9535
3	1987	68393	40684	6499	64059	36061	6210	50025	26159	23866
	1988	74576	45563	6420	68393	40684	7724	33730	27851	5879
	1989	81271	48292	3966	74576	45563	7932	25873	30010	-4137
	1990	86624	55614	6903	81271	48292	4934	45440	32516	12924
4	1987	18381	10029	1651	17487	8996	1512	58103	29715	28388
	1988	19583	10342	1501	18381	10029	2390	61566	31435	30131
	1989	20980	10752	1234	19583	10342	2221	63874	35407	28467
	1990	24898	11631	2359	20980	10752	5398	71180	38324	32856
5	1987	176199	139468	19441	155631	118668	19209	75767	36265	39502
	1988	205470	161217	22261	176199	139468	29783	94486	38316	56170
	1989	227824	180479	19793	205470	161217	22885	87736	43869	43867
	1990	250930	194082	14203	227824	180479	23706	71958	47489	24469
6	1987	77376	36271	3025	68693	33685	9122	63334	45759	17575
	1988	86041	40534	4497	77376	36271	8899	61620	51052	10568
	1989	92792	46732	6946	86041	40534	7499	76563	55021	21542
	1990	99902	54083	7749	92792	46732	7508	85889	57999	27890
7	1987	224976	130383	18402	210878	113526	15643	84161	56264	27897
	1988	226752	142774	19167	224976	130383	8552	98191	60285	37906
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9	1987	48459	33131	3452	51335	35152	2597	74133	59643	14490
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13	1987	143926	110383	9512	132423	100614	11246	58243	49004	9239

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18	1987	82100	27723	8783	75258	20074	7976	49515	35518	13997
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	1989	99009	40423	8060	90374	33610	9882	52812	45155	7657
	1990	108886	51069	11408	99009	40423	10639	63539	47533	16006
19	1987	11688	5100	1584	10122	3914	1964	30169	13140	17029
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	1990	15461	9138	1418	14281	7859	1319	40145	16633	23512
20	1987	53105	36903	9979	47400	29005	7786	65621	38284	27337
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21	1987	51469	23357	5882	47891	18638	4741	43869	29390	14479
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22	1987	54815	19792	2492	48037	17528	7006	26475	14846	11629
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	1989	70153	23500	2490	62380	21556	8319	36766	17869	18897
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23	1987	7475	4544	1347	7162	3238	354	10693	3903	6790
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24	1987	884	468	168	731	395	248	4311	3597	714
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25	1987	13457	9246	1356	12490	8045	1122	13224	7798	5426
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	1990	16356	11914	1158	15779	11044	865	15550	10908	4642
26	1987	46105	31688	7826	30207	24168	16204	45786	21674	24112
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	1990	72883	59321	4578	70011	54867	2996	24949	18559	6390
28	1987	57082	35615	5649	50990	29540	5666	38642	26637	12005
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29	1987	8992	6467	2038	7207	4764	2120	10778	3460	7318
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32	1987	24012	9256	2275	24040	8647	1638	25745	18627	7118
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35	1987	7950	5089	549	7757	4699	352	8364	4664	3700
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37	1987	43239	19143	4495	40920	15433	3104	29125	16277	12848
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38	1987	83375	56175	8133	75960	48880	8253	24693	11357	13336
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39	1987	25013	14223	2480	12720	8507	9057	13606	9280	4326
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57	1987	5342	3239	633	4958	2727	505	12719	9032	3687
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58	1987	4303	3277	308	4092	2971	213	7467	4330	3137
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59	1987	7789	1494	2567	8302	542	1102	3981	3857	124
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60	1987	25308	17661	2291	23833	15978	2083	18030	11020	7010
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61	1987	16467	7543	2025	12278	6246	4917	31782	26761	5021
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62	1987	192146	85505	23201	170960	64926	23808	87366	32714	54652
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63	1987	90121	50702	12441	82428	43808	13240	112108	47631	64477
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	1988	116744	19733	16129	95029	9788	27899	25198	26445	-1247
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65	1987	33983	25260	1826	29898	19656	307	29480	20522	8958
	1988	36118	26073	2027	33983	25260	3349	34132	22902	11230
	1989	39168	27153	2690	36118	26073	4660	38817	25889	12928
66	1987	23552	21966	1617	22401	20374	1176	31470	6448	25022
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67	1987	186464	99120	8218	137587	92020	49995	33355	24277	9078
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68	1987	35659	20425	3888	31698	15988	3412	18140	10618	7522
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69	1987	63827	32471	2662	58955	30141	5204	25601	23744	1857
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70	1987	10814	6333	1017	9900	5503	1101	20884	8120	12764
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71	1987	20963	14708	3830	18728	11142	2499	15048	7057	7991
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	1989	24396	19103	2441	22830	17382	2286	16526	9885	6641
72	1987	7572	4364	701	6485	3756	1180	10534	6659	3875
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73	1987	18012	7964	1714	16336	6891	2317	8292	5179	3113
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74	1987	11605	8493	1017	10093	7653	1689	9607	7489	2118
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75	1987	23757	14480	2089	21463	12868	2771	7170	10444	-3274
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	1989	31443	16882	1411	27245	16095	4822	5630	9963	-4333
76	1988	616	402	80	572	326	48	10376	2951	7425
	1989	604	425	80	616	402	45	7352	2911	4441
	1990	477	327	81	604	425	52	7535	3354	4181
77	1988	54082	28927	4796	49658	25173	5466	48262	32860	15402
	1989	61431	33657	5135	54082	28927	7754	51825	36980	14845
	1990	68983	38718	5525	61431	33657	8016	55598	40114	15484
78	1988	40982	4864	5742	39603	0	2257	34410	1047	33363
	1989	48412	9744	5763	40982	4864	8313	25887	1181	24706
	1990	50501	15210	6350	48412	9744	2973	16266	1284	14982
79	1988	56254	15659	2893	53773	13655	3370	32285	21913	10372
	1989	60648	18047	3398	56254	15659	5404	35180	22363	12817
	1990	74855	27358	4680	60648	18047	9576	45311	29901	15410
80	1988	45350	25132	3236	38875	23501	8080	29524	20888	8636
	1989	51785	27538	3604	45350	25132	7633	31270	23968	7302
	1990	53576	29830	3632	51785	27538	3131	26920	25142	1778
81	1988	32724	20767	2738	30320	18127	2502	15296	10316	4980
	1989	35098	23629	2798	32724	20767	2310	16375	10835	5540
	1990	37902	25903	2395	35098	23629	2925	18138	11527	6611
82	1988	95599	84820	6111	89976	79379	6293	35189	19510	15679
	1989	103551	90786	6750	95599	84820	8736	42303	21863	20440
	1990	114241	98397	8147	103551	90786	11226	47523	23983	23540
83	1988	22941	13532	1885	20967	11961	2288	13644	11161	2483
	1989	24110	15299	2082	22941	13532	1484	12531	11449	1082
	1990	30110	17027	2050	24110	15299	6322	7399	10503	-3104
84	1988	3618	1393	445	1965	1006	1711	21448	17685	3763
	1989	5372	2075	725	3618	1393	1797	20626	19444	1182
	1990	7475	3010	1055	5372	2075	2223	22024	20615	1409
85	1988	706	545	171	771	533	94	6330	2372	3958
	1989	1011	646	168	706	545	372	7355	2743	4612
	1990	1313	634	145	1011	646	459	8309	3134	5175
86	1988	9955	5299	2142	7988	3304	2114	13787	5472	8315
	1989	12138	6975	1776	9955	5299	2283	8337	5918	2419
	1990	14881	8662	1855	12138	6975	2911	9531	6311	3220
87	1988	14810	8213	2910	10906	5670	4271	9369	4985	4384
	1989	13347	8750	2857	14810	8213	857	8033	4548	3485
	1990	14488	10914	2561	13347	8750	1538	8389	4601	3788
88	1988	4953	2133	726	3884	1428	1090	3735	1831	1904
	1989	5569	2829	743	4953	2133	663	4540	2022	2518
	1990	5975	3307	486	5569	2829	414	4843	2324	2519
89	1987	72937	33634	8294	65818	23698	5477	42894	29067	13827
	1988	84335	44664	10914	72937	33634	11282	44569	24532	20037
	1989	92758	52589	10847	84335	44664	11345	43736	26967	16769
90	1987	88270	32033	10005	72369	25833	19706	55756	33019	22737

	1988	101964	35930	7536	88270	32033	17333	69043	35839	33204
91	1987	323468	269619	21619	305132	259592	29928	92676	43965	48711
	1988	346427	285859	21355	323468	269619	28074	104545	47676	56869
92	1987	69713	42293	7725	66688	39026	7483	35703	22223	13480
	1988	81005	49164	9056	69713	42293	13477	37714	23099	14615
93	1987	60432	25318	4190	54282	21218	6240	56710	18881	37829
	1988	72336	29788	4608	60432	25318	12042	66880	21618	45262
94	1987	30668	20894	3757	26186	17436	4781	37778	25939	11839
	1988	34936	24379	3812	30668	20894	4595	44658	29768	14890
95	1987	26052	19806	3445	23863	16868	2696	21427	8210	13217
	1988	28729	22408	3106	26052	19806	3181	26944	8832	18112
96	1987	41896	32512	4274	38681	28718	3695	20528	8806	11722
	1988	45674	35175	3577	41896	32512	4692	21393	9496	11897
97	1987	50996	34927	5074	46085	30941	5999	22313	15486	6827
	1988	52947	39804	5252	50996	34927	2326	24601	17138	7463
98	1987	28080	15523	2178	25958	13458	2235	22706	15745	6961
	1988	30358	17328	1991	28080	15523	2464	24898	17557	7341
99	1987	18323	15099	2303	15151	12803	3179	12375	3034	9341
	1988	23580	17943	2943	18323	15099	5356	12809	3305	9504
100	1988	549017	343225	59260	512051	293619	46620	355064	199027	156037
	1989	591384	390789	51599	549017	343225	46402	373891	225189	148702
101	1988	457853	48887	50602	390209	6340	75699	146337	144634	1703
	1989	512564	79779	45753	457853	48887	69572	97451	153658	-56207
102	1988	81284	10917	9620	61988	3358	21357	51635	42170	9465
	1989	102840	20409	11988	81284	10917	24052	62547	46830	15717
103	1988	97354	39774	5196	87581	34766	9961	18724	7956	10768
	1989	97911	44901	6382	97354	39774	1812	17939	9556	8383
104	1988	39311	34309	2568	38671	34017	2916	17001	12205	4796
	1989	45743	35915	1973	39311	34309	6799	11241	11591	-350
105	1988	17923	13106	1301	16591	11928	1455	9272	6235	3037
	1989	19549	13953	1070	17923	13106	1849	7899	7082	817
106	1988	11695	7349	1567	10756	5824	981	6141	2633	3508
	1989	14234	9007	1789	11695	7349	2670	7904	3347	4557
107	1988	72	25	17	57	12	19	804	631	173
	1989	174	56	34	72	25	105	883	795	88
108	1989	56035	22349	5514	45568	18034	11666	90458	61767	28691
	1990	71542	29027	7413	56035	22349	16242	94889	69793	25096
109	1989	181254	71944	19375	154162	56993	31516	65780	54995	10785
	1990	216335	85013	19464	181254	71944	41476	68026	63521	4505
110	1989	92345	44215	21889	81081	19104	8042	64261	36562	27699
	1990	103772	55116	13313	92345	44215	13839	61968	38243	23725
111	1989	91975	45406	11498	77846	39119	19340	46378	25966	20412
	1990	122406	54596	14831	91975	45406	36072	57313	31175	26138
112	1989	4030	4011	275	2937	2897	254	22878	3902	18976
	1990	4250	4243	1762	4030	4011	1750	26291	4838	21453
113	1989	187103	90467	14675	175162	83410	19559	47921	33010	14911
	1990	204218	105345	17317	187103	90467	19554	38195	34013	4182
114	1989	38274	12628	3862	34091	9296	4713	23836	17232	6604
	1990	47388	17359	4359	38274	12628	8742	28104	22399	5705
115	1989	27031	20397	3556	23698	17636	4128	18370	10023	8347
	1990	28265	20793	1747	27031	20397	2585	12912	9252	3660
116	1989	59919	34574	6461	46058	28868	14616	26943	18551	8392
	1990	75018	40150	5948	59919	34574	15471	28961	20851	8110
117	1989	617	417	116	525	302	93	10038	4032	6006
	1990	720	523	110	617	417	107	13115	6261	6854
118	1989	24933	15908	1823	18793	14509	6564	16789	10775	6014

	1990	28643	18023	2454	24933	15908	4049	15735	11686	4049
119	1989	22215	13928	1246	17641	13050	4942	14127	3937	10190
	1990	27225	15530	1641	22215	13928	5049	14650	4144	10506
120	1989	25795	15316	3626	19958	12983	7130	13019	7320	5699
	1990	27856	17930	3773	25795	15316	3220	15779	8858	6921
121	1989	42472	19642	9051	41607	14196	4470	18327	7200	11127
	1990	43152	24588	8654	42472	19642	4388	19310	8146	11164
122	1989	36526	15068	6007	32842	9357	3980	10904	3568	7336
	1990	37234	19551	4643	36526	15068	868	12816	4034	8782
123	1989	11381	8192	912	10231	7420	1290	7417	4769	2648
	1990	12394	8969	797	11381	8192	1033	7001	5357	1644
124	1989	10728	5837	1748	10273	4256	622	8999	6950	2049
	1990	17556	8414	1886	10728	5837	6137	9798	7398	2400

EQ.	RES.	L.T.F.D.	loginv	prorat	mu	lnmu	firm no.	year
20000	47461	28656	9.760829	1.437697	0.424779	0.354017	1	1987
22330	125440	26298	10.00514	1.339409	0.177966	0.163789		1988
22330	109850	54582	10.28742	2.363711	0.412937	0.34567		1989
22330	119688	104772	11.43889	2.334783	0.737737	0.552584		1990
16000	11976	5800	9.00749	0.676059	0.207321	0.188403	2	1987
16000	8565	5781	9.751501	0.698717	0.235335	0.211342		1988
31500	1480	6203	9.516648	0.370298	0.188084	0.172342		1989
31500	1335	5406	9.251002	0.249593	0.164641	0.152413		1990
30800	20667	24524	8.733916	0.80316	0.4765	0.389674	3	1987
30800	31586	8323	8.952088	0.201939	0.133411	0.125232		1988
30800	33094	34728	8.97866	-0.13432	0.543525	0.434069		1989
30800	30720	10784	8.503905	0.371491	0.175293	0.161517		1990
12000	23322	34000	7.321189	3.150109	0.962573	0.674256	4	1987
15000	23888	104000	7.779049	3.433688	2.674347	1.301375		1988
15000	28685	119350	7.705713	2.90179	2.732059	1.31696		1989
15000	31780	140834	8.593784	3.045178	3.01056	1.388931		1990
30000	22401	25282	9.863134	1.006935	0.482472	0.393711	5	1987
30000	23790	17789	10.30169	1.455491	0.330712	0.285714		1988
30000	24680	33488	10.03824	0.933767	0.612436	0.477746		1989
30000	24516	38603	10.07348	0.489926	0.708104	0.535384		1990
3200	14789	3189	9.118444	0.473018	0.177275	0.163202	6	1987
3200	18969	9053	9.093694	0.244701	0.408363	0.342428		1988
3200	19896	8356	8.922525	0.445914	0.361794	0.308803		1989
3200	24155	12482	8.923724	0.574002	0.456297	0.375897		1990
27920	85403	4059	9.657779	0.269999	0.035818	0.035191	7	1987
27920	68657	4655	9.05392	0.381405	0.0482	0.047074		1988
27920	52283	13320	9.499272	0.520335	0.166079	0.153646		1989
27920	39652	12362	10.21461	0.644531	0.182946	0.168008		1990
5000	5749	5557	8.378391	1.032055	0.516978	0.41672	8	1987
5000	6152	5366	7.878155	0.97705	0.481169	0.392832		1988
5000	6970	7888	7.773174	0.987255	0.658981	0.506203		1989
5000	7710	7068	7.486613	0.687417	0.556098	0.442181		1990
30000	23910	5896	7.862112	0.843643	0.109367	0.10379	9	1987
45000	17471	4874	8.35538	0.621316	0.07802	0.075126		1988
45000	25476	23841	8.454892	0.221406	0.338285	0.291389		1989
45000	33259	21330	8.134761	-0.45239	0.272557	0.241028		1990
50000	21630	14665	9.518266	0.341965	0.204733	0.186258	10	1987
50000	20922	10864	9.33618	0.502836	0.153182	0.142525		1988
50000	27752	14575	9.588434	0.78672	0.187455	0.171812		1989
50000	41130	12929	9.795624	0.359503	0.141874	0.132671		1990
5700	46880	714	8.520986	4.160997	0.013579	0.013488	11	1987
5700	50783	555	8.415825	2.322813	0.009826	0.009778		1988
5700	55491	386	8.022897	1.822624	0.006308	0.006288		1989
5700	55851	1053	9.005282	1.811937	0.017108	0.016963		1990
28500	877	40228	9.325542	0.408114	1.369371	0.862624	12	1987
60000	1077	12564	9.51856	0.326344	0.205708	0.187067		1988
60000	2044	32091	9.706255	0.254921	0.51723	0.416886		1989
60000	2508	6930	9.547312	0.28043	0.110866	0.10514		1990
22500	2665	14593	9.327768	0.273668	0.579893	0.457357	13	1987

4500	-257	10424	8.535033	0.348388	2.456752	1.24033		1988
4500	659	6254	7.990577	0.493931	1.21225	0.79401		1989
4500	3327	2084	8.388905	0.497954	0.266258	0.236066		1990
10000	21844	5653	9.366831	0.562419	0.177522	0.163412	14	1987
10000	24160	5248	9.635347	1.301463	0.15363	0.142913		1988
10000	25386	4798	9.738141	1.454358	0.13559	0.127153		1989
10000	45709	3176	9.760656	1.071174	0.057011	0.055445		1990
57199	100182	17270	8.777093	1.263763	0.109734	0.10412	15	1987
61645	101468	11538	8.963288	1.286433	0.070736	0.068346		1988
61645	105606	9949	9.142918	1.425141	0.059485	0.057783		1989
61645	110606	8367	9.012986	1.654484	0.048574	0.047432		1990
30000	738	5113	10.00622	0.249474	0.166341	0.153872	16	1987
30000	1448	10889	10.64132	0.065135	0.346254	0.297326		1988
15000	15000	12944	10.94706	-0.22424	0.431467	0.3587		1989
20000	0	1591	10.79144	-0.20729	0.07955	0.076544		1990
22551	20703	7370	9.507478	0.62104	0.170389	0.157336	17	1987
22551	26682	9497	8.871084	0.6953	0.192899	0.176387		1988
22551	33199	15445	9.207336	0.607556	0.27704	0.244545		1989
22551	35897	9679	8.561593	0.558858	0.1656	0.153236		1990
42134	3462	982	8.984192	0.238985	0.021537	0.021308	18	1987
42134	5443	869	9.190852	0.138137	0.018265	0.0181		1988
47000	6595	766	9.19847	0.127066	0.014292	0.014191		1989
57000	9467	1668	9.272282	0.258987	0.025095	0.024785		1990
4038	22382	0	7.582738	2.584562	0	0	19	1987
4038	23329	0	7.277248	2.892766	0	0		1988
2736	17833	0	7.342132	3.079984	0	0		1989
2736	24856	0	7.184629	3.470627	0	0		1990
36400	45871	8922	8.960083	1.400234	0.108446	0.102959	20	1987
36400	46413	10683	8.697012	2.306202	0.129001	0.121334		1988
36400	52510	10513	9.518266	2.422433	0.118243	0.111759		1989
36400	55137	21073	9.783972	1.696372	0.230213	0.207187		1990
27500	22069	7468	8.464003	0.466356	0.150659	0.140335	21	1987
27500	20650	6064	7.990238	0.665794	0.12594	0.118618		1988
27500	17358	5121	9.083075	0.803075	0.11416	0.108101		1989
27500	18235	3618	9.057772	0.547163	0.079108	0.076135		1990
8275	11284	31864	8.854522	0.35914	1.629122	0.96665	22	1987
11275	13807	38116	8.952735	0.36587	1.519656	0.924122		1988
14000	19528	32334	9.026297	0.436034	0.964388	0.675181		1989
14000	21087	31598	9.517825	0.37227	0.900561	0.642149		1990
10000	6533	0	5.869297	1.630386	0	0	23	1987
10000	4297	0	6.030685	2.566014	0	0		1988
10000	8990	0	6.727432	3.524238	0	0		1989
10000	6685	0	6.466145	1.499027	0	0		1990
220	5561	0	5.513429	2.002205	0	0	24	1987
220	6243	5839	6.070738	4.223536	0.90345	0.643668		1988
220	44	0	5.942799	8.087271	0	0		1989
220	1666	34100	5.521461	5.904607	18.08059	2.948672		1990
5000	6278	2699	7.022868	1.150158	0.239315	0.214559	25	1987
5000	6962	2362	6.753438	1.234989	0.197459	0.180201		1988
5000	7934	1986	7.59287	1.335326	0.153549	0.142843		1989
5000	8916	1567	6.76273	0.929338	0.112604	0.106703		1990
8000	21607	2810	9.693013	3.761991	0.09491	0.090672	26	1987
8000	27664	2307	9.219994	1.867784	0.064687	0.062681		1988
8000	34994	1682	9.444463	1.854081	0.039122	0.038376		1989
8000	43672	1058	9.270212	1.593829	0.020475	0.020269		1990
28940	5859	2057	7.601402	0.290093	0.059111	0.05743	27	1987

28940	5303	18460	7.987864	0.32308	0.539088	0.43119		1988
28940	6404	0	8.483636	0.531372	0	0		1989
28940	7183	0	8.005033	0.39999	0	0		1990
2000	14983	17164	8.642239	0.527332	1.010658	0.698462	28	1987
2000	14491	732	8.946245	0.45707	0.044388	0.043431		1988
2000	15763	1582	9.04204	0.457391	0.089062	0.085316		1989
2000	17612	3064	9.562756	0.468223	0.156231	0.145165		1990
1000	1902	1694	7.659171	2.8224	0.583735	0.459786	29	1987
1000	3155	2182	8.020599	3.137679	0.52515	0.422093		1988
5000	2084	2727	8.101678	1.748484	0.384952	0.325665		1989
5000	2509	2727	8.607399	0.522239	0.363164	0.309809		1990
7000	56359	25600	9.924662	0.138132	0.404047	0.339359	30	1987
7000	47830	23011	10.43079	0.535618	0.419679	0.350431		1988
7000	54742	20253	10.90099	0.765179	0.328026	0.283694		1989
7000	66049	25423	10.5052	0.360397	0.348027	0.298642		1990
15000	190	9917	8.341887	0.407853	0.652864	0.502509	31	1987
15000	1019	8703	8.542861	0.38617	0.543292	0.433918		1988
15000	1802	6898	7.849324	0.377873	0.410546	0.343977		1989
16500	2312	5773	6.781058	0.236773	0.306879	0.267642		1990
5000	-1331	19202	7.401231	0.435697	5.233579	1.829951	32	1987
5000	2378	8032	7.586804	0.403843	1.088642	0.736514		1988
8000	2725	8190	8.376321	0.432709	0.763636	0.567378		1989
8000	3792	7683	8.721113	0.186181	0.651543	0.50171		1990
4000	7755	2533	7.746301	1.403845	0.215483	0.195141	33	1987
4000	8681	2474	7.833204	1.702945	0.195095	0.178226		1988
4000	13964	1877	7.627544	1.882825	0.104487	0.099381		1989
10000	2110	28374	10.39259	2.383582	2.343022	1.206875		1990
10000	50799	3857	8.919721	1.367841	0.063439	0.061508	34	1987
10000	53013	3267	8.395929	1.16983	0.051846	0.050547		1988
10000	59122	2360	8.198914	0.899205	0.034143	0.033573		1989
10000	69914	432	8.334231	0.678859	0.005406	0.005391		1990
2400	3870	0	5.863631	1.140023	0	0	35	1987
4800	2379	0	5.762051	1.743881	0	0		1988
4800	3661	0	5.976351	2.076685	0	0		1989
4800	5370	0	5.505332	2.136132	0	0		1990
650	326	0	5.459586	0.441303	0	0	36	1987
650	503	0	5.141664	0.251853	0	0		1988
650	263	0	4.317488	0.183752	0	0		1989
650	313	0	4.26268	0.231072	0	0		1990
9000	849	3014	8.040447	0.47497	0.306021	0.266985	37	1987
9000	1564	9481	9.957407	0.571915	0.897482	0.640528		1988
9000	4807	15613	9.131405	0.414633	1.130803	0.756499		1989
9000	9702	7301	8.084871	0.502799	0.390386	0.329581		1990
3000	13003	3411	9.018332	0.464009	0.213148	0.193218	38	1987
3150	15187	2239	8.576405	0.342362	0.122103	0.115204		1988
3300	16683	10098	9.356689	0.455819	0.50533	0.409012		1989
3940	20747	13235	9.455793	0.433976	0.536112	0.429255		1990
5780	1765	10061	9.111293	0.967486	1.333466	0.847355	39	1987
5780	2800	7220	8.080547	0.491504	0.841492	0.610576		1988
5780	2183	11256	7.891705	0.653185	1.413538	0.881094		1989
7000	2249	11773	8.282483	0.64795	1.272894	0.821054		1990
22230	2442	5617	7.532088	0.557767	0.227667	0.205116	40	1987
22230	2253	5000	6.971669	0.674039	0.204223	0.185835		1988
22230	3465	5700	7.45008	0.737503	0.221833	0.200352		1989
22230	3833	6290	7.127694	0.763989	0.241338	0.21619		1990
4000	3873	7008	5.937536	0.56179	0.890131	0.636646	41	1987

4000	4443	5700	7.691657	0.721484	0.675115	0.515882		1988
4000	4546	7200	7.95367	0.821107	0.842499	0.611123		1989
4000	4939	6718	7.597898	0.671153	0.751538	0.560494		1990
1100	13295	2404	8.089482	2.555365	0.167002	0.154438	42	1987
1100	15987	2277	8.927181	3.809512	0.133259	0.125098		1988
1100	19887	2138	9.45313	1.538938	0.101873	0.097011		1989
1100	21212	3850	9.048174	1.068681	0.172553	0.159183		1990
6600	189	0	7.244228	0.548666	0	0	43	1987
6600	2642	4950	7.434257	0.696076	0.535598	0.42892		1988
6600	5691	0	9.18338	0.856654	0	0		1989
6600	8024	5000	8.602269	0.335253	0.341904	0.294089		1990
15190	11877	12451	8.726968	0.312477	0.460007	0.378441	44	1987
15190	11940	14571	8.50593	0.363281	0.537081	0.429885		1988
15190	12129	17594	8.273081	0.529776	0.644021	0.497145		1989
15190	12465	15330	5.697093	0.448726	0.55433	0.441045		1990
10400	1775	7000	6.89467	0.804896	0.574949	0.454223	45	1987
10400	3103	7000	7.4313	0.817775	0.518403	0.417659		1988
10400	3960	6500	7.005789	0.6228	0.452646	0.373387		1989
10400	5189	5500	8.144098	0.669544	0.352813	0.302186		1990
2600	4294	8192	8.434464	1.094475	1.18828	0.783116	46	1987
2600	5840	10698	7.351158	0.676702	1.267536	0.818694		1988
2600	7149	10347	7.41998	0.826483	1.06134	0.723356		1989
2600	8747	9911	8.244071	1.486976	0.873447	0.62778		1990
3200	2001	3008	7.444249	1.490383	0.57835	0.45638	47	1987
3200	3519	2463	7.583756	1.36065	0.366572	0.312306		1988
3200	4999	3044	7.803435	1.571576	0.371265	0.315734		1989
3200	7037	2469	8.737934	1.514404	0.241184	0.216066		1990
1000	16481	13066	7.913887	0.393162	0.74744	0.558152	48	1987
1000	16752	5868	7.822445	0.440199	0.330554	0.285596		1988
1000	17841	6143	8.156223	0.382008	0.326044	0.2822		1989
1000	22150	8438	8.80807	0.561745	0.364492	0.310783		1990
2500	1684	0	7.367077	2.258317	0	0	49	1987
2500	2621	0	7.650645	2.111646	0	0		1988
2500	3862	0	7.287561	1.695394	0	0		1989
2500	4735	0	7.580189	1.393036	0	0		1990
4285	5597	6370	8.360539	0.439722	0.644606	0.497501	50	1987
4285	5643	5866	9.049819	0.24119	0.590854	0.464271		1988
4285	5645	8749	9.466532	0.123133	0.881067	0.631839		1989
4285	3483	12028	6.946976	-0.06716	1.548404	0.935467		1990
12000	38	5608	7.763871	0.313238	0.465858	0.382441	51	1987
12000	662	5155	9.016634	0.505551	0.407124	0.341548		1988
12000	2170	4122	8.560061	0.399905	0.290896	0.255337		1989
12500	3050	2969	8.232706	0.281268	0.190932	0.174737		1990
2800	696	3788	7.160069	0.375265	1.083524	0.734061	52	1987
2800	904	3302	7.085901	0.469486	0.891469	0.637354		1988
2800	963	5353	7.130899	0.382814	1.422535	0.884815		1989
2800	1028	5925	6.652863	0.515864	1.547806	0.935232		1990
2000	1244	0	3.850148	128.7508	0	0	53	1987
2000	1395	0	4.727388	45.04247	0	0		1988
2000	-317	0	5.023881	21.11866	0	0		1989
2000	304	0	6.173786	17.64825	0	0		1990
1400	3787	3198	7.325808	0.557917	0.616541	0.480289	54	1987
1400	3728	4183	8.442901	0.335495	0.815718	0.596481		1988
2516	11553	21253	10.62147	0.290795	1.510626	0.920532		1989
5816	11653	4912	7.038784	0.044268	0.281184	0.247785		1990
8400	13759	10380	9.931297	1.527004	0.468433	0.384196	55	1987

8400	15240	9581	8.898912	0.339875	0.405288	0.340242		1988
8400	16106	11493	7.177782	0.358272	0.468987	0.384573		1989
10600	15893	9993	6.562444	0.188004	0.377194	0.320048		1990
32000	762	1622	8.033983	0.167451	0.049509	0.048322	56	1987
32000	522	1291	8.236421	0.223597	0.039696	0.038929		1988
32000	987	3056	8.646114	0.176759	0.092643	0.088599		1989
32000	1379	2727	8.369621	0.098333	0.081698	0.078532		1990
1060	2821	1409	6.224558	1.557124	0.363051	0.309725	57	1987
1060	3540	1279	6.124683	1.769148	0.278043	0.24533		1988
1060	3718	1250	6.251904	1.26009	0.261616	0.232393		1989
1060	4853	2250	6.695799	0.437423	0.380518	0.322458		1990
2000	1501	0	5.361292	2.636686	0	0	58	1987
3000	1196	0	6.721426	3.475027	0	0		1988
3000	1678	0	6.788972	2.481856	0	0		1989
3000	1835	0	5.66296	2.874933	0	0		1990
40000	-3212	0	7.004882	0.015056	0	0	59	1987
50000	-3579	0	7.669962	-0.29483	0	0		1988
90000	-7087	0	7.550135	1.418442	0	0		1989
100000	-5695	0	8.63693	1.042691	0	0		1990
10720	3522	974	7.641564	0.840856	0.068389	0.066152	60	1987
10720	5383	1987	7.952263	0.577641	0.123393	0.116354		1988
10720	6123	7714	8.187855	0.393908	0.457994	0.377062		1989
10720	6620	7421	8.055475	0.260712	0.42797	0.356254		1990
2520	4785	0	8.500454	0.784293	0	0	61	1987
2520	7022	0	9.276783	0.333721	0	0		1988
2520	9044	0	10.21618	0.349762	0	0		1989
2520	11106	0	9.158205	0.194095	0	0		1990
120000	24067	28918	10.07778	0.485636	0.200726	0.182926	62	1987
120000	38661	33318	10.18867	0.617421	0.209995	0.190616		1988
120000	57716	32581	10.58777	0.482511	0.183332	0.168334		1989
11000	98861	3379	9.490998	1.573048	0.030757	0.030294	63	1987
11000	124077	20947	9.479604	1.607158	0.155075	0.144165		1988
11000	152722	23137	9.775597	1.314802	0.141319	0.132184		1989
10000	86560	51298	9.973946	0.056773	0.531255	0.426088	64	1987
100000	-5471	85597	10.23635	-0.01392	0.90551	0.64475		1988
100000	-29565	108092	9.887612	-0.10142	1.534635	0.93005		1989
8000	54288	10901	5.726848	0.824092	0.17501	0.161276	65	1987
48300	15067	9386	8.116417	1.225326	0.148121	0.138127		1988
48300	15041	7762	8.446771	1.21234	0.122543	0.115597		1989
2700	14445	0	7.069874	11.63102	0	0	66	1987
2700	16637	0	6.463029	12.55741	0	0		1988
2700	18510	0	6.874198	16.55937	0	0		1989
2000	2782	67551	10.81968	0.187711	14.1261	2.716422	67	1987
2000	1017	105586	10.4765	0.194979	34.99702	3.583436		1988
2000	1218	71948	10.13805	0.208213	22.35799	3.150939		1989
6000	3257	11679	8.135054	0.451135	1.26164	0.81609	68	1987
6000	4410	14341	8.644002	0.272527	1.377618	0.866099		1988
6000	2349	16624	8.20166	0.22501	1.991137	1.095653		1989
15000	33906	45741	8.557183	0.060724	0.935284	0.660254	69	1987
15000	92691	29949	10.34856	0.479534	0.278101	0.245376		1988
15000	88198	13454	8.900004	0.252221	0.130371	0.122546		1989
1046	12708	193	7.003974	2.735142	0.014032	0.013935	70	1987
1046	15105	153	7.03966	2.636359	0.009473	0.009429		1988
1046	16515	748	7.658228	2.532174	0.042594	0.041712		1989
5200	7389	1093	7.823646	0.992517	0.086822	0.083258	71	1987
5200	8162	1367	7.762596	0.865962	0.102305	0.097403		1988

5200	8339	1367	7.734559	1.148258	0.100968	0.096189		1989
2700	3409	2716	7.07327	1.337882	0.44459	0.367826	72	1987
2700	3522	3820	7.429521	0.529296	0.61395	0.478685		1988
2700	3693	3529	7.865572	0.628353	0.55201	0.439551		1989
3000	1226	2479	7.748029	0.310547	0.586607	0.461598	73	1987
3000	1233	1577	7.639642	0.259543	0.372549	0.31667		1988
3000	-132	2754	7.993958	0.256241	0.960251	0.673073		1989
2000	4196	0	7.431892	0.817873	0	0	74	1987
2000	5657	0	6.806829	1.251203	0	0		1988
2000	5823	0	7.640123	1.777313	0	0		1989
40000	8895	1040	7.926964	-0.35891	0.02127	0.021047	75	1987
40000	10215	1526	8.19257	-0.54212	0.030389	0.029937		1988
40000	6503	1375	8.480944	-0.36606	0.029568	0.029139		1989
1015	256	0	3.871201	28.72759	0	0	76	1988
1015	1387	0	3.806662	19.54835	0	0		1989
1015	2937	0	3.951244	22.14195	0	0		1990
4000	27389	1584	8.606302	0.598708	0.050464	0.049232	77	1988
4000	30065	757	8.955964	0.555903	0.022222	0.021979		1989
4000	33951	1085	8.989195	0.528486	0.028589	0.028188		1990
17715	3944	9589	7.721792	0.801816	0.442726	0.366534	78	1988
17715	18542	8457	9.025576	0.64435	0.233252	0.209654		1989
17715	26787	7132	7.997327	0.367288	0.160262	0.148646		1990
10000	1445	13875	8.122668	0.246071	1.21232	0.794042	79	1988
15000	9615	5296	8.594895	0.297411	0.215153	0.19487		1989
25000	1888	10762	9.167015	0.342903	0.400253	0.336653		1990
10200	10732	5893	8.997147	0.534643	0.281531	0.248055	80	1988
20200	1346	3482	8.940236	0.34021	0.161608	0.149805		1989
20200	3284	2420	8.049108	0.069512	0.103049	0.098078		1990
8000	12676	4228	7.824846	0.388738	0.204488	0.186055	81	1988
8000	12770	2734	7.745003	0.436446	0.131632	0.123661		1989
8000	12811	5817	7.98105	0.546425	0.279516	0.246482		1990
2300	16637	5486	8.747193	1.408229	0.289697	0.254408	82	1988
2300	42304	7870	9.075208	1.786264	0.176442	0.162494		1989
2300	51369	6401	9.325988	1.748133	0.119268	0.112675		1990
210	4010	0	7.735433	0.262411	0	0	83	1988
4000	20191	0	7.302496	0.108325	0	0		1989
4000	20865	0	8.751791	-0.33395	0	0		1990
7500	25842	0	7.444833	3.73468	0	0	84	1988
7500	28830	0	7.493874	0.500415	0	0		1989
7500	28690	0	7.706613	0.405117	0	0		1990
1000	2834	13000	4.543295	15.82839	3.390715	1.479492	85	1988
1000	3099	13000	5.918894	26.98402	3.171505	1.428277		1989
1000	3145	20000	6.12905	13.44021	4.82509	1.762175		1990
3500	974	1935	7.656337	1.689597	0.432499	0.35942	86	1988
3500	1060	2229	7.733246	0.489402	0.488816	0.397981		1989
3500	1431	1705	7.976252	0.591211	0.345772	0.296968		1990
3300	415	2011	8.359603	0.796909	0.541319	0.432639	87	1988
3300	762	2934	6.753438	0.497622	0.722304	0.543663		1989
3300	1743	6141	7.338238	0.781132	1.217728	0.796483		1990
750	1384	2469	6.993933	0.737864	1.156982	0.76871	88	1988
1206	790	3580	6.496775	0.841104	1.793587	1.027326		1989
1350	913	4326	6.025866	0.871498	1.911622	1.06871		1990
7000	4923	25013	8.608313	0.309307	2.097878	1.130717	89	1987
7000	5305	17857	9.330964	0.485227	1.451199	0.896577		1988
7000	6117	14530	9.336532	0.398178	1.107723	0.745608		1989
10300	17612	5181	9.888678	0.460356	0.185619	0.170265	90	1987

10300	21251	10063	9.760367	0.561961	0.318944	0.276831		1988
24396	103608	34769	10.30655	1.007821	0.271624	0.240295	91	1987
24573	115758	29387	10.2426	1.005161	0.209412	0.190134		1988
12000	14422	28514	8.920389	0.459151	1.079176	0.731972	92	1987
12000	11220	28256	9.50874	0.507305	1.216882	0.796102		1988
1286	25294	667	8.738735	1.078001	0.025094	0.024784	93	1987
1286	25397	242	9.396156	1.226849	0.009069	0.009029		1988
3024	8530	8833	8.472405	1.274842	0.764497	0.567866	94	1987
3024	12945	9746	8.432724	1.449974	0.610307	0.476425		1988
8000	5289	1272	7.899524	1.780306	0.095718	0.09141	95	1987
7400	8312	269	8.064951	2.759956	0.017121	0.016976		1988
1800	22883	335	8.214736	1.108565	0.013572	0.013481	96	1987
1800	23235	0	8.453614	1.206667	0	0		1988
7500	7679	7736	8.699348	0.424755	0.509651	0.411879	97	1987
7500	9642	6859	7.751905	0.442041	0.400128	0.336564		1988
23000	3724	4003	7.711997	0.5247	0.14979	0.13958	98	1987
23000	3821	4124	7.809541	0.556426	0.15376	0.143026		1988
4000	6487	2612	8.064322	3.748391	0.24907	0.222399	99	1987
4000	6094	6216	8.585973	2.805751	0.615811	0.479837		1988
242825	64995	67845	10.74978	0.679906	0.220405	0.199183	100	1988
242825	67889	63210	10.7451	0.680662	0.203435	0.18518		1989
95000	234	225358	11.23452	0.004222	2.366361	1.213832	101	1988
32562	76993	223217	11.15012	-0.12946	2.037488	1.111031		1989
75015	0	4172	9.969135	0.153652	0.055616	0.054124	102	1988
9020	55225	0	10.08797	0.210399	0	0		1989
7000	14487	25553	9.206433	0.194051	1.189231	0.78355	103	1988
7000	16794	24743	7.502186	0.137142	1.039884	0.712893		1989
2000	23361	106	7.977968	0.980823	0.00418	0.004171	104	1988
2000	24494	3300	8.824531	-0.06591	0.124557	0.117389		1989
1500	4762	656	7.282761	0.619894	0.104759	0.099627	105	1988
1500	5116	516	7.5224	0.159768	0.077993	0.075101		1989
1750	1812	4598	6.888572	0.676978	1.290848	0.828922	106	1988
1750	2784	3852	7.889834	0.987717	0.849581	0.614959		1989
200	2	0	2.944439	3.659076	0	0	107	1988
200	6	0	4.65396	1.763713	0	0		1989
32000	23752	342	9.364434	0.981566	0.006134	0.006116	108	1989
32000	31164	212	9.695356	0.706226	0.003356	0.003351		1990
80000	-10845	18582	10.35825	0.104553	0.268701	0.237993	109	1989
80000	-18158	19997	10.63287	0.039068	0.323356	0.280171		1990
58816	-4899	10659	8.992433	0.420995	0.197693	0.180397	110	1989
58816	-5956	376	9.535246	0.467282	0.007113	0.007088		1990
40000	3303	33507	9.869931	0.496495	0.77378	0.573113	111	1989
55000	3719	43087	10.49327	0.532064	0.733783	0.550306		1990
8500	12347	0	5.537334	446.8769	0	0	112	1989
8500	8985	0	7.467371	1070.343	0	0		1990
53235	802	49326	9.881191	0.153086	0.912819	0.648578	113	1989
53235	-1665	59185	9.880935	0.041024	1.147663	0.76438		1990
27000	3116	3812	8.45808	0.250892	0.126577	0.119184	114	1989
27000	3132	4168	9.075894	0.210875	0.138325	0.129558		1990
3000	11827	3292	8.325548	1.297053	0.222027	0.200511	115	1989
4000	12766	2897	7.857481	0.522991	0.17279	0.159386		1990
13500	3620	5467	9.589872	0.459868	0.319334	0.277127	116	1989
13500	6364	4980	9.646723	0.303331	0.250705	0.223707		1990
2000	1669	0	4.532599	25.37019	0	0	117	1989
2000	2311	0	4.672829	32.48649	0	0		1990
4820	5583	1687	8.789355	1.322383	0.162165	0.150284	118	1989

4820	4659	4387	8.306225	0.425294	0.462813	0.380361		1990
7500	8960	2745	8.505525	2.090788	0.166768	0.154237	119	1989
7500	10754	2214	8.526945	1.20179	0.121288	0.114478		1990
5000	9810	9587	8.872067	0.769658	0.647333	0.499158	120	1989
5000	10445	8756	8.077137	0.626091	0.566915	0.449109		1990
9900	3176	73095	8.405144	0.382381	5.590012	1.885555	121	1989
9900	5896	63784	8.386629	0.463556	4.037984	1.617006		1990
6175	13367	3318	8.289037	0.294247	0.169788	0.156823	122	1989
6175	13556	6000	6.766192	0.387965	0.30409	0.265505		1990
1000	5726	2402	7.162397	0.887361	0.357122	0.305366	123	1989
1000	6646	2948	6.940222	0.488693	0.385561	0.326105		1990
1325	613	2111	6.43294	0.320778	1.089267	0.736813	124	1989
1325	624	5566	8.722091	0.46516	2.855823	1.349585		1990

Electronics sector

firm no.	year	K	ACC.D.	DEPR.	K(-1)	t-1 ACC.D.	INV.	V.ADD.	LAB.C.
1	1987	449425	223714	57351	409375	188161	61848	510511	342897
	1988	510760	277393	69215	449425	223714	76871	605400	382538
	1989	599909	344675	75969	510760	277393	97836	754469	419015
	1990	673979	423489	91170	599909	344675	86426	776518	462490
2	1987	369245	323241	49762	358466	297459	34759	361234	240643
	1988	445071	357991	56925	369245	323241	98001	394982	265317
	1989	615911	391448	98397	445071	357991	235780	423720	302496
	1990	629921	419625	111814	615911	391448	97647	387051	329869
3	1987	135359	92271	13368	123318	82128	15266	122768	85110
	1988	146411	99328	10316	135359	92271	14311	122710	87267
	1989	157340	104973	10560	146411	99328	15844	146578	98325
	1990	166218	112659	11625	157340	104973	12817	165046	104724
4	1987	59379	36541	32444	43307	24539	36514	170737	131389
	1988	92400	42679	10961	59379	36541	37844	164294	105699
	1989	139482	57436	19161	92400	42679	51486	185469	130977
	1990	167816	74368	24021	139482	57436	35423	213413	149039
5	1987	21137	8619	1689	20560	7997	1644	46328	20226
	1988	25849	10315	2060	21137	8619	5076	56037	22497
	1989	26708	11661	2405	25849	10315	1918	63336	25582
	1990	31445	14657	3812	26708	11661	5553	61488	29880
6	1987	193897	154949	22649	172224	136266	25639	184570	145836
	1988	223405	184809	30396	193897	154949	30044	266650	199065
	1989	252123	208302	28955	223405	184809	34180	337067	215274
	1990	279549	230976	30102	252123	208302	34854	410189	230934
7	1987	90753	65720	11019	86761	55745	5036	61567	68632
	1988	101097	71911	9486	90753	65720	13639	125812	80495
	1989	167042	80432	9558	101097	71911	66982	104748	93843
	1990	449940	85143	19057	167042	80432	297244	63109	102947
8	1987	95190	43966	17925	84847	35529	19831	119478	106938
	1988	108788	54073	20861	95190	43966	24352	136377	130751
	1989	125377	76111	31631	108788	54073	26182	158776	148861
	1990	146958	88948	14975	125377	76111	23719	168137	168209
9	1987	161614	146200	16094	173636	154105	11977	129912	70965
	1988	147259	127343	10529	161614	146200	15031	104603	78797
	1989	135976	115514	1010	147259	127343	1556	89058	86492
	1990	122763	90880	5957	135976	115514	17378	64214	94706
10	1987	4090	2949	1113	3355	2104	1003	50329	44610
	1988	4660	3702	1091	4090	2949	908	65027	55977
	1989	5265	4358	1255	4660	3702	1204	77289	68779
	1990	5673	4539	1425	5265	4358	1652	91484	83773
11	1987	51018	31623	6670	44291	26069	7843	89064	74754
	1988	59381	37957	6853	51018	31623	8882	101131	80421
	1989	64980	44187	7028	59381	37957	6397	121228	93540
	1990	69134	48287	6431	64980	44187	6485	141362	103907
12	1987	143830	77160	23426	116698	62291	35689	98848	45300
	1988	178364	98136	39736	143830	77160	53294	112506	52443
	1989	227126	122025	41794	178364	98136	66667	147640	63816
	1990	257923	146238	44122	227126	122025	50706	159351	75783
13	1987	122365	64914	66034	121082	60170	62573	-3118	56308
	1988	125627	71248	24515	122365	64914	21443	81240	53543
	1989	141978	77953	16490	125627	71248	26136	74963	55071
	1990	146097	83268	15278	141978	77953	14082	76013	55385
14	1987	43515	25370	5722	32223	20218	11862	102708	78252
	1988	66849	32713	9619	43515	25370	25610	129108	95710
	1989	76510	42866	13536	66849	32713	13044	164261	126012
	1990	82197	57480	19008	76510	42866	10081	194076	146920

15	1987	74046	46016	17850	73158	43082	15804	100375	66702
	1988	80855	50449	18092	74046	46016	20468	106800	75714
	1989	90292	55219	14536	80855	50449	19203	111923	84889
	1990	100459	63842	12193	90292	55219	13737	113001	93069
16	1987	8118	3082	2879	7056	2505	3364	14566	10145
	1988	9390	4186	1236	8118	3082	1404	26408	12184
	1989	11706	5322	1256	9390	4186	2436	29643	16950
	1990	14606	5964	1686	11706	5322	3944	46474	24423
17	1987	92654	33767	19082	59937	25508	43540	69131	50404
	1988	96322	42823	17471	92654	33767	12083	76140	53228
	1989	103141	52803	16847	96322	42823	13686	88303	61191
	1990	111154	62202	16334	103141	52803	14948	95386	71564
18	1987	8351	4839	1458	6883	3567	1654	26836	10208
	1988	11945	6090	1571	8351	4839	3914	30565	11679
	1989	13679	7661	1952	11945	6090	2115	41800	14354
	1990	17088	9072	2256	13679	7661	4254	45165	16301
19	1987	63726	45430	8140	53893	37633	10176	57242	44064
	1988	72241	52833	8477	63726	45430	9589	62985	47172
	1989	114592	58890	5883	72241	52833	42177	42331	32782
	1990	122834	68573	12719	114592	58890	11278	71910	56703
20	1987	15197	7626	2955	10268	4937	5195	15690	5303
	1988	23979	10979	4045	15197	7626	9474	20237	7304
	1989	26721	15106	4874	23979	10979	3489	20277	10944
	1990	35481	19060	5097	26721	15106	9903	27924	11046
21	1987	31162	16285	2743	28395	14401	3626	37698	35078
	1988	33719	18449	2966	31162	16285	3359	42219	37189
	1989	38443	20786	4252	33719	18449	6639	42869	42004
	1990	42924	23907	5972	38443	20786	7332	46754	45871
22	1987	2960	2168	479	2749	1720	242	30064	16210
	1988	3328	2495	453	2960	2168	494	34021	18311
	1989	3757	2823	450	3328	2495	551	34801	22353
	1990	4037	2901	430	3757	2823	632	32703	22740
23	1987	45178	21932	5982	40425	17339	6142	40957	32086
	1988	48205	29509	7865	45178	21932	3315	48139	36572
	1989	52468	33589	4866	48205	29509	5049	50920	42449
	1990	54259	37579	4487	52468	33589	2288	55927	47256
24	1987	18441	9895	1457	16602	8593	1994	28300	15161
	1988	20616	10807	1566	18441	9895	2829	32367	17035
	1989	22316	12005	1870	20616	10807	2372	37783	19726
	1990	24254	13544	2216	22316	12005	2615	35619	22332
25	1987	54007	26273	8049	34341	18904	20346	30102	19417
	1988	75114	33834	9163	54007	26273	22709	40617	26893
	1989	78906	42101	13949	75114	33834	9474	57721	39677
	1990	102716	58741	20835	78906	42101	28005	76909	50517
26	1987	16065	4267	2415	9808	1280	5685	14501	10968
	1988	23294	9828	5634	16065	4267	7302	28862	24402
	1989	29862	16505	6794	23294	9828	6685	37298	28311
	1990	39601	24015	7583	29862	16505	9812	42541	31232
27	1987	73312	48057	9335	64048	42791	13333	2712	0
	1988	89938	56077	9964	73312	48057	18570	6795	0
	1989	102861	64403	10924	89938	56077	15521	8478	0
	1990	111695	71101	11519	102861	64403	13655	9100	0
28	1987	8191	6650	1955	6921	5062	1637	26034	11174
	1988	9417	7939	1857	8191	6650	1794	32213	13244
	1989	14722	9041	1538	9417	7939	5741	23174	15353
	1990	16767	8761	1880	14722	9041	4205	17542	16647

29	1987	4162	1469	236	4017	1387	299	6245	2602
	1988	4433	1744	350	4162	1469	346	9787	3108
	1989	4974	2059	436	4433	1744	662	10826	3621
	1990	5096	2158	338	4974	2059	361	8085	4676
30	1987	36944	20577	3362	29228	18122	8623	21994	20178
	1988	39388	22994	3216	36944	20577	3243	28070	20983
	1989	46291	27680	5055	39388	22994	7272	40130	24151
	1990	48906	31852	5552	46291	27680	3995	34671	25997
31	1987	23994	15067	2632	20432	12542	3669	13224	9844
	1988	26712	17839	2778	23994	15067	2724	12746	9767
	1989	29749	20228	2959	26712	17839	3607	15009	11971
	1990	32859	23141	3382	29749	20228	3579	16476	13549
32	1987	6234	2651	1634	5770	1935	1382	11778	7790
	1988	7136	3563	1816	6234	2651	1806	17847	10404
	1989	8480	4546	1379	7136	3563	1740	17996	11179
	1990	10333	5584	2000	8480	4546	2815	21556	13410
33	1987	5219	4010	691	4533	3353	720	13014	6738
	1988	6197	4647	684	5219	4010	1025	13710	8048
	1989	6444	5037	832	6197	4647	689	14683	10059
	1990	6434	5443	793	6444	5037	377	16627	10131
34	1987	30057	19911	6744	29847	17424	4467	30662	28350
	1988	30872	19549	7994	30057	19911	9171	29995	28054
	1989	31230	20879	11472	30872	19549	10500	28894	30240
	1990	26168	16329	7979	31230	20879	7467	26857	25198
35	1987	11161	8648	1793	9669	7133	1770	18882	11898
	1988	13330	10207	1941	11161	8648	2551	24753	15668
	1989	17757	12465	2443	13330	10207	4612	30839	19086
	1990	28444	16200	3815	17757	12465	10767	48570	31700
36	1987	8928	5383	1546	6613	4190	2668	22941	10482
	1988	12283	7010	1949	8928	5383	3677	23959	13302
	1989	16097	9232	1987	12283	7010	3579	19258	14095
	1990	18522	10773	1626	16097	9232	2510	21138	14809
37	1987	4413	2402	710	3930	1727	518	14681	8872
	1988	5151	3091	733	4413	2402	782	16682	10001
	1989	5309	3263	626	5151	3091	612	19359	11929
	1990	6094	4009	791	5309	3263	830	22777	13725
38	1987	8520	7237	1876	7662	5789	1286	16836	12130
	1988	9307	8286	1329	8520	7237	1067	16634	13204
	1989	9228	8309	1090	9307	8286	988	19221	15124
	1990	9516	8758	1039	9228	8309	878	19847	16009
39	1987	2458244	2262451	538116	2135121	1661451	260239	2258740	932657
	1988	2648774	1807606	466316	2458244	2262451	1111691	2623903	1024749
	1989	2860550	1982834	445856	2648774	1807606	482404	2760068	1156572
40	1987	70538	44017	6633	58834	39195	13515	188514	116007
	1988	83073	50023	8060	70538	44017	14589	212346	129100
	1989	92877	59820	11215	83073	50023	11222	270354	145123
41	1987	341171	191912	27361	323391	167833	21062	652073	272544
	1988	378806	216324	28924	341171	191912	42147	392330	301713
	1989	424105	246002	33214	378806	216324	48835	476602	339577
42	1987	1581	765	424	1010	412	642	6550	1436
	1988	3351	1202	413	1581	765	1746	11700	3241
	1989	5861	1763	588	3351	1202	2537	11375	4576
43	1988	227229	50064	34761	172378	21381	60929	227515	178130
	1989	249837	78622	42064	227229	50064	36114	216967	185164
	1990	273248	120138	50898	249837	78622	32793	194863	171301
44	1988	165701	122193	23647	127979	102047	41223	273917	86768

	1989	203978	148067	31175	165701	122193	43578	304472	104693
	1990	240757	178884	35623	203978	148067	41585	324652	115991
45	1988	1554	793	445	1135	588	659	22475	3264
	1989	1744	1173	546	1554	793	356	26102	4004
	1990	1841	1285	487	1744	1173	472	32670	4938
46	1988	21932	13522	3588	25474	14772	1296	27649	21002
	1989	25207	16730	5187	21932	13522	5254	29957	21673
	1990	29885	20710	5008	25207	16730	5706	30193	23611
47	1988	34271	27338	2524	31523	25250	3184	41729	26698
	1989	48433	27285	2172	34271	27338	16387	46472	32227
	1990	54019	29459	2809	48433	27285	6221	47892	36175
48	1988	7433	5146	1458	6771	4352	1326	10930	5736
	1989	8825	5558	1366	7433	5146	2346	9458	5786
	1990	9329	5701	1273	8825	5558	1634	8916	6400
49	1988	10940	4176	1242	8934	3434	2506	15161	13145
	1989	12310	5191	1456	10940	4176	1811	17598	14712
	1990	14028	6335	1569	12310	5191	2143	20024	16142
50	1988	13996	2088	1121	7026	981	6984	9804	10787
	1989	17347	4658	2045	13996	2088	2826	16471	15119
	1990	19331	6556	2686	17347	4658	2772	17508	15765
51	1988	2853	1678	1526	2796	1090	995	6595	3526
	1989	2966	1862	1127	2853	1678	1056	6031	3746
	1990	3015	2035	1116	2966	1862	992	5580	4113
52	1988	3426	2777	153	3188	2669	283	6042	3872
	1989	3840	2952	296	3426	2777	535	6581	4452
	1990	4631	3447	504	3840	2952	800	7540	4839
53	1987	175806	104242	15014	160672	94570	20476	182136	180631
	1988	198885	115513	16602	175806	104242	28410	246812	191438
54	1987	54511	35401	9023	47220	28569	9482	83208	59880
	1988	65622	40933	8778	54511	35401	14357	99315	70610
55	1987	45197	32749	5007	43343	29988	4100	53674	39631
	1988	46532	35692	4755	45197	32749	3147	61048	45455
56	1987	32510	21603	4501	34633	21854	2629	29170	22413
	1988	30963	21398	3519	32510	21603	2177	13587	18057
57	1987	26627	18618	4823	22167	14914	5579	21085	8157
	1988	37238	23424	5541	26627	18618	11346	28969	10098
58	1987	4586	3133	986	3821	2520	1138	24513	7370
	1988	8693	4191	10101	4586	3133	13150	29455	9532
59	1987	13161	9984	1305	12081	8763	1164	16762	10810
	1988	15190	11318	1514	13161	9984	2209	19797	12340
60	1987	14354	8319	1593	12648	6758	1738	14389	12236
	1988	16377	9843	1720	14354	8319	2219	17609	13867
61	1989	326894	229720	47908	275513	199795	69364	486674	252432
	1990	413404	267947	55071	326894	229720	103354	457342	281556
62	1989	404961	109033	62791	354045	53188	57862	195060	207266
	1990	509202	179724	82666	404961	109033	116216	267218	221965
63	1989	29395	11787	5553	8736	2486	16911	60720	13295
	1990	47215	20116	10598	29395	11787	20089	123572	25810
64	1989	34232	17923	10419	27906	7724	6546	51653	16343
	1990	37121	24506	6854	34232	17923	3160	39832	31470
65	1989	46646	18839	9306	41398	11521	7236	79219	51056
	1990	50008	23197	5726	46646	18839	4730	58328	35298
66	1989	10831	6402	5930	12462	4276	2173	53756	42687
	1990	12462	8498	8966	10831	6402	8501	50774	39341
67	1989	14935	7965	3444	10353	5197	5258	33929	21651
	1990	19284	11359	4102	14935	7965	5057	46142	25346

68	1989	14799	6458	2552	11160	5293	5026	23763	14129
	1990	15837	7945	3237	14799	6458	2788	23061	16065
69	1989	10583	5008	3287	7123	2432	4171	18097	6518
	1990	15471	6001	1565	10583	5008	5460	13786	5565
70	1989	35178	22363	5552	29240	14252	3379	43605	17303
	1990	43532	28343	7768	35178	22363	10142	53208	22285
71	1989	24959	16064	4480	15877	13026	10524	36864	27079
	1990	30311	21314	7527	24959	16064	7629	40547	29139
72	1989	1811	620	754	1337	292	900	15820	10567
	1990	2008	970	777	1811	620	624	15686	12468
73	1989	3859	1342	2386	3602	1137	2438	5560	13362
	1990	2045	769	2193	3859	1342	952	25414	12628

VAR.PROF	EQ.	RES.	L.T.F.D.	loginv	prorat	mu	lnmu	firm no.	year
167614	396000	105954	255784	11.0324	0.71392	0.50958	0.41183	1	1987
222862	396000	189168	280925	11.2499	0.93977	0.48008	0.39209		1988
335454	396000	282285	313595	11.491	1.35406	0.46234	0.38003		1989
314028	396000	374231	331571	11.367	1.16632	0.43048	0.35801		1990
120591	11880	228490	59574	10.4562	1.86245	0.24784	0.22142	2	1987
129665	11880	260762	161110	11.4927	2.68266	0.59092	0.46431		1988
121224	200000	67698	172322	12.3707	1.31133	0.64372	0.49696		1989
57182	200000	70820	268908	11.4891	0.24149	0.99294	0.68961		1990
37658	60000	36368	58543	9.63338	0.86142	0.60749	0.47468	3	1987
35443	60000	41827	32131	9.56878	0.78291	0.31554	0.27425		1988
48253	60000	53458	88388	9.67055	0.96539	0.77904	0.57607		1989
60322	90000	156805	81990	9.45853	1.09196	0.33221	0.28684		1990
39348	22000	12753	0	10.5055	1.9754	0	0	4	1987
58595	22000	26921	0	10.5412	2.44197	0	0		1988
54492	22000	37850	30000	10.8491	1.03237	0.50125	0.4063		1989
64374	22000	49575	60000	10.4751	0.74378	0.83828	0.60883		1990
26102	20000	42311	0	7.40489	1.95763	0	0	5	1987
33540	20000	49195	0	8.53228	2.55015	0	0		1988
37754	26000	49815	0	7.55904	2.28941	0	0		1989
31608	33000	54994	0	8.62209	1.9913	0	0		1990
38734	15500	108081	91261	10.1519	1.01495	0.73847	0.55301	6	1987
67585	30000	82081	106730	10.3104	1.65159	0.95226	0.66899		1988
121793	30000	88288	77395	10.4394	2.97251	0.65429	0.50337		1989
179255	50000	80783	88079	10.4589	3.87773	0.67347	0.5149		1990
-7065	14000	14376	11936	8.52437	-0.2146	0.42064	0.35111	7	1987
45317	14000	1825	35163	9.52069	1.723	2.22199	1.17		1988
10905	50000	28227	30022	11.1122	0.35196	0.38378	0.32482		1989
-39838	100000	62487	305960	12.6023	-0.436	1.88298	1.05882		1990
12540	70000	35879	78570	9.895	0.23958	0.74207	0.55508	8	1987
5626	70000	33305	76625	10.1004	0.10454	0.74174	0.55488		1988
9915	100000	3608	69377	10.1728	0.1707	0.66961	0.51259		1989
-72	100000	4019	73022	10.074	-0.0014	0.70201	0.53181		1990
58947	7500	71753	30453	9.39074	2.84372	0.38425	0.32516	9	1987
25806	7500	19797	51922	9.61787	1.59347	1.90211	1.06544		1988
2566	7500	18126	38771	7.34987	0.12137	1.51296	0.92146		1989
-30492	7500	20247	22117	9.76296	-1.4126	0.7971	0.58617		1990
5719	4000	4202	0	6.91075	4.30737	0	0	10	1987
9050	6000	3577	0	6.81124	7.5492	0	0		1988
8510	8000	4308	0	7.0934	8.36772	0	0		1989
7711	12000	3143	0	7.40974	8.0592	0	0		1990
14310	30533	1960	28548	8.96738	0.73993	0.87859	0.63052	11	1987
20710	30533	2777	21241	9.09178	1.01631	0.63768	0.49328		1988
27688	30533	5408	19231	8.76358	1.2174	0.53507	0.42858		1989
37455	30533	13392	4007	8.77725	1.70758	0.09122	0.0873		1990
53548	12000	14788	13000	10.4826	0.92734	0.48529	0.39561	12	1987
60063	12000	20771	7000	10.8836	0.85746	0.2136	0.19359		1988
83824	12000	25816	23000	11.1075	0.98421	0.60821	0.47512		1989
83568	12000	31006	23000	10.8338	0.75374	0.53481	0.42841		1990
-59426	40000	37482	0	11.0441	-0.9192	0	0	13	1987
27697	40000	14559	0	9.97315	0.45885	0	0		1988
19892	40000	7564	0	10.1711	0.34458	0	0		1989

20628	40000	11839	0	9.55265	0.30542	0	0			1990
24456	10800	17724	2071	9.3811	1.91943	0.07261	0.07009	14	1987
33398	17280	18428	2360	10.1507	1.75187	0.06609	0.064		1988
38249	20736	27172	2650	9.47608	1.05548	0.05531	0.05384		1989
47156	20736	33803	2675	9.21841	1.32867	0.04905	0.04788		1990
33673	25000	22191	45702	9.66802	1.0549	0.96845	0.67725	15	1987
31086	60000	10852	37907	9.92662	1.05555	0.53502	0.42854		1988
27034	60000	12779	38139	9.86282	0.83752	0.52404	0.42136		1989
19932	60000	13187	56361	9.52785	0.53872	0.7701	0.57103		1990
4421	8000	-2483	21232	8.12089	0.9153	3.84847	1.57866	16	1987
14224	8000	92	13000	7.24708	2.68828	1.60652	0.95802		1988
12693	16000	4969	3000	7.79811	2.29758	0.14307	0.13372		1989
22051	16000	2964	3000	8.27995	3.27434	0.15819	0.14686		1990
18727	30000	8591	48804	10.6814	0.5125	1.26465	0.81742	17	1987
22912	30000	6736	47671	9.39955	0.37032	1.29766	0.83189		1988
27112	30000	5240	49248	9.52413	0.47737	1.3975	0.87443		1989
23822	30000	6183	17084	9.61233	0.44861	0.47216	0.38673		1990
16628	5000	14234	616	7.41095	4.72471	0.03203	0.03152	18	1987
18886	10000	14985	579	8.27232	5.11827	0.02317	0.02291		1988
27446	10000	22554	496	7.65681	4.41566	0.01524	0.01512		1989
28864	10000	29377	345	8.35561	4.54667	0.00876	0.00872		1990
13178	5600	12639	16664	9.22779	0.76362	0.91365	0.64901	19	1987
15813	5600	14750	4279	9.16837	0.82261	0.21027	0.19084		1988
9549	9065	1730	9824	10.6496	0.46347	0.91005	0.64713		1989
15207	9065	-38	21336	9.33061	0.2588	2.36358	1.213		1990
10387	1800	3130	10675	8.55545	1.83582	2.16531	1.15225	20	1987
12933	4900	1531	15853	9.15631	1.62586	2.46509	1.24274		1988
9333	4900	3036	15063	8.15737	0.67627	1.89806	1.06404		1989
16878	4900	3560	17512	9.20059	1.3775	2.06998	1.12167		1990
2620	16000	-1423	42319	8.19589	0.1764	2.90314	1.36178	21	1987
5030	16000	-1713	41320	8.1194	0.3218	2.89214	1.35896		1988
865	16000	-1366	39675	8.80072	0.05336	2.71115	1.31134		1989
883	200	14860	38104	8.9	0.04741	2.53015	1.26134		1990
13854	1500	15922	0	5.48894	12.6856	0	0	22	1987
15710	1500	17130	0	6.20254	18.8794	0	0		1988
12448	1500	18905	0	6.31173	14.0766	0	0		1989
9963	1500	18972	0	6.44889	10.1119	0	0		1990
8871	10030	13110	10748	8.72291	0.36205	0.46448	0.3815	23	1987
11567	10030	16460	11185	8.10621	0.4736	0.42223	0.35223		1988
8471	10030	17950	11185	8.52695	0.4268	0.39975	0.33629		1989
8671	10030	18931	11216	7.73543	0.43539	0.38728	0.32734		1990
13139	4500	16142	7627	7.5979	1.54573	0.36949	0.31444	24	1987
15332	4500	20648	9862	7.94768	1.70755	0.39216	0.33086		1988
18057	4500	26038	6547	7.77149	1.73406	0.21439	0.19424		1989
13287	4500	30260	5265	7.86902	1.22156	0.15147	0.14104		1990
10685	5000	8005	3264	9.92064	0.65217	0.25098	0.22393	25	1987
13724	5000	7910	10060	10.0305	0.47098	0.77924	0.57619		1988
18044	5000	8097	9767	9.15631	0.41175	0.74574	0.55718		1989
26392	7500	35956	6710	10.2401	0.67976	0.15441	0.14359		1990
3533	10000	-785	9270	8.64559	0.39034	1.00597	0.69613	26	1987
4460	10000	-981	9655	8.8959	0.3598	1.07052	0.7278		1988
8987	10000	-877	10965	8.80762	0.62867	1.20191	0.78932		1989
11309	10000	-13	10028	9.19136	0.80261	1.00411	0.6952		1990
2712	1200	4243	16302	9.498	0.12021	2.99504	1.38505	27	1987
6795	1200	4191	31031	9.8293	0.25608	5.75607	1.91044		1988
8478	1200	4191	29686	9.64995	0.23585	5.50659	1.87281		1989

9100	1200	4191	26262	9.52186	0.22431	4.87145	1.7701		1990
14860	8350	10591	1444	7.40062	7.53163	0.07624	0.07347	28	1987
18969	8350	12753	2172	7.4922	11.716	0.10292	0.09796		1988
7821	8350	14986	5215	8.65539	4.98461	0.22347	0.20169		1989
895	8768	16888	6555	8.34403	0.14934	0.2555	0.22753		1990
3643	5000	6116	793	5.70044	1.30513	0.07134	0.06891	29	1987
6679	5000	7097	656	5.84644	2.36055	0.05423	0.05281		1988
7205	7500	5502	533	6.49527	2.52398	0.04099	0.04018		1989
3409	7500	6612	409	5.88888	1.10861	0.02898	0.02857		1990
1816	70000	71948	23200	9.06219	0.15407	0.16344	0.15138	30	1987
7087	70000	75724	18754	8.08425	0.41213	0.1287	0.12106		1988
15979	70000	77394	11496	8.89179	0.91814	0.078	0.0751		1989
8674	70000	79822	13846	8.2928	0.44181	0.09242	0.08839		1990
3380	4500	2993	8759	8.20767	0.40364	1.16896	0.77425	31	1987
2979	4500	5277	8732	7.90986	0.31762	0.89312	0.63822		1988
3038	6000	4502	8393	8.19063	0.32252	0.79918	0.58733		1989
2927	6000	5194	7488	8.18284	0.29143	0.66893	0.51218		1990
3988	7010	3	0	7.23129	0.9798	0	0	32	1987
7443	7010	2786	0	7.49887	1.97715	0	0		1988
6817	7010	5792	0	7.46164	1.79723	0	0		1989
8146	7010	10134	0	7.94272	1.9629	0	0		1990
6276	3780	18538	0	6.57925	5.0113	0	0	33	1987
5662	3780	20435	0	6.93245	4.4574	0	0		1988
4624	3780	22289	0	6.53524	2.81015	0	0		1989
6496	3780	22401	0	5.93225	4.37664	0	0		1990
2312	13000	-264	2600	8.40447	0.17535	0.20415	0.18577	34	1987
1941	13000	-254	2450	9.1238	0.18208	0.19222	0.17581		1988
-1346	15000	-1372	638	9.25913	-0.112	0.04682	0.04575		1989
1659	15000	964	398	8.91825	0.15193	0.02493	0.02463		1990
6984	4000	2904	56	7.47873	2.5948	0.00811	0.00808	35	1987
9085	4000	4354	0	7.84424	3.44089	0	0		1988
11753	4000	5881	0	8.43642	3.54503	0	0		1989
16870	4000	7696	547	9.28424	3.02193	0.04677	0.04571		1990
12459	2000	2879	1574	7.88908	4.84484	0.32261	0.2796	36	1987
10657	2000	7282	2502	8.20985	2.86125	0.26955	0.23867		1988
5163	4000	10247	2080	8.18284	0.92233	0.146	0.13627		1989
6329	4000	11037	1688	7.82804	0.87394	0.11226	0.10639		1990
5809	1500	3543	0	6.24998	2.48449	0	0	37	1987
6681	1500	5445	0	6.66185	3.16204	0	0		1988
7430	1500	7500	0	6.41673	3.39754	0	0		1989
9052	1500	10661	0	6.72143	4.19399	0	0		1990
4706	2614	12077	7666	7.15929	2.36736	0.52182	0.4199	38	1987
3430	2614	16357	9441	6.97261	2.54452	0.49765	0.4039		1988
4097	2614	17738	9453	6.89568	3.77993	0.46448	0.3815		1989
3838	2614	20140	8131	6.77765	3.95893	0.35734	0.30553		1990
1326083	540000	579522	11876	12.4694	2.63782	0.01061	0.01055	39	1987
1599154	650000	257488	8712	13.9214	7.77376	0.0096	0.00955		1988
1603496	650000	275957	28139	13.0865	1.79568	0.03039	0.02994		1989
72507	30000	64960	38813	9.51156	3.47865	0.40873	0.34269	40	1987
83246	50000	62462	34571	9.58802	2.98752	0.3074	0.26804		1988
125231	65000	67313	49750	9.32563	3.5693	0.376	0.31918		1989
379529	130000	194085	112659	9.95523	2.29881	0.34762	0.29834	41	1987
90617	130000	207352	113811	10.6489	0.57784	0.33737	0.2907		1988
137025	130000	212389	216405	10.7962	0.7944	0.63204	0.48983		1989
5114	1200	108	435	6.46459	8.05766	0.33257	0.28711	42	1987
8459	1200	1587	388	7.46508	9.86658	0.13922	0.13034		1988

6799	8000	428	7262	7.83874	2.98024	0.86165	0.62146		1989
49385	90000	2850	39273	11.0175	0.31129	0.42297	0.35275	43	1988
31803	90000	4146	31207	10.4944	0.1691	0.33147	0.28629		1989
23562	90000	-6569	34464	10.398	0.13045	0.41308	0.34577		1990
187149	60000	143862	167924	10.6268	6.86893	0.82371	0.60088	44	1988
199779	60000	196883	377989	10.6823	4.32538	1.47144	0.9048		1989
208661	60000	243544	479372	10.6355	3.5378	1.57925	0.9475		1990
19211	1800	8932	11076	6.49072	33.4272	1.03205	0.70905	45	1988
22098	1800	12297	7073	5.87493	27.3534	0.50174	0.40662		1989
27732	1800	16170	5044	6.15698	46.0398	0.28069	0.2474		1990
6647	5100	1773	4826	7.16704	0.59115	0.70217	0.5319	46	1988
8284	5100	3168	6057	8.56674	0.92787	0.73258	0.54961		1989
6582	5100	2421	6211	8.64927	0.73605	0.82582	0.60203		1990
15031	12000	14200	12338	8.06589	2.28061	0.47092	0.38589	47	1988
14245	12000	14302	21744	9.70424	1.93546	0.82671	0.60251		1989
11717	12000	15303	22873	8.73569	0.52521	0.83775	0.60854		1990
5194	750	6365	5000	7.18992	2.04364	0.70274	0.53224	48	1988
3672	750	7430	595	7.76047	1.51245	0.07274	0.07021		1989
2516	750	7679	998	7.39879	0.73005	0.1184	0.1119		1990
2016	1000	2961	5291	7.82644	0.34887	1.33577	0.84834	49	1988
2886	10000	2204	5291	7.50163	0.40192	0.43355	0.36015		1989
3882	10000	1772	9399	7.66996	0.51692	0.79842	0.58691		1990
-983	4900	0	5925	8.85138	-0.1548	1.20918	0.79262	50	1988
1352	7500	270	3521	7.94662	0.10695	0.45315	0.37374		1989
1743	7500	-344	3989	7.92732	0.13021	0.55743	0.44304		1990
3069	9900	52	0	6.90274	1.7122	0	0	51	1988
2285	9900	74	0	6.96224	1.83186	0	0		1989
1467	6600	93	0	6.89972	1.25965	0	0		1990
2170	1000	1540	10548	5.64545	3.97952	4.15276	1.63953	52	1988
2129	1000	1701	9253	6.28227	3.09011	3.42577	1.48744		1989
2701	1000	1872	11646	6.68461	2.88337	4.05501	1.62038		1990
1505	38690	50583	4393	9.92701	0.02145	0.04921	0.04804	53	1987
55374	38690	60921	45015	10.2545	0.73646	0.45191	0.37288		1988
23328	6000	3777	19390	9.15715	1.17849	1.98323	1.09301	54	1987
28705	6000	6993	55390	9.57199	1.42967	4.26306	1.66071		1988
14043	3000	16306	2063	8.31874	0.99075	0.10686	0.10153	55	1987
15593	10000	13794	6247	8.0542	1.19225	0.26255	0.23313		1988
6757	8000	7155	12828	7.87436	0.4982	0.84645	0.61327	56	1987
-4470	8000	14584	17062	7.6857	-0.3901	0.75549	0.56275		1988
12928	6800	5272	11388	8.62676	1.67944	0.94334	0.66441	57	1987
18871	6800	6108	13463	9.33662	2.24261	1.043	0.71442		1988
17143	5000	3552	5500	7.03703	12.4154	0.64312	0.4966	58	1987
19923	45000	220	19000	9.48418	13.0505	0.42017	0.35078		1988
5952	3000	13938	3000	7.05962	1.69019	0.17712	0.16307	59	1987
7457	3000	16093	3000	7.7003	2.23401	0.15713	0.14594		1988
2153	2000	3576	2282	7.46049	0.34441	0.40925	0.34306	60	1987
3742	4520	5751	1847	7.70481	0.59015	0.17983	0.16537		1988
234242	55560	164688	149347	11.1471	2.91413	0.67809	0.51765	61	1989
175786	55560	188945	139101	11.5459	1.71484	0.56891	0.45038		1990
-12206	250000	5929	286254	10.9658	-0.0382	1.11849	0.7507	62	1989
45253	250000	16024	251588	11.6632	0.14496	0.94573	0.66564		1990
47425	12000	74605	0	9.73572	7.14777	0	0	63	1989
97762	12000	103271	0	9.90793	5.26319	0	0		1990
35310	9800	-7745	0	8.78661	1.64807	0	0	64	1989
8362	9800	-1900	10972	8.05833	0.48604	1.38886	0.87082		1990
28163	33000	22800	36490	8.88682	0.88794	0.65394	0.50316	65	1989

23030	34000	22452	22692	8.46168	0.78511	0.40197	0.33788			1990
11069	30600	164	71920	7.68386	1.27374	2.3378	1.20531		66	1989
11433	38250	1869	69779	9.04794	2.44705	1.7393	1.0077			1990
12278	7800	5493	13428	8.56751	2.24315	1.01016	0.69821		67	1989
20796	7800	6263	5994	8.52853	2.82837	0.42622	0.35503			1990
9634	900	2500	965	8.52238	1.5468	0.28382	0.24984		68	1989
6996	900	4163	701	7.93308	0.7951	0.13846	0.12967			1990
11579	2343	7600	0	8.33591	2.32514	0	0		69	1989
8221	2343	7646	0	8.6052	1.39788	0	0			1990
26302	16000	4597	3591	8.12534	1.65306	0.17435	0.16071		70	1989
30923	16000	12984	3445	9.22444	2.28745	0.11886	0.11231			1990
9785	4000	6419	29942	9.26141	3.23301	2.87379	1.35423		71	1989
11408	4000	7023	22799	8.93971	1.21577	2.06831	1.12113			1990
5253	8000	382	0	6.80239	4.73516	0	0		72	1989
3218	8000	1883	0	6.43615	2.56131	0	0			1990
-7802	12000	15169	14556	7.79893	-2.9815	0.53576	0.42902		73	1989
12786	12000	15144	13730	6.85857	4.81549	0.50582	0.40934			1990

Clothing sector

firm no.	year	K	ACC.D.	DEPR.	K(-1)	ACC.D. t-1	INV.	V.ADD.	LAB.C.	VAR.PR.
1	1987	137643	89862	12023	147894	89185	1095	270538	42394	228144
	1988	181628	105425	16492	137643	89862	44914	221352	50535	170817
	1989	192682	123471	19342	181628	105425	12350	168198	59709	108489
	1990	194767	129555	18746	192682	123471	14747	219299	61452	157847
2	1987	103100	81979	9300	91735	69012	7698	176256	156304	19952
	1988	103554	84957	8128	103100	81979	5604	187199	172692	14507
	1989	118593	92694	10112	103554	84957	17414	167232	147767	19465
	1990	124236	96463	7992	118593	92694	9866	157003	161104	-4101
3	1987	33967	10731	3614	28219	8866	7497	67968	15434	52534
	1988	35202	12703	4451	33967	10731	3714	68369	19133	49236
	1989	40003	15356	3724	35202	12703	5872	70938	23181	47757
	1990	47130	18220	5310	40003	15356	9573	88295	26591	61704
4	1987	4325	2510	670	3882	1874	477	50931	4252	46679
	1988	4530	3100	677	4325	2510	292	41169	4715	36454
	1989	5351	3874	686	4530	3100	733	48700	5745	42955
	1990	6683	4729	27961	5351	3874	28438	61334	5738	55596
5	1987	17724	8869	4679	15696	7570	5408	34333	22742	11591
	1988	21571	10349	4037	17724	8869	6404	42650	25385	17265
	1989	22697	11451	4403	21571	10349	4427	45425	29454	15971
	1990	25976	12758	4472	22697	11451	6444	53243	30242	23001
6	1987	22794	13690	2793	20186	11357	3068	37607	25457	12150
	1988	25801	16012	3106	22794	13690	3791	43224	27739	15485
	1989	28375	18013	3257	25801	16012	3830	43120	29763	13357
	1990	30043	20491	3331	28375	18013	2521	45526	30931	14595
7	1987	9994	3797	1104	10754	3466	13	19546	12201	7345
	1988	10929	5049	1081	9994	3797	764	17919	11351	6568
	1989	12182	5887	1384	10929	5049	1799	19020	12403	6617
	1990	11914	6673	1436	12182	5887	382	21259	13378	7881
8	1987	11568	7009	1986	10809	5142	878	18135	6943	11192
	1988	12630	7645	1243	11568	7009	1669	21264	9277	11987
	1989	13137	8531	1136	12630	7645	757	29062	11951	17111
	1990	14535	8527	1599	13137	8531	3001	25388	15420	9968
9	1987	20348	9896	1028	18588	8920	1812	33921	34908	-987
	1988	20692	10842	1303	20348	9896	701	36924	36747	177
	1989	20621	10670	1347	20692	10842	1448	42583	37186	5397
	1990	22957	11712	1557	20621	10670	2851	47946	37462	10484
10	1987	36076	19802	5890	27446	14526	9244	25265	12099	13166
	1988	49156	26124	6677	36076	19802	13435	37176	15184	21992
	1989	56449	31716	6631	49156	26124	8332	48754	17928	30826
	1990	63029	37503	7961	56449	31716	8754	44418	19103	25315
11	1987	12599	6464	2656	12610	5841	2022	16533	11085	5448
	1988	12546	7165	2613	12599	6464	1859	18523	9090	9433
	1989	12795	7970	2740	12546	7165	2184	18841	9321	9520
	1990	13000	8132	2920	12795	7970	2963	29764	10813	18951
12	1987	13720	8675	1512	11252	7678	2983	32122	27515	4607
	1988	17768	9828	1471	13720	8675	4366	34759	29599	5160
	1989	18805	11170	1706	17768	9828	1401	38694	31908	6786
	1990	19671	12625	1008	18805	11170	419	41549	33621	7928
13	1987	8841	6095	978	8389	5163	498	21221	12228	8993
	1988	11789	7943	1043	8841	6095	2143	22018	13350	8668
	1989	12231	7727	1030	11789	7943	1688	22976	14663	8313
	1990	13546	8557	1400	12231	7727	1885	26135	16190	9945
14	1987	14447	6489	886	14655	6009	198	11669	1941	9728
	1988	14529	7088	894	14447	6489	377	10171	2245	7926
	1989	14646	7514	572	14529	7088	263	11460	3457	8003
	1990	15145	7836	430	14646	7514	607	8847	3723	5124
15	1987	8874	3933	1112	7846	2965	1172	25505	19252	6253

	1988	9709	4845	1164	8874	3933	1087	30037	21948	8089
	1989	12224	5619	905	9709	4845	2646	34472	25399	9073
	1990	20877	6465	1222	12224	5619	9029	37722	26329	11393
16	1987	26455	13453	2908	23292	10896	3514	20366	14428	5938
	1988	31838	16255	3234	26455	13453	5815	22157	15465	6692
	1989	34289	18666	2989	31838	16255	3029	26665	17856	8809
	1990	35695	19725	1992	34289	18666	2339	26046	19051	6995
17	1987	9830	4540	403	9376	4212	529	15236	4314	10922
	1988	14396	5670	1000	9830	4540	4436	16335	5093	11242
	1989	20014	6710	1106	14396	5670	5684	9964	5733	4231
	1990	21834	7727	1148	20014	6710	1951	13937	5925	8012
18	1987	14984	10869	1071	14284	10179	1081	28210	12173	16037
	1988	21815	11885	1214	14984	10869	7029	33816	14187	19629
	1989	26686	13049	1337	21815	11885	5044	41486	16889	24597
	1990	29847	14566	1757	26686	13049	3401	45573	18985	26588
19	1987	14677	10094	2558	12449	7569	2261	10074	4533	5541
	1988	16064	11916	2145	14677	10094	1710	9729	4341	5388
	1989	15968	12576	978	16064	11916	222	5470	4187	1283
	1990	17451	13642	1226	15968	12576	1643	7077	3618	3459
20	1987	14319	7472	2309	12995	6668	2829	21843	16999	4844
	1988	15192	8364	2569	14319	7472	2550	21487	16323	5164
	1989	15036	8949	3273	15192	8364	2532	20844	15402	5442
	1990	14528	8680	2121	15036	8949	1882	17928	13767	4161
21	1987	12650	8772	1464	12389	7415	368	13497	6736	6761
	1988	5546	1062	1205	12650	8772	1811	15247	7655	7592
	1989	6659	2031	1145	5546	1062	1289	22029	9067	12962
	1990	10826	3533	1785	6659	2031	4450	24060	10988	13072
22	1987	21489	11789	1186	21509	11267	644	19714	16515	3199
	1988	21564	13020	1423	21489	11789	267	24394	18661	5733
	1989	25857	14145	1214	21564	13020	4382	23189	20611	2578
	1990	26514	15149	1148	25857	14145	801	23843	21220	2623
23	1987	9667	7849	1002	9445	6954	329	15425	13176	2249
	1988	11739	8377	697	9667	7849	2241	15417	14442	975
	1989	14371	8981	942	11739	8377	2970	16824	15448	1376
	1990	15793	9836	1131	14371	8981	1698	18459	16762	1697
24	1987	7173	4859	593	6943	4344	308	17537	15101	2436
	1988	8264	5448	643	7173	4859	1145	18280	15579	2701
	1989	8352	5994	719	8264	5448	261	22423	18754	3669
	1990	8555	6453	621	8352	5994	365	24183	20516	3667
25	1987	1975	1173	306	1652	993	449	6398	2472	3926
	1988	2637	1617	487	1975	1173	705	7818	3059	4759
	1989	3279	1995	856	2637	1617	1120	10362	3981	6381
	1990	4333	2229	1227	3279	1995	2047	11790	4585	7205
26	1987	15290	6048	1296	15317	5102	323	13552	9865	3687
	1988	16166	7006	1253	15290	6048	1171	14925	10888	4037
	1989	16932	8040	1294	16166	7006	1026	16940	13204	3736
	1990	17179	8956	1260	16932	8040	591	16460	13039	3421
27	1987	8754	4668	1862	7847	3357	1458	25254	9685	15569
	1988	10509	5277	891	8754	4668	2037	19108	13778	5330
	1989	13762	6303	1427	10509	5277	3654	18593	14860	3733
	1990	16771	6705	936	13762	6303	3543	18283	14896	3387
28	1987	17144	11934	1535	15895	10479	1329	28247	20201	8046
	1988	18394	13206	1388	17144	11934	1366	25358	20451	4907
	1989	19338	13419	1126	18394	13206	1857	25376	21150	4226
	1990	20085	14084	1126	19338	13419	1208	26133	21150	4983
29	1987	5405	1466	306	5221	1191	215	6457	3037	3420

	1988	5697	1746	361	5405	1466	373	8228	3563	4665
	1989	5871	2056	379	5697	1746	243	8719	4012	4707
	1990	7785	2374	440	5871	2056	2036	8714	4387	4327
30	1987	23470	17178	1842	21385	15623	2372	60047	19003	41044
	1988	24930	17590	2203	23470	17178	3251	68463	14994	53469
	1989	24323	18119	2958	24930	17590	1822	46955	15375	31580
31	1987	27891	14421	2801	24233	12169	4207	29817	8345	21472
	1988	32075	15574	2446	27891	14421	5477	20890	10143	10747
	1989	32214	15565	2769	32075	15574	2917	25741	11404	14337
32	1987	8694	5348	3944	7738	3846	3398	22999	5294	17705
	1988	9692	6839	3775	8694	5348	3282	30616	6458	24158
	1989	11700	7746	3589	9692	6839	4690	37039	7858	29181
33	1987	7084	4986	1102	6367	4233	1066	17460	3861	13599
	1988	7567	5637	1078	7084	4986	910	20846	6762	14084
	1989	7907	6129	1025	7567	5637	873	22543	6087	16456
34	1987	4632	1817	677	4306	1304	490	6250	4273	1977
	1988	5246	2070	327	4632	1817	688	5599	4235	1364
	1989	5281	2155	335	5246	2070	285	6519	4695	1824
35	1988	21174	2224	1323	7910	1172	13535	25434	14912	10522
	1989	30044	5284	3331	21174	2224	9141	29664	16210	13454
	1990	35462	8653	5238	30044	5284	7287	2877	18063	-15186
36	1988	10308	4500	1759	6798	3014	3783	15304	6054	9250
	1989	11387	5913	1794	10308	4500	1460	15925	7219	8706
	1990	12200	6972	1681	11387	5913	1435	18584	7941	10643
37	1988	6702	2119	680	6751	1739	251	7760	1716	6044
	1989	7045	2430	521	6702	2119	553	7063	1377	5686
	1990	10178	2723	613	7045	2430	3453	7982	1408	6574
38	1988	8382	2891	3635	3909	2338	7555	16147	7955	8192
	1989	9975	3735	3948	8382	2891	4697	21831	11272	10559
	1990	12924	4736	4405	9975	3735	6353	24061	13277	10784
39	1988	2048	1287	496	1776	1044	525	12632	3521	9111
	1989	2129	1447	435	2048	1287	356	11718	2344	9374
	1990	3235	1610	400	2129	1447	1343	16624	2048	14576
40	1988	7814	3590	518	5578	3190	2354	18250	15113	3137
	1989	9532	4259	855	7814	3590	1904	20942	17310	3632
	1990	10420	5302	1225	9532	4259	1070	21701	17643	4058
41	1988	25041	19003	1210	23943	18345	1650	26430	23932	2498
	1989	25746	19392	1278	25041	19003	1594	25324	24605	719
	1990	26567	20313	1555	25746	19392	1455	25239	24586	653
42	1987	13706	7341	2417	12020	5336	2098	19119	9252	9867
	1988	15206	8899	1782	13706	7341	1724	17502	10572	6930
43	1987	8465	5093	627	7013	4716	1702	17158	5418	11740
	1988	10109	5690	820	8465	5093	1867	20068	6010	14058
44	1987	317	126	243	265	80	249	4034	6389	-2355
	1988	371	162	393	317	126	411	8658	4751	3907
45	1987	3271	1384	838	2222	959	1462	4207	2872	1335
	1988	3582	2166	1045	3271	1384	574	3988	3763	225
46	1987	3870	1859	441	2990	1614	1076	5697	7000	-1303
	1988	5273	1990	1200	3870	1859	2472	11196	6775	4421
47	1989	10731	3594	4075	8507	2835	5540	83356	56454	26902
	1990	15745	5883	6111	10731	3594	8836	83196	63063	20133
48	1989	27186	16440	2269	24543	14207	2679	50477	39364	11113
	1990	31054	19205	2915	27186	16440	4018	46818	31890	14928
49	1989	31341	16812	2595	31278	15126	972	26345	19672	6673
	1990	33277	17831	3791	31341	16812	4708	24814	17270	7544
50	1989	20033	6013	2462	12226	3885	8141	12462	7577	4885

	1990	24324	8972	3327	20033	6013	4659	15275	8352	6923
51	1989	20956	13209	2322	19075	11213	2207	21409	11472	9937
	1990	23627	15583	2566	20956	13209	2863	24043	12653	11390
52	1989	11849	5980	973	10814	5435	1463	20722	15451	5271
	1990	12586	6762	1390	11849	5980	1345	9951	16031	-6080
53	1989	54154	21507	2968	42422	18543	11736	29915	21501	8414
	1990	66954	24649	3154	54154	21507	12812	29064	23898	5166

EQ.	RES.	L.T.F.D.	loginv	prorat	mu	lnmu	firm no.	year
74500	73702	10043	6.99851	3.661457	0.067766	0.065568	1	1987
74500	59188	7986	10.7125	3.402622	0.059736	0.05802		1988
74500	61394	5852	9.421411	1.341087	0.043063	0.042162		1989
74500	66216	4480	9.598795	2.161971	0.031837	0.031341		1990
28000	67283	7315	8.948716	0.827314	0.076771	0.073967	2	1987
28000	82112	8552	8.631236	0.653734	0.077666	0.074798		1988
28000	91652	9539	9.76503	0.98595	0.079723	0.076704		1989
28000	109118	21937	9.19685	-0.15011	0.159986	0.148408		1990
65000	43176	6163	8.922258	2.557654	0.056972	0.055408	3	1987
65000	59965	5094	8.219865	2.016783	0.040763	0.039954		1988
71500	69114	11761	8.677951	1.99948	0.08364	0.080326		1989
71500	69805	17702	9.166702	2.37322	0.125275	0.118028		1990
200	21220	0	6.167516	21.90319	0	0	4	1987
200	5477	0	5.676754	19.11641	0	0		1988
200	8323	0	6.597146	28.29573	0	0		1989
36035	144828	0	10.25548	35.68221	0	0		1990
6250	14952	6000	8.595635	1.343983	0.282992	0.249195	5	1987
6250	15586	6000	8.764678	1.855734	0.274776	0.24277		1988
6250	16181	6000	8.395477	1.340618	0.267487	0.237036		1989
6250	17064	6000	8.770905	1.938819	0.257356	0.229011		1990
6920	15890	10771	8.028781	1.296625	0.472205	0.386761	6	1987
13840	11209	10128	8.240385	1.618888	0.404328	0.339559		1988
13840	12482	7064	8.25062	1.285327	0.268369	0.237732		1989
13840	13999	7006	7.832411	1.335209	0.251661	0.224472		1990
10265	1924	10749	2.564949	0.949583	0.881861	0.632261	7	1987
10265	1984	7146	6.638568	1.008764	0.583395	0.459571		1988
10265	2137	11029	7.494986	1.060052	0.889292	0.636202		1989
10265	2293	9767	5.945421	1.186791	0.777751	0.575349		1990
1000	10147	11524	6.777647	1.860819	1.033821	0.709916	8	1987
1000	13028	9927	7.41998	2.502527	0.707656	0.535122		1988
5000	11786	10299	6.629363	3.233355	0.613547	0.478435		1989
5000	15714	7711	8.006701	2.051506	0.37226	0.316459		1990
15000	496	2718	7.502186	-0.09619	0.1754	0.161609	9	1987
15000	-2133	2441	6.552508	0.016118	0.18971	0.17371		1988
15000	0	1704	7.277939	0.51613	0.1136	0.107598		1989
15000	-769	895	7.955425	0.998732	0.062891	0.060992		1990
3600	2014	20204	9.13173	0.960154	3.59886	1.525808	10	1987
3600	4317	29336	9.505619	1.286199	3.705444	1.54872		1988
8600	10706	25375	9.027859	1.260749	1.314358	0.839132		1989
8600	21867	27359	9.077266	0.970264	0.897988	0.640794		1990
7016	9365	6690	7.611842	0.758337	0.4084	0.342454	11	1987
7016	-527	9500	7.527794	1.463434	1.464016	0.901793		1988
7016	468	9500	7.688913	1.666545	1.269375	0.819504		1989
7016	2404	19500	7.993958	3.723261	2.070064	1.121698		1990
5000	4746	5260	8.000685	1.214544	0.539709	0.431593	12	1987
5000	5483	5117	8.381603	0.973478	0.488124	0.397516		1988
5000	6340	5827	7.244942	0.805075	0.513845	0.414653		1989
5000	7743	5027	6.037871	0.984336	0.394491	0.33253		1990
5000	5195	6333	6.2106	2.626575	0.621187	0.483159	13	1987
4990	7125	5825	7.669962	3.004389	0.480809	0.392589		1988
4990	9584	7183	7.4313	2.036065	0.492864	0.400696		1989
4990	15012	5385	7.541683	2.093125	0.269223	0.238405		1990

1000	4286	31968	5.288267	1.060127	6.047673	1.952698	14	1987
1000	6601	26103	5.932245	0.947955	3.434153	1.489337		1988
1000	8640	20717	5.572154	1.013129	2.149066	1.147106		1989
1000	8792	16536	6.408529	0.681062	1.688725	0.989067		1990
2650	3338	600	7.066467	1.207061	0.1002	0.095492	15	1987
2650	4199	200	6.991177	1.558181	0.029201	0.028783		1988
8000	2180	0	7.880804	1.757116	0	0		1989
8000	2939	5000	9.108197	1.635136	0.45708	0.376435		1990
24000	7565	677	8.16451	0.451345	0.021448	0.021221	16	1987
24000	8600	3384	8.668196	0.489873	0.103804	0.098762		1988
24000	10342	4484	8.015988	0.532499	0.130569	0.122721		1989
24000	11579	3912	7.757479	0.424436	0.109953	0.104317		1990
8200	1788	11000	6.270988	1.992808	1.101322	0.742566	17	1987
14000	622	12000	8.397508	2.022673	0.820681	0.599211		1988
14000	4742	14000	8.64541	0.456742	0.746985	0.557892		1989
14000	7841	14000	7.576097	0.570883	0.640996	0.495304		1990
1500	32468	3400	6.985642	3.680947	0.100094	0.095396	18	1987
1500	41450	2664	8.8578	4.540108	0.062026	0.060178		1988
1500	51381	1866	8.525955	2.33333	0.035287	0.034678		1989
1500	64351	541	8.131825	1.848228	0.008216	0.008182		1990
3500	4396	1800	7.723562	1.069838	0.227964	0.205357	19	1987
3500	5452	6250	7.444249	1.118962	0.698168	0.52955		1988
3500	7211	6750	5.402677	0.291361	0.630193	0.488699		1989
3500	7981	5965	7.404279	0.966682	0.519554	0.418417		1990
2000	3723	4665	7.947679	0.721366	0.815132	0.596158	20	1987
2000	4224	3771	7.843849	0.717833	0.60588	0.473672		1988
6000	4489	3297	7.836765	0.750772	0.314329	0.273326		1989
6000	5899	2667	7.54009	0.648012	0.224136	0.202236		1990
2692	9794	1388	5.908083	1.280722	0.111165	0.105409	21	1987
5000	0	1198	7.501634	1.863315	0.2396	0.214789		1988
5000	2051	975	7.161622	2.723012	0.138278	0.129517		1989
5000	6781	710	8.400659	2.677549	0.060267	0.05852		1990
16750	6517	401	6.467699	0.294292	0.017235	0.017088	22	1987
16750	6956	286	5.587249	0.562533	0.012064	0.011992		1988
16750	7202	1462	8.385261	0.284227	0.061039	0.059248		1989
16750	8123	2374	6.685861	0.212303	0.095445	0.091161		1990
3000	2204	2194	5.796058	0.850678	0.421599	0.351782	23	1987
4500	1054	3000	7.714677	0.510445	0.540151	0.431881		1988
5500	1402	4500	7.996317	0.385535	0.651985	0.501978		1989
8000	1522	5100	7.437206	0.298457	0.535602	0.428922		1990
1500	1150	1220	5.7301	0.883122	0.460377	0.378695	24	1987
1500	1352	802	7.04316	1.110962	0.281206	0.247802		1988
2500	677	2000	5.56452	1.227321	0.629525	0.488288		1989
2500	1257	1775	5.899897	1.474198	0.472451	0.386929		1990
1200	683	0	6.107023	5.613251	0	0	25	1987
2000	376	0	6.558198	5.647798	0	0		1988
2000	1185	0	7.021084	5.892936	0	0		1989
2500	10315	720	7.624131	5.319339	0.056184	0.054663		1990
6000	-802	0	5.777652	0.340083	0	0	26	1987
6000	-658	0	7.065613	0.415748	0	0		1988
6000	585	340	6.933423	0.384198	0.051632	0.050344		1989
6000	1789	3739	6.381816	0.364706	0.480036	0.392066		1990
6733	4671	8191	7.284821	3.266311	0.718257	0.54131	27	1987
6733	10742	7778	7.619233	1.236567	0.445093	0.368174		1988
6733	10134	38090	8.203578	0.685393	2.258256	1.181192		1989
6733	10145	36159	8.172729	0.429644	2.142375	1.144979		1990

9832	12150	6526	7.192182	1.427088	0.296879	0.259961	28	1987
9875	13181	5325	7.219642	0.891154	0.230959	0.207794		1988
9872	14270	7790	7.526718	0.767501	0.322674	0.279656		1989
9875	14547	6145	7.096721	0.801273	0.251617	0.224437		1990
3000	450	6116	5.370638	0.799596	1.772754	1.019841	29	1987
3000	610	7360	5.921578	1.127206	2.038781	1.111457		1988
5000	885	7729	5.493061	1.122226	1.313339	0.838692		1989
5000	1062	4866	7.618742	1.07518	0.802705	0.589289		1990
16300	32617	205	7.771489	6.711599	0.004191	0.004182	30	1987
16300	60336	182	8.086718	8.088186	0.002375	0.002372		1988
16300	74210	59072	7.50769	4.052838	0.652657	0.502384		1989
6000	23628	10009	8.344505	1.676991	0.337822	0.291043	31	1987
6000	30540	9930	8.608313	0.759377	0.271757	0.240399		1988
6000	30727	10135	7.978311	0.818448	0.275955	0.243695		1989
5000	13258	3000	8.130942	4.286202	0.164312	0.15213	32	1987
5000	19798	0	8.096208	6.871837	0	0		1988
5000	27663	30000	8.453188	9.634775	0.91847	0.651528		1989
2000	13821	134	6.971669	6.004296	0.00847	0.008434	33	1987
2000	19678	0	6.813445	6.389374	0	0		1988
2000	24775	20000	6.771936	8.031749	0.746965	0.55788		1989
2000	337	441	6.194405	0.620505	0.188703	0.172863	34	1987
2000	590	952	6.533789	0.461184	0.367568	0.313034		1988
4000	595	1233	5.652489	0.540988	0.268335	0.237705		1989
10000	1050	21089	9.513034	1.486295	1.908507	1.06764	35	1988
10000	2193	22661	9.120525	0.668783	1.858525	1.050306		1989
10000	3078	23869	8.893847	-0.58141	1.825126	1.038553		1990
2400	5342	5780	8.238273	2.326636	0.746577	0.557658	36	1988
2400	7493	5890	7.286192	1.412002	0.59537	0.467106		1989
2400	8096	8646	7.26892	1.843096	0.823742	0.600891		1990
7800	4890	7800	5.525453	1.14776	0.614657	0.479123	37	1988
7800	6538	7800	6.315358	1.168692	0.544009	0.434382		1989
7800	8050	7800	8.146999	1.350351	0.492114	0.400194		1990
4980	797	5650	8.929965	4.963083	0.978016	0.682094	38	1988
4980	1694	13028	8.454679	1.811401	1.952053	1.082501		1989
4980	3379	13113	8.756682	1.638264	1.568728	0.943411		1990
5000	658	0	6.263398	11.84657	0	0	39	1988
5000	855	0	5.874931	11.60335	0	0		1989
5000	3573	0	7.202661	20.26015	0	0		1990
1800	1101	2785	7.763871	1.250311	0.960014	0.672952	40	1988
1800	1331	3646	7.551712	0.809963	1.164484	0.772182		1989
1800	1677	4266	6.975414	0.72953	1.22692	0.800619		1990
3200	5452	6250	7.408531	0.424715	0.722376	0.543705	41	1988
3200	5621	1303	7.374002	0.112171	0.147716	0.137774		1989
3200	5663	963	7.282761	0.097421	0.108654	0.103147		1990
5000	4852	2649	7.64874	1.390907	0.268879	0.238134	42	1987
5000	7601	2432	7.452402	1.036269	0.193001	0.176472		1988
10500	13080	2000	7.439559	4.815669	0.084818	0.081412	43	1987
10500	18782	0	7.532088	3.968019	0	0		1988
3000	1815	1500	5.517453	-11.9941	0.311526	0.271192	44	1987
3000	1857	0	6.018593	19.46919	0	0		1988
6500	426	13850	7.287561	0.995927	1.999711	1.098516	45	1987
6500	501	14059	6.352629	0.113488	2.008142	1.101323		1988
8000	123	675	6.981006	-0.89223	0.083097	0.079825	46	1987
8000	2196	3400	7.812783	2.092407	0.333464	0.28778		1988
28000	41456	2896	8.61975	4.467777	0.041695	0.04085	47	1989
28000	46601	2670	9.08659	2.674124	0.03579	0.035165		1990

4950	48112	0	7.893199	1.012796	0	0	48	1989
4950	60103	0	8.29854	1.316872	0	0		1990
7688	2428	14984	6.879356	0.389169	1.481218	0.90875	49	1989
9610	1396	20395	8.457018	0.492215	1.85308	1.048399		1990
2500	4147	3155	9.004668	0.551683	0.47465	0.388421	50	1989
2500	4760	13658	8.446556	0.468096	1.881267	1.05823		1990
4500	3006	4500	7.699389	1.190599	0.59952	0.469704	51	1989
4500	6081	4500	7.959625	1.393731	0.425291	0.354376		1990
4500	968	2408	7.288244	0.92307	0.44038	0.364907	52	1989
4500	1246	2129	7.204149	-0.98204	0.370519	0.315189		1990
4800	6960	20465	9.370416	0.331917	1.740221	1.008039	53	1989
4800	7889	33729	9.458138	0.150003	2.658129	1.296952		1990

CHAPTER 6

CONTROLLING GROUPS, MARKET POWER, AND THE COST OF CAPITAL IN A NON-SECURITIZED FINANCIAL SYSTEM: AN ALTERNATIVE INTERPRETATION OF THE FIRMS' INVESTMENT DECISION

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CONTROLLING GROUPS, MARKET POWER, AND THE COST OF CAPITAL IN A NON-SECURITIZED FINANCIAL SYSTEM: AN ALTERNATIVE INTERPRETATION OF THE FIRMS' INVESTMENT DECISION

1. Introduction

The contents of this chapter might be regarded as a digression starting from the theoretical analysis of the investment decision of the firm of the previous chapter. The present analysis is, moreover, largely based on the same type of literature and very much concerned with the same problems analyzed in the previous chapter. For this reason, the present introductory section does not contain the usual brief survey on the relevant literature. The purpose of this chapter is to assess and analyze the implications - for the investment decision of the firm - of a few results of the industrial economics and finance literature. In addition, some emphasis will be placed on a few financial "anomalies" and institutional features that might characterize the "non-securitized" financial systems. For several reasons, many parts of the analysis will be *deliberately* conducted in a qualitative way. First of all, it might useful to attempt to describe, in more than usual detail, the multiplicity of causal links that characterize the interaction between finance and firm's investment decision. This attempt might not be easily done by the usual description of "stylized facts" through simplifying functional links, because such an approach might cause some loss of information, even if it has the big merit and advantage of yielding algebraically tractable models focusing on a few important mechanisms. These few important mechanisms might indeed not exhaust all of the possible causal links existing between some structural features (such as market power), the cost of capital, and a few financial decisions. Obviously, it will not be possible here to perform a complete and exhaustive analysis, but a few important theoretical contributions of industrial economics and finance - suggesting the simultaneity of the financial and investment decision - need, nevertheless, to be explicitly taken into account, and (since they often result in causal links of opposite sign) not all of them at the same time, and by means of a qualitative analysis. Finally, as in the previous chapter, another goal of the present analysis is to provide a framework where the simultaneity of financial and investment decisions is explicitly taken into account.

Section 2 introduces the main assumptions of the present analysis. Section 3 discusses a few possible causal links between the real decisions of the firm and the cost of capital. Section 4 formalizes the more general decision problem of the firm, which includes a set of "financial decisions" - discussed in section 5 - and a set of "real decisions", discussed in section 6. Section 7 contains a few conclusive comments.

2. The main assumptions of the analysis.

In the standard models of finance it is assumed that the market for shares is associated with a market for firms' control, acting as a mechanism of incentives and control on managers' behaviour: a management acting inefficiently would cause (in an efficient market) the firm's share price to fall, increasing the probability of a hostile take-over, and putting at risk the job of the management itself. This theoretical assumption requires a situation of highly dispersed shares ownership, such as the one of the British and American "securitized" financial systems. The fact that the "managerial revolution" approach took place in the Anglo-Saxon institutional contexts, where the theoretical implications of the separation between ownership and control is an important issue, could be pertinent here. While in the U.K. and in the U.S. hostile takeovers constitute a very frequent phenomenon, they are relatively rare in Germany (not more than four or five per year, as De Felice et al. [1988] and Mayer [1992] points out) and almost completely absent in Italy and in most of the "non-securitized" financial sectors[14]. In non-securitized financial systems, a very little dispersion of firms' ownership is associated with the persistence of the old traditional family clan, who typically leads its financial holdings and some of the most important firms of the group effectively and efficiently (at least from their point of view!). Another feature of these institutional contexts is the fact that stock markets are rarely a source of financial funds, compared to intermediated credit. In particular, the transactions in the stock market mainly concern the larger financial groups[15].

In this section (and the following subsections), it is assumed that the management act in the interest of the controlling group of shareholders, while the individual shareholder herself is regarded as an external supplier of funds. Further, it will be assumed that the market for shares is not associated with a market for control, while "informal" financial markets exist for the firms whose shares

14 For a discussion on the main characteristics of "securitized" and "non-securitized" financial systems see, for example, Gardener [1991] and Gardener and Molyneux [1990].
15 In 1987, the 29 larger financial holdings had issued 94% of shares traded in the Italian stock market, according to the data provided by Brioschi, Buzzacchi and Colombo [1990].

are not traded in the stock market. All these assumptions are meant to describe a "non-securitized" financial sector, where, in addition, the management is directed by the group in control. In Italy, for example, such a situation applies not only to small or average sized firms, but also to most of the giant firms, issuing shares in the stock market.

The main assumptions of the present analysis are the following:

i) The goods market is assumed to be imperfectly competitive, although perfect competition can be a limit case of the framework of analysis employed in this paper;

ii) The management is composed of members of the controlling group of the firm and acts in the interest of the controlling group of the firm;

iii) The stock market is not associated with a market for firm's control; in other words, takeovers, mergers and any transaction having as an object the firm's control are performed by means of private negotiations among the managements of the different firms;

iv) On the basis of assumptions ii) and iii), the controlling group of shareholders finance the physical capital with their own wealth (i.e. by subscribing shares), or by retaining profits, or by raising external funds, which can be debts or shares allocated to non-controlling shareholders. In other words, the following balance sheet constraint must always hold:

$$k = E + R + B \qquad (1$$

where k = value of the physical capital (net of the accumulated depreciation); E = Psub N, i.e. equities defined at their "subscription" price; R = reserves; B = financial debt. The expression "E + R + B" is then the financial capital of the firm. Following the finance literature, its cost is the discount factor for the future streams of income.

v) The decisions of the firm are assumed to be taken in continuous time, but are made known to outsiders only at discrete intervals (i.e. when the accounting data are available to outsiders).

For what concerns point i), we define the profit function in the same way as in the previous chapter:

$u°(k,w \mid \mu i)$ (2

where k is the physical capital, w, the cost of variable inputs, μi is the profit margin, determined by the demand elasticity, the degree of product differentiation, and all the other aspects affecting the market power of the firm.

For assumption ii) it might be worth mentioning a recent empirical study by Blanchard et al. [1993], on the behaviour of managers with cash windfalls, that shows evidence that contrasts with the assumption of perfect capital markets models, while it "*... needs to be stretched considerably to fit the asymmetric information model in which managers act in the interest of shareholders, (...) and supports the agency model of managerial behaviour*". However, In those institutional contexts without the structural and institutional phenomenon of dispersion of firms' ownership, the persistence of controlling groups and the lack of a market for firms' control might take the appearance of a self-sustaining mechanism, if one assumes that the insiders are better informed on the quality of the firm's investments than the outsider potential buyers of the shares. In fact, the assumption of highly dispersed share ownership, may raise the "radical economics" objection as to *why should the original controlling groups have decided to give up their control and switch to a configuration of highly dispersed ownership*[16]. The relatively higher share ownership dispersion (and higher frequency of hostile take-overs) which characterizes the "securitized" financial systems (i.e. mainly the U.S. and the U.K.) can certainly find a reasonable economic justification. However, the above-mentioned "radical" objection could be accepted at least in "weak terms", assuming, in other words, that the economic conditions that would induce the original controlling groups to gradually disperse their controlling shares might not have occurred for all institutional contexts.

Buying a non-majority share is equivalent to performing a financial portfolio investment, since the shareholders who do not belong to the controlling group cannot interfere neither on the strategic choices of the firm, nor on the decision concerning the distribution of dividends, and their motivation lies entirely in the remuneration (dividends plus capital gains) of their shares. The stock market in this framework only provides a constraint on the behaviour of the managers (operating through a mechanism of incentives), compelling them to distribute dividends in order to remunerate the shareholders at the market rate of return[17].

16 For a discussion, see Cowling [1982], ch.4

17 The individual's decision on whether to invest in financial assets or physical assets is intrinsically characterized by a situation of information asymmetry. If we interpret the investment decisions of agents in terms of traditional portfolio allocation theory, the distinction between insiders and outsiders introduces a sort of discontinuity in the portfolio analysis. The traditional assumption that managers act on behalf of the generical shareholder removes this discontinuity in the portfolio decision because it allows us to regard the single share as a portion of ownership of the firm. But this may imply a loss of relevant information, to the extent that the level of wealth needed to buy the control of a firm

Assumption ii) and iii) do not imply that the financial control of a firm cannot be the object of a transaction: they only say that the existence of a stock market does not necessarily imply the existence of a market for financial control, since "outsiders" may regard their investments in shares as a financial portfolio. The transactions involving financial control could be modelled as single episodes of bargaining, or described as modifications of coalitions among a (small) number of "insiders", but they will be considered exogenous for the purposes of this analysis.

On the basis of assumptions ii) and iii), the asset denominated "control of the firm" can be defined as:

$$V(0) = \int_0^\infty \exp\left[-\int_0^\tau \Phi(s)ds\right] \{u^\circ(k,w\,|\mu_i) - A[I(t)]\}\, d\tau \qquad (3$$

where, like in the model of chapter 5, $\Phi(s)$ is the (instantaneous) cost of firm's financial funds, $A[I(t)]$ is the *"purely technological" adjustment cost function of investment*. This function is twice continuously differentiable, with $A(0)=0$; $A'>0$; $A''>0$. Equation 3 simply expresses the fact that, by definition, the controlling group has the right to choose how to allocate the flow of variable profits.

The value of the asset denominated "control of the firm X" might not be the same for the controlling group of firm X and the controlling group of another firm, say Y. In fact, since the variable profits $u^\circ(k,w|\mu_X)$ of firm X are conditional on the

is high compared to the wealth that an individual might be willing to invest in a diversified portfolio of financial assets. In other words, in the absence of a market for control associated to the stock market, the decision of investing in physical capital is equivalent to a decision of entry.

conjectures c_X and the market share sh_X of firm X, it might well be that, because of the strategic market interactions, if the management of firm Y bought the control of firm X, the increase in the present value of the variable profits of firm Y could be bigger than V(0) such as defined in equation 3.

In other words, due to market strategic interactions, the value attributed to the asset denominated "control of firm X" by the management of firm X might not necessarily coincide with the value attributed to the same asset by the management of firm Y . In this sense, a non-hostile takeover might take place when the management of firm Y offers to the controlling group of firm X a price for the control of firm X larger that the present value of the future variable profits. In this sense, an element of indeterminacy is introduced for what concerns the value of the firm's financial capital. If this is true, it might not be appropriate to equate the value of the physical capital of the firm to the value of its financial assets, even if one assumes (following the efficient financial markets hypothesis) that the price of the shares of a firm is determined by the present value of the firm's future profits[18]. This last point takes into account the fact that serious objections on the equality between stock prices and present value of future dividends have been raised by the empirical studies on excess

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18 At this point, an obvious objection is that a situation of different value attributed to the firm's control by the managements of two different firms would be unstable and temporary, since it would cause mergers and takeovers and disappear. However, the managers of a firm might have incentives not to reveal the impact of a merger on its conjectures. Furthermore, some of the advantages of a merger could be obtained by a collusive strategy, which would raise a prisoner's dilemma.

volatility, started by Shiller [1981], [1984] and Summers [1986][19]. However, the result of the model illustrated later could hold even if it is assumed that share prices are equal to the net present value of future dividends.

Assuming that there is no market for control, the problem for the managers is just to raise, in the cheapest way, the financial funds necessary to cover the optimal physical capital, according to the constraint 1. The price in the shares of their company is only relevant to the managers to the extent that it allows the possibility of raising financial funds in the future by issuing new shares. The yield on shares is defined as follows:

$$r^*s(t) = \frac{D(t)}{ps(t)N(t)} + \frac{\dot{p}s(t)}{ps(t)} \qquad (4$$

If the managers are only concerned with remunerating the shareholders at the expected ex ante rate of return on shares r^*s, the higher the rate of growth of the share price, the lower the dividends that the managers need to pay in order to keep the remuneration of the shares of their company at the market level. If we identify the managers with the controlling group, we can regard the decision of profits retention as a redistribution of income internal to the firm, that makes unavailable for the shareholders not belonging to the controlling group a portion of the income produced by the firm. Such a portion of income could increase the value of the firm (and as a consequence the value of the firm control) or could be reallocated in the future, on the basis of a decision taken by the controlling group. In this sense the dividend

19 For an exhaustive analysis of some of the main contributions on this regard see Shiller [1989].

distribution can be thought of as the cost that the management has to support in order to raise external finance on the stock market.

For given values of r^*_s, $p_s(t)$, $p_s(t)$, $N(t)$, equation 4 yields the dividend policy that the managers must follow in order to remunerate shareholders at the financial market yield. If we assume a stable "efficient market" relationship (on the basis of the information available for investors) between r^*_s and the risk-free interest rate r_f, r^*_s also represents an opportunity cost for the controlling group's wealth invested in the asset defined as "control of the firm".

Therefore, the dividends will be:

$$D(t)= r^*_s(t)p_s(t)N(t)-\dot{p}_s(t)N(t) \qquad (5$$

The managers are constrained to choose their dividend policy in order to remunerate the shareholders at the market yield on shares[20]. Once such a "market" constraint is satisfied, the managers retain the remaining profits on behalf of the controlling group. In this case, if the cash flow is not sufficient to pay the required level of dividends, the firm could pay the shareholders by reducing the accumulated profits (reserves), or the shares. However, on the basis of the balance sheet constraint of equation 1, such a reduction of the reserves has to be financed by issuing new debt, or new shares, or by reducing the level of physical capital. The

20 We can imagine that, if the elements affecting the time path of $p_s(t)$ act, for a sufficient length of time, in such a way that the capital gain element prevails to the extent that

$$D(t)= r^*_s(t)p_s(t)N(t)-\dot{p}_s(t)N(t) < 0$$

then, this situation of "negative dividends" would correspond to a situation where the firm finds it convenient to issue new shares on the stock market.

reduction in the level of physical capital may bring about the liquidation of the firm. The liquidation of the firm may happen not only in cases of bankruptcy, but also when the controlling group finds the opportunity cost of keeping its wealth endowment invested in physical capital higher than the net present value of the right to dispose of the future flows of variable income of the firm.

We define now the cost of the firm's own capital as the negative cash flow that the firm has to pay in order to provide itself with this source of capital. Therefore:

$$c(t) = r^{*}_{s}(t)p_{s}(t)N(t)-\dot{p}_{s}(t)N(t) \qquad (6$$

where c(t) stands for cost of own capital.

In unit terms we will have:

$$i(t) = \frac{c(t)}{E(t) + R(t)} \qquad (7$$

where E(t) and R(t), are respectively the *subscription* value of the shares and the reserves originating either from the past accumulated profits retentions, or, again, by mean of shareholders' subscription. Therefore, the cost of the firm's own capital could be defined as follows:

$$i(t) = \frac{r^{*}_{s}(t)p_{s}(t)N(t)-\dot{p}_{s}(t)N(t)}{E(t) + \int_{0}^{t}[\pi(t)-(r_{f}+\phi(\Omega))-D(t)]dt} \qquad (8$$

where $\pi(t)$ are the variable profits, net of "purely technological" adjustment costs of investments, at time t, D(t) the dividends such as defined in equation 5, r_f the interest rate on risk free assets, $\phi(\Omega)$ a risk premium on borrowing which is assumed to be (as in the previous chapter) an increasing function of the leverage ratio Ω such that $\phi(0)=0$ and $\phi'>0$. The denominator of equation 8 shows that the own capital is increased by the past accumulated profits, which, in their turn are determined by the profits, net of the "purely technological" adjustment costs of investments and of the remuneration of borrowed capital, as well as own capital. If the payment of the remuneration of debt and own capital entirely exhaust π, then the firm does not accumulates profits. If the remuneration of debt and own capital leads to financial flows greater than π, then the denominator of 8 increases and the cost of own capital also increases. This mechanism, however, needs further explanation which will be given in section 5, dealing with the financial decisions of the firm.

Assumption "v" is analogous to the one of the model of the previous chapter.

3. A digression on the cost of capital and the "financial side of the firm"

The considerations contained in this section will not be formalized into a model, but will be helpful in a qualitative discussion that will follow in the next section. Let us consider equation 8 and let us assume that p_S reflects the net present value of the future dividends (assuming efficient financial markets) but the information about π only gradually spreads and affects p_S. For a given exogenous value r^*_S, a persistent increase in the profits associated with a less than complete adjustment of $p_S(t)$ to the new level of profits, would enable the firm to retain more profits, reducing more and more the denominator of equation 8. If the average cost of financial funds is an increasing function of the leverage ratio, then the firm's cost of financial capital would be increasingly reduced.

If we imagine a persistent reduction (increase) of $\pi^{\circ}(k,w|\mu_i)$, and we assume that news about this spread first gradually and then increasingly faster (i.e. according to an "epidemic" diffusion model like the one earlier mentioned and described in Shiller [1989], chapter 2), in such a way as to determine increasingly negative (positive) values of $\dot{p}_s(t)N(t)$, this might indeed reproduce (on the basis of equation 8) a few empirical phenomena, such as persistence in the levels of dividends and cheaper cost of own capital for firms that enjoy a persistent positive trend in their level of profits.

The assumption of persistence of the value $\dot{p}_s(t)N(t)$ for a non infinitesimal length of time would also be consistent with the empirical phenomenon of excess volatility in share prices (Shiller [1981], [1984], [1989]) for the same argument that accounts for the empirical phenomenon of "sticky dividends". In fact, looking at equation 8, if a firm is able to increase its level of profits, and this determines an increase in the share price p_s, which takes place gradually, so that a positive value of the term $\dot{p}_s(t)N(t)$ persists for a non infinitesimal length of time, then for the same length of time the firm, in order to remunerate the shareholders at the exogenous rate $r^*_s(t)$, would need to increase the dividends less than proportionately than the increase in p_s. This would allow the firm to retain profits and accumulate reserves, so that, if the cost of borrowed capital is a function of the leverage ratio, even after the complete adjustment of the dividends to the new equilibrium level of the share prices p, the firm would be enabled to enjoy a lower cost of capital.

It is clear that the assumption concerning the relation between $\pi(.)$ and ps relies heavily on the assumptions concerning the diffusion of the information concerning the profits and the profitability of the firm. In addition, the profits and the profitability of the firms could also affect the risk premium on external financial funds, which might apply not only to debt, but also to shares, to the extent that the presence of a controlling group and the lack of a market for firms' control lead the managers and the other agents to regard the shares as external funds. Therefore, looking at equation 8, one could say that the effect of an increase in $\pi(.)$ on the cost of financial capital might be ambiguous and depend on the assumptions on how ps reflects the information on profits, and whether and how the *ex ante* yield on shares contains some risk premium (being an external fund like the debt). In fact, looking at equation 8, if an increase in profits determines an immediate and instantaneous increase in the share prices (and if all of the profits $\pi(.)$ net of the adjustment costs for investments are entirely absorbed as remuneration for the debtholders and the shareholders), then the numerator of equation 8, and the denominator of 8 would not change. On the other hand, if $r^*_s(t)$ contains some kind of risk premium negatively correlated to $\pi(.)$, or to k, then the numerator of 8 would become smaller, and the denominator larger. All of these possible cases could be summarized by assuming some kind of functional link between $\pi(.)$, ps and $r^*_s(t)$, whose quantitative effects have to be determined simultaneously to the firm's financial decision and the flow of funds equation.

However, some form of transaction costs might be captured by a "transaction premium" on external funds, not to be confused with the traditional risk premium on borrowing, usually assumed to be an increasing function of the leverage ratio. Such "transaction premium" on external financial funds might be thought of as being negatively correlated with the flow of profits, and formalized as follows:

Assumption A.

In addition to the risk premium on borrowing $\phi=\phi(\Omega)$, the cost of external financial funds contains a "transaction" premium defined as follows.

$\phi_2=\phi_2(\overset{-}{\pi})$; with $\phi_2\geq 0$; (9

where π are the variable profits. Since the variable profits, as we will see later, are assumed to be a monotonically increasing function of the stock of capital k, Assumption A is equivalent to the following:

Assumption B.

In addition to the risk premium on borrowing $\phi=\phi(\Omega)$, there is a "transaction" premium on firm's external finance defined as follows:

$\phi_k=\phi_k(\overset{-}{k})$; with $\phi_k\geq 0$; (9'

Assumption "A" may be justified on the basis of the following arguments "a", "c" and "d". Assumption B can be justified on the basis of argument "b".

a) "Signalling and profit retention" argument: as Leland and Pyle [1977] point out, with information asymmetry and signalling on stock market, the proportion of investment "owned" by the insiders is a signal of good quality of the investment. If the firm has to choose between financing new investments by issuing new shares or retaining profits, then the decision to retain profit to finance new investments and give up dividends may be equivalent to the insiders' decision to keep a high proportion of investment. Therefore, the decision concerning profits retention and dividends distribution enable the firm to send a signal. However, firms operating in a context close to perfect competition may not send such a signal, since profits, by definition, only allow the firm to remunerate the financial capital with a return close to the interest rate acting as opportunity cost. Therefore, the firms enjoying a certain degree of monopoly power (and, as a consequence a high margin of profits) are enabled to send a signal that perfectly competitive firms (or firms with low market power) cannot send. The immediate consequence of this argument would be a sort of *binary discrimination* between the firms able to reduce the *lemon premium* on their external finance by issuing a costly signal and those unable to do so. However, if we assume that lenders also detect the *intensity* of the above-mentioned signal (i.e. how big are the dividends that the insiders are giving up, and what is their magnitude compared to the capital invested in the enterprise), it could be assumed that the higher the profit rate, the more successful the firm is in reducing the risk premium the interest rate on borrowing. This situation could be captured by assuming a negative functional link between the risk premium on debt (and external finance) and the profits.

b) **"Transactions and information spreading argument"**: let us assume that the transaction concerning the liabilities of the firm (i.e. equities and debt) are a major vehicle of information for spreading the quality of the investments of the firms. This is equivalent to the rather orthodox assumption that prices are the main vehicle of information spreading. Therefore, the higher the outstanding stock of financial capital of the firm and the higher the volume of its transactions, the more diffusion of information on the quality of the firm's investments. If the balance sheet constraint 1 holds, the higher the physical capital and the higher the transactions concerning the financial capital, the more diffused is the information on the quality of the firm's investments. This assumption can be formalized following the "general epidemic model" (Bailey [1957], quoted in Shiller [1984] and [1989]).

> "It is assumed, first, that new carriers of news (as of a disease) are created at a rate equal to an 'infection rate' β times the number of carriers times the number of susceptibles and, second, that carriers cease being carriers at a 'removal rate' τ".
>
> (Shiller [1989], p.15)

This model is quoted by Shiller as a possible tool for interpreting phenomena of information-spreading in stock market. It could be extended to the interpretation of the diffusion of information concerning the profitability of the physical capital of the firm "K" (referring to the balance sheet constraint 1) to the extent that "E", "R" and "B" are the objects of transactions, either internal or external to the firm (since one could think of the decision concerning dividends retention as a transaction internal to the firm, involving the controlling group and the outsiders). In particular, let us assume that the "infection rate" β is constant, the removal rate τ depends on the maturity of the financial assets (and, for simplicity, could be assumed to be constant, as a first approximation), the "number of carriers" of information correspond to the individuals who have been involved in the negotiations having for object "S" and "B", the "number of susceptibles" correspond to all of the potential buyers of the firm's assets (i.e., at least potentially, the entire population). Then, on the basis of the balance sheet constraint 1, all these assumptions imply that the "lemon premium" on the firm's external finance depends negatively on "K".

c) **"High vs low transaction costs" argument:** if, due to information asymmetries, the internally generated financial flow, (which is the object of a transaction internal to the firm) is subject to lower transaction costs than external funds, then a firm enjoying a high market power (and, as a consequence high profits) can potentially rely on a larger source of "low-transaction-cost" financial capital.

d) **"Empirical" argument:** this can obviously be accepted only if one follows methodological approaches where empirical evidence can be regarded as a possible source of information, specially in those cases where the implications of rigourously microfounded theories are clearly "falsified" by empirics or are unable to account for empirical evidence. The main point of this argument can be introduced on the basis of empirical results, such as the famous one provided by Fazzari, Hubbard and Petersen, which can be summarized as follows:

"...Indeed, outside the Fortune 500 companies, the overwhelming majority of bond finance has been obtained historically through private placements, usually with life insurances or pension funds. Two features of private placements are significant. First, they are more restrictive than typical bond arrangements, requiring minimum levels of working capital and stockholders' equity and often limiting dividends payments and capital spending. Second, during periods of tight credit, small and medium-sized borrowers are often denied loans in favour of better-quality borrowers, who could also obtain funds from centralized securities markets. Similarly, bank loans and lines of credit, the typical source of finance for smaller industrial firms, restrict operating flexibility and require particular levels for certain financial operating ratios".

(Fazzari, Hubbard and Petersen, [1988], p.153)

It must be said, first of all, that in "non-securitized" financial systems like the Italian one, the volume of financial funds traded on stock markets is hardly relevant at all, compared to the intermediated credit. Therefore the considerations of Fazzari, Hubbard and Petersen should apply, in general, to all firms. Since working capital can be regarded as a function of the sales, one can assume, for simplicity, that it is a function of the profits.

e) "Strategic use of financial structure" argument: Loosely speaking, the implications of the literature on entry deterrence with the strategic use of financial structure (for example Benoît [1984], Poitervin [1989a] and [1990]) might suggest that higher profit margins could be associated with a higher leverage ratio (and, more generally, to a more costly financial structure). In fact, as suggested by Poitervin [1990], a costly financial structure is a signal that the incumbent with low costs (high profit margins) addresses to the potential entrant.

On the basis of this argument, one could think of a causal link among the risk premium ϕ, the leverage ratio Ω, and the profits π like the following:

$$\phi = \overset{+}{\phi}(\overset{+}{\Omega}(\pi)) \quad .$$

This functional link could be thought of as an effect of the persistence of an equilibrium in a strategic financial signalling game analogous to the one described in Poitervin [1990].

Alternatively, if there is common knowledge of this particular use of financial structure for entry deterrence purpose, the banks could be aware that the use of a more costly financial structure is needed to preserve a high market power, and, therefore, high profit margins. For this reason they could allow more profitable firms to have a higher leverage ratio, without charging them with a higher risk premium on borrowing. In other words, one could imagine a tradeoff between leverage ratio and profits like the following

$$\phi = \phi(\overset{+}{\Omega},\overset{-}{\pi}) \quad .$$

Argument "e" ("strategic use of financial structure") will not be considered in the following part of the paper because it would require a detailed analysis on the characteristics of the equilibrium in a financial signalling game, which is beyond the purpose of this paper.

However, the considerations contained in this section suggest that some form of "transaction costs premium" (different from the traditional risk premium depending on the leverage ratio) might be included in the expected ex ante yield on shares, as well as in the interest rate on borrowing. This possibility will be considered in the qualitative analysis that follows.

4. The decision problem of the firm

Again, the decision problem is assumed to be recursive, i.e., the firm, which in each moment is assumed to maximize the level of variable profits $u°(k,w\,|\mu_i)$, chooses the financial structure that minimizes the cost of financial capital. The managers have to remunerate the shareholders at the ex ante expected yield, and have to pay the lenders at the interest rate on borrowing.

The controlling group is maximizing the value of the asset denominated "control of the firm", i.e.

$$V(0) = \int_0^{\infty} \exp\left[-\Phi°(t)\right] \{u°(k,w\,|\mu_i) - A[I(t)]\}\, dt \qquad (10$$

subject to the following constraints (together with the balance sheet constraint 1):

$$\dot{k} = I - gk, \quad k(0)>0 \quad \text{and} \lim_{t\to\infty} k(t)\geq 0 \qquad (11$$

$$u°(k,w/p\,|\epsilon,sh_i,c_j) - A[I(t)] - [r_f(t) + \phi(\Omega(t))]\cdot B(t) + \dot{B}(t) + - \dot{R}(t) - D(t) = 0 \qquad (12$$

where r_f is the interest rate on risk free assets, $\phi(\Omega)$ a risk premium on borrowing earlier defined, $A[(I)]$ is the function of (purely technological) adjustment costs of investments (such as $A(0)=0$, $A'>0$, $A''>0$), $D(t)$ the dividends, $B(t)$ the level of borrowing, $R(t)$ the reserves, $S(t)$ the shares, and a dot over the variables indicates differentiation with respect to time. All of the above conditions have to be considered jointly with the optimal financial structure condition, i.e. an opportune determination of $\Phi°$ such that the firm is equating the marginal cost of borrowing to the marginal cost of the own capital "i". In this regard we introduce here a few slight modifications - with respect to the model of the previous chapter - which simplify the calculations and the exposition of this analysis. Let us define the gearing ratio as

$$\mu = \frac{B(t)}{k(t)}$$

then, given the balance sheet constraint 1, we have:

$$\frac{B(t)}{k(t)} = 1 - \frac{1}{\dfrac{B(t)}{E(t)+R(t)} + 1} \qquad (13$$

which can be written as

$$\mu = 1 - \frac{1}{\Omega + 1} = \overset{+}{h(\Omega)} \qquad (14$$

where $h(\Omega)$ is a monotonically increasing function of Ω. Hence, if we define a risk premium on the gearing ratio, instead of the leverage ratio, let us define an equivalent risk premium ratio defined on the leverage as follows: let $\theta(\mu)$ be the risk premium defined on μ. Then $\theta(\mu) = \theta(h(\mu)) = \phi(\Omega)$. We will have in particular $\theta(0)=0$, $\theta'>0$, and, as in the model of the previous chapter, $\phi(0)=0$, $\phi'>0$.

We can then define the optimization of the firm's financial structure as follows:

$$\Phi^\circ = \min_{\mu} \{(1-\mu)i(t) + [r_f(t) + \theta(\mu)]\,\mu\} \qquad (15$$

Equation 15 is the weighted average of the cost of financial funds, including borrowing and own capital.

The problem is resolved recursively: in each moment the firm is optimizing the financial structure by choosing the optimal leverage ratio (which, as we will see later, is determined simultaneously with the cost of own capital, given the flow of funds condition 12). The optimized financial structure determines the rate of discount appearing in the intertemporal problem. However, the optimal rate of discount is conditional on the flows of profits, net of the "purely technological" adjustment costs of investments. Therefore, the rate of discount will be a function of both the state variable and the control variable, as we will see in the following section.

5. The financial decisions of the firm.

Considering equation 15, and assuming that the second order conditions are satisfied, the first order conditions will be:

$$d\Phi^{\circ}/d\mu = r_f + \theta(\mu) + \mu\theta'(\mu) - i = 0 \qquad (16$$

Equation 16 says that the firm is equating the marginal cost of borrowing to the marginal cost of the own capital "i". Let us assume that $\theta(\mu)$ is homogeneous of degree 1, such that

$$\mu\theta'(\mu) = c\theta(\mu) \qquad (17$$

where "c" is a constant, then equation 16 becomes:

$$i - r_f = \theta(\mu)(1+c) \qquad (16'$$

then:

$$\mu = \theta^{-1}((i-r_f)/(1+c)) \qquad (18$$

assuming that $\theta(.)$ is monotonically increasing and invertible, then equation 18 shows that μ is a monotonically increasing function of $(i-r_f)$, i.e. the difference between the cost of the own capital and the interest rate on a risk-free asset. Since we have $\Omega=h(\mu)$, with $h(.)$ monotonically increasing in μ, then Ω is a monotonically increasing function of the difference $(i-r_f)$. We can then define :

$$\Omega = h(\mu) = h(\theta^{-1}((i-r_f)/(1+c))) = b(\overset{+}{i-r_f}) \quad (19$$

The leverage ratio is an increasing function of the difference between the cost of own capital and the interest rate on risk-free assets because, for a given r_f, the higher the cost of the own capital, the higher the incentive for the firm to borrow and increase the leverage ratio.

However, equation 19, which derives from the equality, at the margin, between the cost of own capital and the cost of debt, has to be considered together with the fact that the determination of dividends (which depends on a few exogenous variables containing information on the financial markets) contributes to determine the cost of own capital, on the basis of the assumptions made in section 1. Therefore, we have to consider jointly equations 19, 8 and 12. The flow of funds condition 12 may be significantly simplified with the following assumptions:

$$u^{\circ}(k,w/p \mid \epsilon,sh_i,c_j) - A[I(t)] = \pi(k(t),I(t) \mid \epsilon,sh_i,c_j) \quad (20$$

$$\dot{B}(t) - \dot{R}(t) = -f(\dot{\Omega}) \quad (21$$

Equation 20 is simply a definition, while equation 21 comes from the definition of the leverage ratio Ω, by observing that an increase in the debts and a reduction in the reserves (accumulated profits) reduces the leverage ratio. Then we can define:

$$\pi(k(t),I(t) \mid \epsilon,sh_i,c_j) - [r_f(t)+\phi(\Omega(t))]\cdot B(t) - D(t) = -f(\dot{\Omega}) \quad (12'$$

Now, considering equation 8, and substituting the flow of funds condition 12', we get

$$i(t) = \frac{r^*s(t)ps(t)N(t)-\dot{p}s(t)N(t)}{E(t) + \int_0^t [-f(\dot{\Omega})]dt} \qquad (8'$$

then i(t) and Ω(t) are simultaneously determined by the following system:

$$\begin{cases} i(t) = \dfrac{r^*s(t)ps(t)N(t)-\dot{p}s(t)N(t)}{E(t) + \int_0^t [-f(\dot{\Omega})]dt} & (8' \\ \\ \Omega = b((\overset{+}{i}-rf)) & (19 \end{cases}$$

The system composed by equations 8' and 19 will only be discussed qualitatively, since it is a non linear system of differential equations. In particular, the system is going to give a simultaneous solution for Ω(t) and i(t) conditional on π(t). It is extremely important to point out that the link among π(t), Ω(t), and i(t) crucially depends on the functional link (if any), on one hand between π(t) and ps(t), and, on the other hand, between π(t) and $r^*s(t)$. All these functional links need to be briefly discussed, by recalling some of the considerations contained in section 3. Before doing that, we have to make a brief digression by noting that equation 16 may be solved in order to determine Φ°(t) as a function of μ(t). In fact, solving equation 16 for i(t) and substituting into equation 15, we get (omitting for simplicity the symbol (t) for notational convenience)

$$\Phi^\circ = r_f + \theta(\mu) + \mu\theta'(\mu) - \mu^2\theta'(\mu) = \Phi^\circ(\mu) \qquad (22.$$

If we further assume that $\theta''(\mu)$ is null or neglectable, and reminding that by definition we have $0<\mu<1$, then Φ° is monotonically increasing in μ (or in Ω):

$$\Phi^\circ = \overset{+}{\Phi^\circ(\mu)} = \overset{+\ +}{\Phi^\circ(h(\Omega))} \qquad (23.$$

Let us consider the system composed by equations 8' and 19, and let us make the last (very strong) simplifying assumption that the system has a unique solution for $i(t)$ and $\Omega(t)$[21]. On the basis of the relations existing among $\pi(t)$, $r^*_s(t)$ and $p_s(t)$ three main cases can be depicted.

Case A: There is no relation between $p_s(t)$ and $\pi(t)$: in other words $p_s(t)$ is exogenous.

Such a case violates the standard assumption of efficient markets, stating that the share price is the net present value of the future stream of dividends. In fact, according to the efficient markets assumption, if the dividends are correlated with the flow of profits, then the share price $p_s(t)$ should adjust to variations of $\pi(t)$, and, in particular, if the managers acted in the interest of the shareholders, they should pay out as dividends all of the available flow of profits (net of the "purely technological" adjustment cost of investments and of the interest payments on borrowing), determining a correspondent adjustment of the expected future dividends. However, since in this part of the analysis it has been assumed first of all that the managers do not necessarily act

21 The assumption of solution unicity is indeed very strong although very usual and commonly accepted in neoclassical and rational expectation literature.

in the interest of the shareholders as such, secondly that they regard shares as an external source of finance and merely remunerate them at the expected ex ante yield on shares and thirdly, given that the empirical evidence raises a few doubts about the assumption of market efficiency, then there is no particular obligation to assume a *priori* that markets are efficients, that share prices reflect the net present value of dividends, and, above all, that dividend payments adjust completely to changes in the flow of profits. In particular, the strong empirical evidence provided by Blanchard et al. [1993] shows that firms tend to accumulate cash windfall without distributing them to shareholders. In this situation, the unexpected cash flows contributes to increase the reserves and reduces the cost of own capital such as defined in equation 8'. Therefore the case where $p_s(t)$ and $\pi(t)$ are independent and uncorrelated is theoretically possible. In this case, we can see from equation 12' that when the profits $\pi(k(t),I(t)|\mu_i)$ increase, the leverage ratio would decrease. The numerator of equation 8' would not change, the denominator would increase, and, therefore, the cost of own capital would be reduced. This would determine a reduction in the leverage ratio, as we can see from equation 19. In this case, the system of equations 8' and 19 would determine a negative functional link between $\pi(t)$ and $\Omega(t)$, on the basis of the assumption of independence between $\pi(t)$ and $p_s(t)$. The negative Functional link between $\pi(t)$ and $\Omega(t)$ would result in a negative functional link between $\Phi^\circ(t)$ and $\pi(t)$, on the basis of equation 23. A similar situation would result if, on the basis of **assumption A** of section 3, one assumed that both the remuneration of the own capital and the

cost of debt included a "transaction premium" like the one justified on the basis of arguments "a", "c" and "d" of section 3.
In this case, a functional link like $r^*_s = r^*_s(\bar{\pi})$ would hold.

Therefore, an increase in $\pi(t)$, being $p_s(t)$ exogenous, by reducing $r^*_s(t)$, would reduce the numerator of 8', as well as reducing its denominator because of the accumulation of profits, as already mentioned.

Case B: there is no "transaction cost premium" in $r^*_s(t)$; $p_s(t)$ is positively correlated with $\pi(t)$, perfectly and instantaneously adjusts to $\pi(t)$, and profits (net of "purely technological adjustment costs of investments") are entirely exhausted in interest and dividends payments.

In this case an increase in $\pi(t)$ would not determine any accumulation of reserves, the denominator of 8' would not change, while the numerator would increase because of the increase in $p_s(t)$ determined by the increase in $\pi(t)$. This would determine an increase in the cost of the own capital, which would determine, in its turn, an increase in the leverage ratio. Therefore in this case we would have a positive correlation between the leverage ratio and the profits. A similar but stronger effect would take place in the case of "excess volatility" of share prices (Shiller [1984], [1989]). In this case, because of the excess volatility assumption, the share prices would overshoot with respect to the expected level in dividends determined by the original increase in $\pi(t)$. *Ceteris paribus*, the increase in the numerator of equation 8' would be larger than in the case of complete exhaustion of profits into dividends, and complete and proportional adjustment of $p_S(t)$ to changes in $\pi(t)$.

The correlation between $\pi(t)$ and $\Omega(t)$ would be uncertain and have an ambiguous sign in the following case.

Case C: One or more of the following situations apply.

C.i) The correlation between $\pi(t)$ and $p_S(t)$ is weak, so that there is no complete exhaustion of profits into dividends payment and the accumulation of profits is feasible (so that the controlling group is partially enabled to implement a redistribution of profits in their favour, at the expense of the generical shareholder).

C.ii) $r^*_S(t)$ contains a "transaction cost premium" negatively correlated with $\pi(t)$, like the one described in Assumption A of section 3, and an increase in $\pi(t)$ determines at the same time an increase in $p_S(t)$ and a reduction in the "transaction cost premium".

C.iii) $\pi(t)$ is positively correlated with $p_S(t)$, but $p_S(t)$ only gradually adjusts to changes in $\pi(t)$, so that the term $\dot{p}_S(t)N(t)$ at the numerator of 8' persists for a non-infinitesimal length of time.

Situation C.i is ambiguous for what concerns the effect on $i(t)$ of an increase in the profits $\pi(t)$: the numerator of 8' would increase because an increase in $\pi(t)$ determines an increase in $p_S(t)$, but, since the correlation between $\pi(t)$ and $p_S(t)$ is weak, and there is accumulation of profits, the denominator of 8' would also increase, and the resulting effect is ambiguous in the sense that it is not possible to state wether an increase in $\pi(t)$ would increase or reduce $\Omega(t)$ without any specific assumption on the link between p_S and π. Situation C.ii describes a case where an increase in $\pi(t)$ would at the same time determine an increase in $p_S(t)$ and a reduction in $r^*_s(t)$, so that it is not clear whether the resulting effect would be an increase or a reduction in the numerator of 8'. Therefore, the resulting effect on $i(t)$ would be ambiguous, even if a well-defined functional link between $\pi(t)$ and $p_s(t)$ allowed us to determine the accumulation (if any) of profits and the variation (if any) in $\Omega(t)$. For what concerns point C.iii, if an initial variation in $\pi(t)$ determines a variation in $p_s(t)$, which takes place only gradually, and the term $\dot{p}_s(t)N(t)$ persists for a relevant length of time, then the final effect of an increase in $\pi(t)$ will be indeterminate for several reasons: first of all it will depend on the length of time necessary for $p_s(t)$ to reach its long run equilibrium. Secondly, the final effect on $i(t)$ will result (as we can see from equation 8') in an increase both of the numerator (because of the increase in $p_s(t)$ determined by the increase in $\pi(t)$) and in the denominator (due to the fact that the firm will have accumulated reserves as long as the term $\dot{p}_s(t)N(t)$ persists).

By summarizing this discussion, we can say that Case A would result in a relation between $\pi(t)$, $\Omega(t)$, and, as a consequence $\Phi°(t)$ that could be captured and described (at the price of some simplifications) by a functional link of this kind:

$$\Omega(t) = a_1(\pi) \qquad (24$$

and $$\Phi° = \Phi°(\overset{+}{\Omega}) = \Phi°(a_1(\overset{-}{\pi})) = \Phi°(\overset{-}{\pi}). \qquad (25$$

Case B, on the other hand would determine a situation that could be described (again with some simplifications) by the following functional link:

$$\Omega(t) = a_2(\overset{+}{\pi}) \qquad (26$$

and $\Phi^{\circ} = \overset{+}{\Phi^{\circ}(\Omega)} = \overset{+}{\Phi^{\circ}(a_2(\pi))} = \overset{+}{\Phi^{\circ}(\pi)}$. (27

where in case A we have $\Omega=a_1(\pi)$, and in case B we have $\Omega=a_2(\pi)$. In case C, on the contrary, the effect of $\pi(t)$ on $\Omega(t)$ would have an uncertain sign, because a variation in $\pi(t)$ would determine effects of the opposite sign in $i(t)$. However, apart from the very extreme and unlikely case where the opposite effects exactly compensate each other, $\pi(t)$ should have, in general an effect on $\Omega(t)$, and therefore $\Omega(t)$, in general, will not be exogenous, differently from what has been assumed in the model of the previous chapter.

In the following part of the present analysis we will assume that a functional link between $\Omega(t)$ and $\pi(t)$ exists, and the two cases of $\Omega=a_1(\pi)$ and $\Omega=a_2(\pi)$ will be taken into account in two pieces of qualitative analysis.

6. The "real" decisions of the firm

Having found that definition 8' and constraints 12' and 15, referring to the financial decision of the firm, result in a functional link (either $\Omega=a_1(\pi)$ or $\Omega=a_2(\pi)$ according to some specific assumptions on the behaviour of the financial markets), we can now turn to the "real" decisions of the firm, which can be described by the maximand 10 subject to the constraints 11. Again the problem can be solved by following the Hamiltonian approach.

$$\underset{I}{\text{Max}}\ V(0)=\int_0^{\infty} \exp\left[-\ \Phi^{\circ}(\pi(t))\right]\ \{u^{\circ}(k,w/p|\epsilon,sh_i,c_j)-A[I(t)]\}\ dt \quad (10$$

s.t.

$$\dot{k} = I - gk, \quad k(0)>0 \quad \text{and} \lim_{t\to\infty} k(t)\geq 0 \qquad (11$$

reminding that

$$\pi(t) = u°(k(t)|\mu_i) - A[I(t)]$$

We define then

$$d\Phi°/d\pi = (d\Phi°/da_i)•(da_i/d\pi); \qquad (28$$

with i=1,2 according to whether the functional link 25 or 27 applies. The Hamiltonian of the problem is the following:

$$H = \exp\left[- \Phi°(\pi(t))t\right] [u°(\cdot) - A(I(t))] + z\cdot[I(t) - g(k(t))] \qquad (29$$

Since the discount factor is a function of π, which, in its turn, is a function of both the state and the control variable, it is a slightly atypical problem of optimal control, which will be solved without working with the current marginal variations.

Assuming that the second order conditions are satisfied as well, the first order conditions will be the following:

$$\delta H/\delta I=0=-e^{-\Phi°(\pi)t}•A'-e^{-\Phi°(\pi)t}.\left[t \frac{d\Phi°}{d\pi}•(-A')\right]•\pi\ t + z \qquad (30$$

hence

$$z = •A'\left[1 - t \frac{d\Phi°}{d\pi}•\pi\right] e^{-\Phi°(\pi)t} \qquad (31$$

The transversality conditions are analogous to the ones of the model of the previous chapter, i.e.:

$$\lim_{t\to\infty} z(t)\geq 0, \qquad [k^*(t)-k(t)]z(t) = 0 \ . \qquad (32$$

It is assumed, in what follows, that the transversality conditions are satisfied. Substituting equations 30 and 31 into the derivative with respect to the state variable yields the following:

$$\frac{dz}{dt} = - \frac{\delta u}{\delta k} e^{-\Phi°(\pi)} + \left[\frac{d\Phi°}{d\pi} • \frac{\delta u}{\delta k} \right] e^{-\Phi°(\pi)} • \pi + z•g$$

hence

$$\frac{dz}{dt} = e^{-\Phi^\circ(\pi)t} \left[- \frac{\delta u}{\delta k} \right] \left[1 - t \frac{d\Phi^\circ}{d\pi} \cdot \pi \right] + z \cdot g \qquad (33$$

Let us now define:

$$e^{-\Phi^\circ(\pi)t} \left[1 - t \frac{d\Phi^\circ}{d\pi} \cdot \pi \right] = m(\pi,t); \qquad (34$$

Then conditions 31 and 32, together with the constraint 11, yield the following system:

$$\begin{cases} z = A' \cdot m(\pi,t) & (35 \\ \dot{z} = z \cdot g + m(\pi,t) \cdot \left[- \frac{\delta u}{\delta k} \right] & (36 \\ \dot{k} = I - g \cdot k & (37 \end{cases}$$

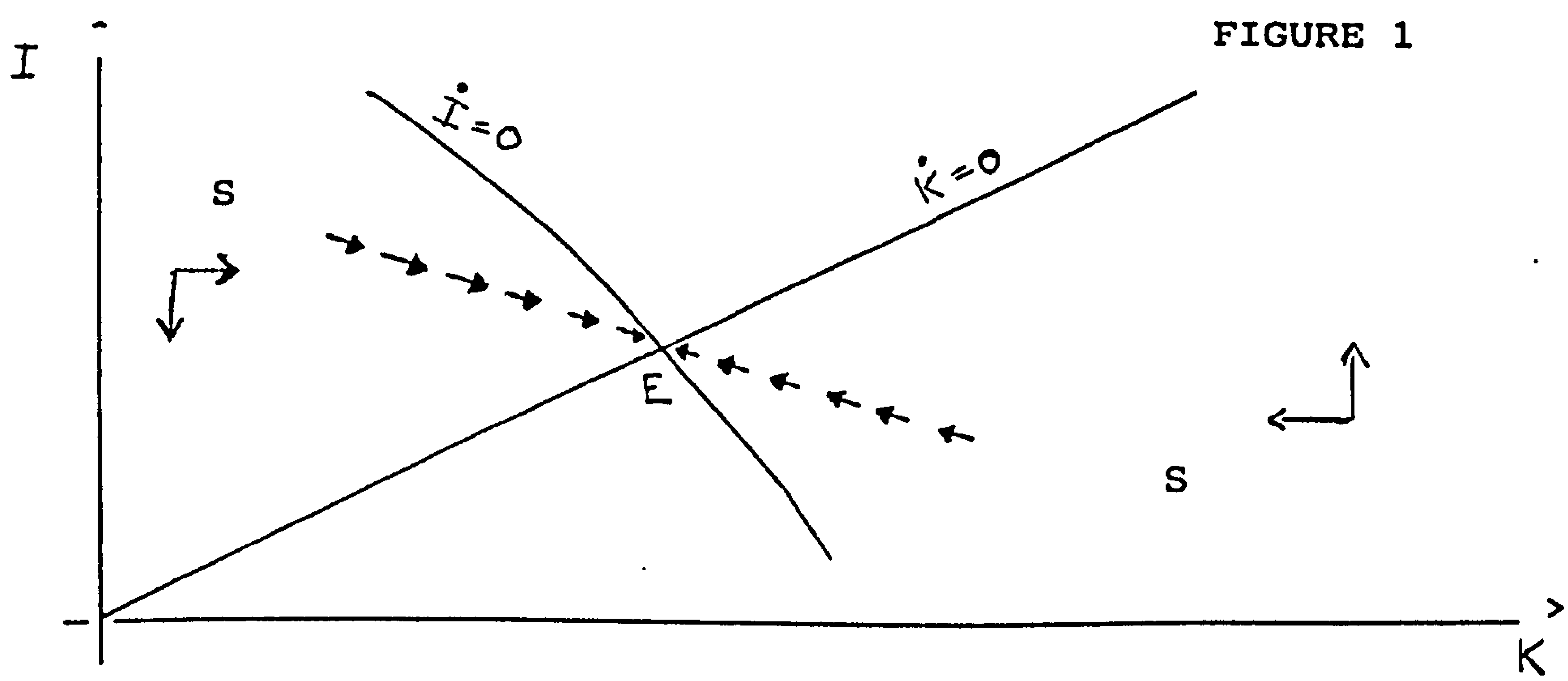
substituting equation 35 into 36 we get:

$$\frac{dI}{dt} = \frac{1}{A''} \left[(\Phi^\circ + g) \cdot A' - \frac{\delta u}{\delta k} \right] \qquad (38$$

$$I^* = G[(\delta u^\circ / \delta k)/(\Phi^\circ + g)] \qquad (38'$$

The system composed by equations 37 and 38 can be represented by the following state space form.

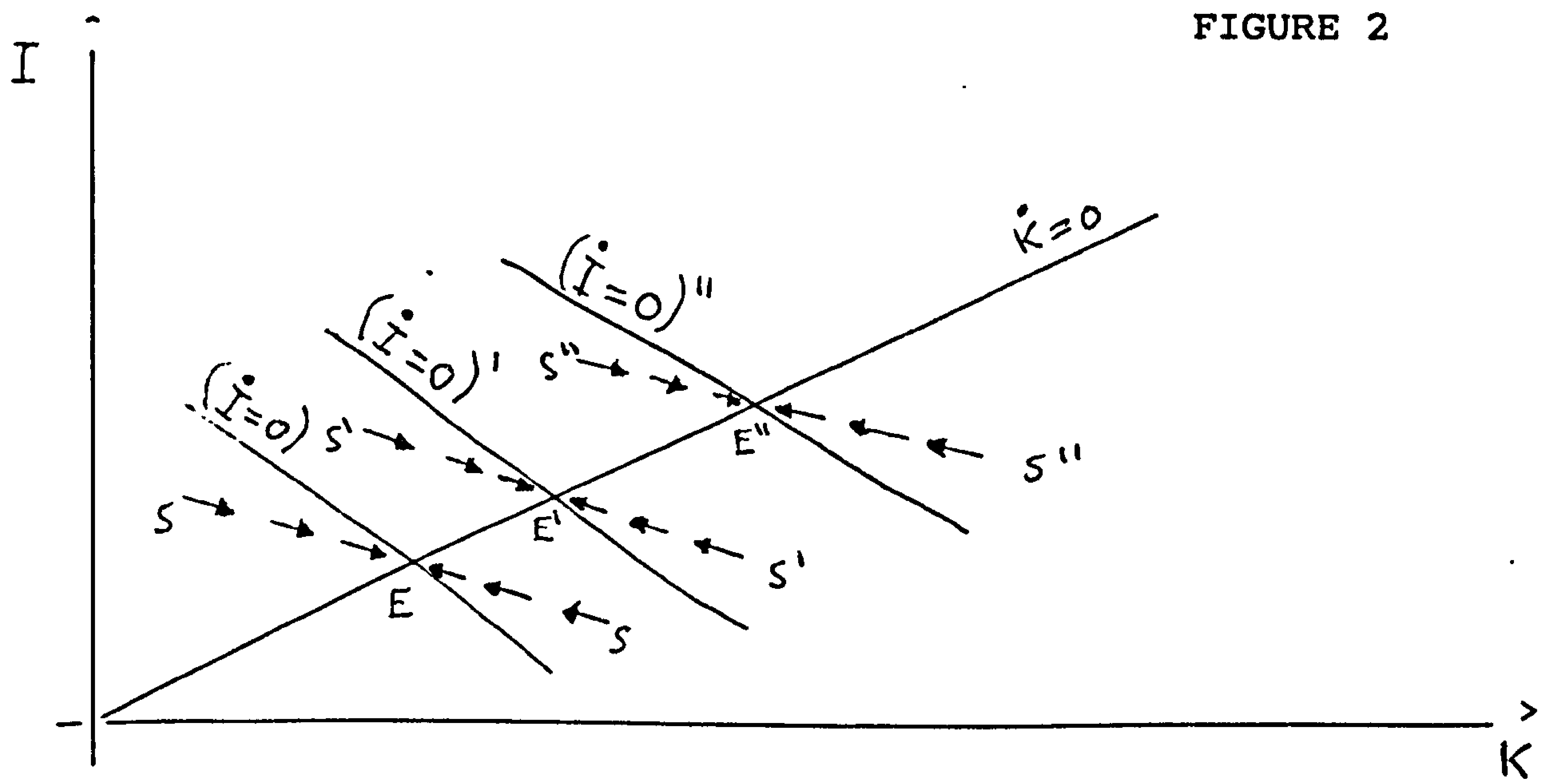
FIGURE 1



In the graphic, SS is the stable saddlepath. The model is similar to the neoclassical model of investment, apart from the fact that δu/δk is in this case the "marginal profitability" of capital (and not the marginal productivity of capital), containing information on the conjectures. However, a few significant qualitative differences appear if we look at the effects of a perturbation in u(t), given the interactions existing between this variable, the rate of discount, and the leverage ratio.

Let us assume that A'>0; A">0; if we also assume that the profit function u(t) is analogous to the one of the model of the previous chapter, and is homogeneous in k - so that an increasing monotone function f(•) exists such that δu/δk = f(u/k) - then a disturbance in u(t) would also imply a disturbance in δu/δk, and the model may be represented according to one of the two following cases. Let us consider first the case where the functional link 25 applies.

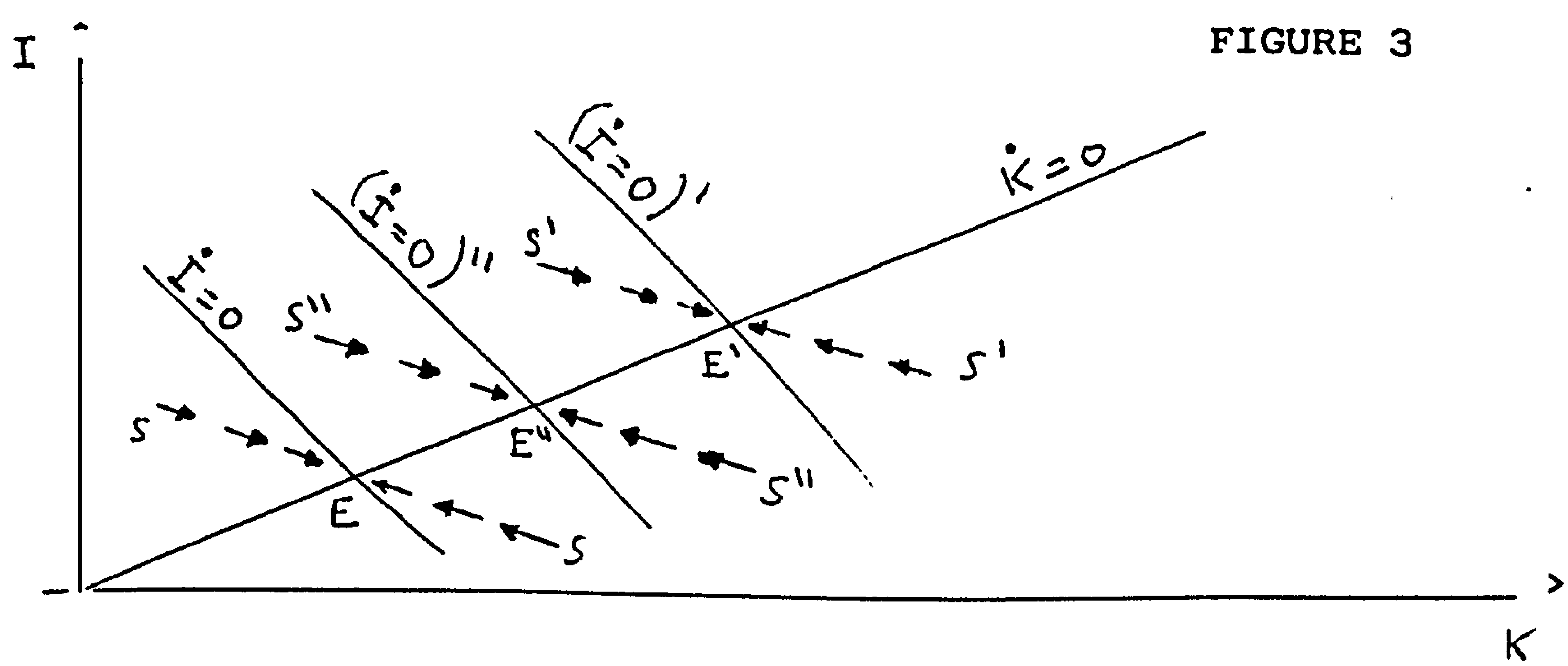
FIGURE 2



An initial unexpected disturbance in δu/δk would shift away the locus dz/dt=0 from the initial equilibrium E to E'. However, to the extent that $\Phi°(\pi)$ is affected by u(t) (since $\Phi°(\pi)$ is a function of π=[u(t)-A(I(t))]), the initial disturbance may also affect the financial variables of the problem (altering the "slope" of dz/dt) and determining the new equlibrium E".

As opposed to the standard neoclassical models of investment, an initial disturbance in $u°(k,w|\mu_i)$ (possibly determined by some exogenous change in the conjectures) affects the equilibrium through two channels: the real channel (i.e. $\delta u/\delta k$) and the financial channel (i.e. $\Phi°$). The latter, in this case, amplifies (because of the sign of the functional link 25) the effects of the disturbances in the "real side" of the firm's decisions adding to the former channel an effect of the same sign. On the other hand, if the functional link 27 applies, the effect on $\Phi°$ of the disturbance in u(t) would have the opposite sign of the "direct" and "real" effect, as we can see in figure 3. In particular, in this case, the effect of an initial disturbance in u(t) through the "financial" channel (i.e. the effect bringing the possible equilibrium from E' to E") could partially or totally offset the "direct" and "real" effect (i.e. the one shifting the equilibrium from E to E'). Figure 3 shows a situation where the "financial" effect only partially offsets the "real" one.

FIGURE 3



7. *Conclusions*

The purpose of this chapter was to present a qualitative framework of analysis for the investment decision of the firm in a "non-securitized" financial system characterized not only by asymmetric information, but also by the absence of a market for firms' financial control. As in the model of the previous chapter, the financial structure and the flow of profits are relevant variables. This qualitative analysis is meant to describe a feed-back mechanism among profits flow, financial structure, cost of capital and investment decision of the firm. In this context, imperfect competition and market power are not ruled out *a priori*.

The case represented in figure 2, based on the functional link 25, is meant, ideally, to find a connection with the analysis by Cowling and Waterson [1976] on the relation between market power and profit margins: in addition to the causal link going from the market power to the flow of profits (empirically shown by Cowling and Waterson [1976]), one could think of another link, going in the opposite sense, via the financial structure and the mechanism of financing investments, which might be potentially barrier-creating. To the extent that a connection exists between profit margins, cost of finance and investments, the empirical links between market power and profits on the one hand, and the link between financial structure and investments on the other, could be thought of as two faces of the same mechanism.

The interpretation of the firm's investment decision as described in figure 2, is consistent with the results of those

Keynesian macromodels (eg. Greenwald and Stiglitz [1988], [1989], [1990a], [1990b], Greenwald, Stiglitz and Weiss [1984], Bernanke and Blinder [1988]), where the financial side of the economy amplifies the possible disturbances affecting the real side of the economy.

The case represented in figure 3 shows a situation where the "financial" side of the firm determines a mechanism which tends to smooth out the effects of the perturbations in the "real" investment decision.

Both the case of figure 2 and figure 3 would suggest that the flow of profits only is a relevant explanatory variable for the firm's investments, since $\Omega(t)$ would be a function of the flow of profits, differently from what happens in the model of the previous chapter. This last consideration might also provide a further interpretation for the fact that the empirical analysis performed in the previous chapter does not provide, for the clothing sector, results consistent with the (standard) theoretical framework employed. The reason for this could be quite simple and trivial: the complexity created by some of the potential causal and functional links discussed in this chapter are ignored in the simplified framework of the more standard theory, which might often tend - for the sake of simplicity and algebraic tractability of the models - to focus on a few relevant causal links.

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CHAPTER 7

CONCLUDING REMARKS

CONCLUDING REMARKS

This study is concerned with the macroeconomic effects of market concentration and of institutional factors. Some chapters, namely the second and the third, were meant to show (by means of theoretical and empirical analyses) the effective macroeconomic relevance of the institutional and structural aspects under consideration; other chapters (namely the fourth) were meant to provide evidence in favour of a few starting assumptions of this analysis (in particular, a behavioural assumption of banks' liquidity preference consistent with the "credit view"), or to describe and critically discuss (by means of theoretical and empirical analyses) the interactions between banks and credit suppliers, and their implications for the firms' investment decisions, given the "realistic" hypothesis of simultaneity between investment and financial decisions, and given some "institutional" assumptions typical of the "non-securitized" financial systems concerning the relevance of the securities' transactions compared to the intermediated credit, and whether or not the market for shares is associated to a market for firms' control.

In accordance with the methodological premises briefly illustrated in the first chapter, some of the starting points of the analysis are taken from acquired results of the relevant literature. In this sense Stiglitz' [1991] point that economics is a "cumulative discipline", and that "not every piece of research has to begin at the beginning" is taken.

The two models presented in the second chapter describe an economy characterized by industrial firms oligopsonistic in the market for credit. In the first (simplified) model, the behaviour of the supply function of bank credit to the industrial firms is captured by a "Cobb-Douglas", which can be thought of as a reduced form for the monetary sector. In this simplified case, an exogenous decrease in the market power of the industrial firms on the credit market increases the effectiveness of monetary policy. This happens because a reduction in the degree of concentration, by reducing the spread between the marginal productivity of capital and the cost of capital, creates an expansionary effect. The second model attempts to generalize the results by introducing a banking sector where banks behave in accordance with the portfolio allocation theory. In this case the results are weakened. In fact, while it is still true that, apart from extreme cases, reductions in the market power of industrial firms in the credit markets increase the macroeconomic level of investment and affect the monetary policy multiplier, on the other hand the sign of the latter effect becomes ambiguous and depends on the analytical forms of the behavioural functions and on the sensitiveness of the agents to the different interest rates of the various assets. Both models however show that modifications of the market structure in the banking sector have, in general, macroeconomic effects. In this sense the second chapter provides a "strong" result.

The third chapter suggests an interpretation of the phenomenon of "securitization" on the basis of Williamson's [1985] contractual framework. It is pointed out that in securitized financial systems substitutability between securities and intermediated credit is an empirically relevant phenomenon that makes the demand for bank credit to the industry more unstable than the supply. For this reason, in a securitized financial system, and in a monoequational framework it is possible to identify and estimate a supply function of bank credit to industry, rather than a demand function, while a demand function is identified in a non-securitized system. A comparative econometric analysis has been performed with British and German data, because the two countries had (apart from the phenomenon of securitization) many similarities in their regulatory systems, as well as in the degree of concentration of their banking sectors and in the magnitude of the respective economies, at least until German Unification. In accordance with the predictions of the theoretical analysis, a supply function for bank credit to industry is estimated in the U.K., while a demand function is estimated in Germany, as expected. The diagnostic tests and the statistical properties of the estimated functions are largely satisfactory.

The analytical form of the bank credit supply function is based on the theoretical part of the paper by Bernanke and Blinder [1988], which put a strong emphasis on the macroeconomic effects of the attitude of banks and their willingness to lend money to firms, affected by the degree of risk of the whole economy, such as perceived by the banking system. This specific aspect of the behaviour of banks is analyzed in Chapter 4, which contains an empirical analysis (performed with Italian data) of the free liquidity ratio for commercial banks. The free liquid reserves of commercial banks are regarded as a liquid asset associated to the non-investing decision of the bank. Such a non-investing decision might be determined by an increase in the degree of risk of the whole economy perceived by the banks (which is the core of Bernanke and Blinder's [1988] model), and is interpreted on the basis of the recent literature on investment decisions under conditions of framework it is possible to identify and estimate a supply function of bank credit to industry, rather than a demand function, while a demand function is identified in a non-securitized system. A comparative econometric analysis has been performed with British and German data, because the two countries had (apart from the phenomenon of securitization) many similarities in their regulatory systems, as well as in the degree of concentration of their banking sectors and in the magnitude of the respective economies, at least until German Unification. In accordance with the predictions of the theoretical analysis, a supply function for bank credit to industry is estimated in the U.K., while a demand function is estimated in Germany, as expected. The diagnostic tests and the statistical properties of the estimated functions are largely satisfactory.

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Chapters 5 and 6 look at the interactions between industrial firms and financial intermediaries in a "microeconomic" perspective. The focus is on the investment decision, and one of the main concerns is to perform a theoretical and empirical analysis on the connections between risk, cost of capital and investment decisions.

Chapter 5 presents a theoretical model - partly based on a contribution by Bernstein and Nadiri [1986] - where the decisions concerning the financial structure and the investment of the firm are simultaneous. Chapter 5 also contains an empirical analysis of the firms' investment decision based on the proposed theoretical framework. The estimates are performed by means of panel data techniques using Italian firms' data referred from three industrial sectors: chemicals, electronics and clothing. Only the results of the first two industries seem to be consistent with the theoretical framework employed, while the inconsistencies of the empirical results referred to the clothing sector seem to be determined by the complexity of the (possibly alternative) causal links among market structure, investment and financing decisions suggested by various contributions in finance as well as in industrial economics.

The study of such causal links is precisely the concern of Chapter 6, which contains an analysis of the implications of a few alternative hypotheses (based on precise results of the industrial economics literature) on the link existing between the cost of capital, the market structure and profit margins.

Chapters 2, 3 and 4 seem to provide some "strong" results (at least as far as the empirical results in the case of chapters 3 and 4 can be regarded as strong, in the light of Stiglitz' [1991] caveats - discussed in the introduction - on the valuation of a theory on the mere basis of "goodness of fit" and other econometric tests). Chapters 5 and 6, on the other hand, raise a few issues that increase the complexity of the models. For this reason the analysis of those two chapters, intended as a deliberately qualitative critical discussion, might be regarded as a starting point for some further study based on the assumption of simultaneous financing and investment decisions in a non-securitized financial sector.

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