



OECD Economics Department Working Papers No. 97

Deregulation, Credit
Rationing, Financial Fragility
and Economic Performance

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<https://dx.doi.org/10.1787/740025471023>

OECD
DEPARTMENT
OF ECONOMICS AND STATISTICS

WORKING PAPERS

No. 97 DEREGULATION, CREDIT RATIONING,
FINANCIAL FRAGILITY AND ECONOMIC PERFORMANCE

by

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February 1991



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This paper is one of four in this Working Paper Series, focusing on financial liberalisation, along with those of Miller and Weller, Kupiec and Blundell-Wignall and Browne. Its main purpose is to evaluate the imperfections still affecting deregulated credit markets. In particular, the paper examines the extent to which rationing continues to be present in credit markets and its implications for credit allocation and the transmission of monetary policy. In addition, the role of deregulation in financial market fragility and instability and its macroeconomic consequences are discussed.

Le présent document constitue l'une de quatre études de cette Série consacrée à la libéralisation financière, avec celles de Miller et Weller, de Kupiec et de Blundell-Wignall et Browne. Son objet principal est d'évaluer jusqu'à quel point les marchés de crédit déréglementés continuent à être affectés par d'importantes imperfections de fonctionnement. Il s'attache, en particulier, à rechercher dans quelle mesure il subsiste des obstacles au fonctionnement parfait des marchés de crédit et quelles en sont les implications pour l'allocation des ressources et les mécanismes de transmission de la politique monétaire. Il traite, en outre, du rôle qui revient à la déréglementation dans la fragilité et l'instabilité des marchés financiers et des conséquences macro-économiques qui en résultent.

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This paper was prepared while the author was working as a consultant to the Monetary and Fiscal Policy Division of the OECD. The author would like to thank Jean-Claude Chouraqui, Frank Browne, and participants at the October 1990 meeting of the Working Party No. 1 of the Economic Policy Committee for their valuable comments. The views expressed are those of the author, however, and do not necessarily represent those of the OECD or of the governments of its Member countries.

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I. INTRODUCTION

For some time the OECD and the monetary and financial authorities of many of its member countries have been advocating the removal of direct controls in financial markets. The main motivation for seeking this reform, and for its widespread implementation, has been the belief that deregulated financial markets allocate capital in the most efficient way possible. It was also expected that the achievement of greater efficiency in financial markets would lead to improved macroeconomic performance. Central to the perceived gains from deregulation has been the expected improvement in the efficiency in credit markets, notably in the reduced incidence of credit rationing. At the same time it was widely recognised that the formulation and implementation of monetary policy might become more difficult. It has been claimed that deregulation has involved other costs also, in particular that it has contributed to increased financial fragility and instability.

The purpose of this paper is to evaluate the extent to which deregulated credit markets continue to be marked by important imperfections which can frustrate the goals of credit market deregulation. In particular the paper focuses on the extent to which rationing continues to be present in credit markets and its implications for credit allocation and the transmission of monetary policy. In addition, the role of deregulation in financial market fragility and instability and the macroeconomic implications of such phenomena are also examined.

The rest of the paper is organised as follows. Section II provides a short overview of the theory of credit rationing in deregulated financial markets. Section III examines the implications (micro and macro) of credit rationing. Section IV contains a review of some recent empirical evidence on credit rationing. Section V takes up the issue of financial fragility and its links with deregulation and financial structure. Some concluding comments are given in Section VI.

II. CREDIT RATIONING IN DEREGULATED FINANCIAL MARKETS

Credit is said to be rationed when the rate of interest on loans or the non-interest terms of loan contracts do not adjust to maintain equality between the ex ante demand and supply for loans (1). Credit rationing can either be temporary (disequilibrium) or permanent (equilibrium).

A. Disequilibrium credit rationing

Disequilibrium credit rationing arises when there are temporary obstacles to the immediate full adjustment of loan rates to market-clearing levels. Such obstacles include political pressures against interest rate changes, usually against interest rate rises, institutional controls on the frequency and speed with which interest rates can be changed, such as legal requirements for advance notification of changes in interest payments, and administrative and advertising costs associated with posting new interest rates. These factors can lead financial intermediaries to respond sluggishly to changes in market conditions. However, the more permanent the changes in market conditions are expected to be the more likely it is that interest rates will be adjusted to market-clearing levels.

The mere sluggishness of interest rate terms on loans is not, however, sufficient to bring about disequilibrium credit rationing. The scope that lenders have for raising the effective cost of borrowing by changing the non-interest terms on loans, such as collateral requirements and compensating balances, must be limited also. If non-interest terms can be adjusted rapidly, equilibrium may be maintained without necessitating interest rate adjustment. Also, if there are substitutes for the loans from regulated lenders, instead of leading to credit rationing, market intervention may simply alter the pattern of financing between intermediated and non-intermediated loans, between domestic and foreign loans and between debt, equity and retention of profit. Unless market intervention is sufficiently comprehensive, so that financing can effectively be limited to the controlled sector, credit rationing may not prove to be important or long lasting.

B. Equilibrium credit rationing

Equilibrium credit rationing may arise even in fully deregulated credit markets if financial intermediaries, when faced with excess demand for loans, have no incentive to choke it off with higher interest rates. The main source of this free-market credit rationing is the imperfect information that lenders have about the quality of borrowers and the projects that they are proposing to invest in and the incentives that borrowers have to misrepresent the true risks associated with their investments. Faced with high costs of gaining more information by monitoring borrower activity, lenders may impose their own ceilings on the amount of lending that they are prepared to undertake to particular classes of borrower, irrespective of the rate of interest that they can charge. This type of credit rationing is likely to be most severe where intermediaries perceive that raising debt service costs to lenders will increase the likelihood of default and, thereby, reduce the expected return on the loan portfolio. Such rationing may be permanent and, therefore, an equilibrium phenomenon, in the sense that it can be expected to persist as long as limited information exists in the loan market. A fuller discussion of the role of limited information and other factors in generating equilibrium credit rationing is contained in the annex.

C. Financial market structure and credit rationing

Financial institutions in Japan and Germany differ significantly from those in the United States and the United Kingdom in the extent to which they are permitted to acquire large equity as well as debt holdings in firms and the extent to which financial institutions are allowed to be involved in the management of firms to which they lend. In Japan and Germany financial institutions can hold large equity stakes in the firms they lend to and can have representatives on the boards of firms which are loan customers. The relationship between financial institutions and firms in the United States and the United Kingdom is, on the other hand, a much more "arms length" one. In particular, commercial banks cannot hold large equity stakes in firms on their own account and have less direct involvement in the management of firms.

In the present context, this marked difference in underlying financial structure raises the question of associated differences in the importance of market based credit rationing. In the more bank-orientated systems of Japan and Germany it might be expected that banks could better monitor, and even

control, the activities and performance of their loan customers and thereby reduce the risk of making inefficient rationing decisions, both because the banks have more information about the risks associated with firms' investment projects and because the agency costs arising from conflicts of interest between shareholders and debt holders can be minimised.

Diamond (1984) and Ramakrishnam and Thukor (1984) argue that, where there are information asymmetries, raising capital by issuing public debt or equity may be more inefficient than borrowing from a financial intermediary like a bank, because, in the former case, monitoring costs are duplicated across individual suppliers of credit or monitoring has the feature of a public good which no individual will have the incentive to provide. The availability of private information to firms may mean that equity will be underpriced and make firms reluctant to issue equity and may induce them to forego profitable opportunities that would be exploited if internal funds were available. In these circumstances, investment becomes liquidity constrained (see Myers and Majluf, 1984), i.e. dependent on profit retentions or the sale of quickly realisable assets.

If the task of monitoring firms' investment activity is delegated to financial intermediaries, agency costs can be reduced because of the expertise and knowledge that such institutions develop. Information asymmetries are likely to be lowest in situations where banks provide a substantial proportion of a firm's debt finance and at the same time have a large equity interest. Under these circumstances, it will be in the interests of the bank to ensure that managers make efficient business decisions. At the same time if firms need new capital it should be possible to persuade the bank to provide funding for sound investment projects. With such bank-oriented financing, investment should not be liquidity constrained.

The incentive to closely monitor and control firms' investment activities associated with bank-oriented financing may also help to mitigate the agency costs associated with conflicts of interest between equity holders and debt holders that can occur in market-oriented financial systems, and thereby reduce the cost of capital to firms. Jensen and Meckling (1976) and Myers (1977) have identified ways in which equity holders can appropriate wealth from debt holders.

One way is for the firms, which it is assumed are controlled by the equity holders, to use debt finance, which has been acquired on the promise that it will be used for low-risk investment, for higher risk projects. This will lower the value of bonds and raise the value of equity. This is the sort of effect that is found in management buy-out and leveraged buy-out situations. Another way is to reject profitable investment opportunities if most of the benefit accrues to debt holders. If the issue price of debt is based on the assumption that profitable projects will be undertaken, wealth is transferred from debt holders to equity holders by this under-investment. If debt holders are aware of these incentives the higher will be the cost of debt finance. The agency cost effects on the cost of debt finance should be reduced in situations where debt holders can also be major shareholders, and, thereby, influence firms' investment activities.

It is perhaps worth noting here that bank-orientated financial systems may give lenders power to go beyond merely reducing the informational advantage of borrowers and to introduce alternative agency costs less present in

market-orientated financial systems. In the former system if financial intermediaries incur significant monitoring costs they may try to recover these from the non-institutional equity holders who free ride on the monitoring role of institutions. They may be able to do this by using "insider" information to make profitable trades in shares with less well-informed "outsider" holders of shares or to use their influence and control of firms to lend larger amounts, at higher than market rates, than is consistent with the efficient management of firms. The later possibility suggests that credit markets in bank-orientated systems might be prone to "credit pushing" rather than credit rationing.

III. IMPLICATIONS OF CREDIT RATIONING

In this section the microeconomic and macroeconomic implications of credit rationing are examined.

A. Microeconomic implications of credit rationing

i) Welfare implications

If credit rationing is a significant feature of financial markets in OECD countries, does this imply anything about the efficiency of credit markets? The answer depends largely on the source of credit rationing. When rationing results from the imposition of constraints by the authorities on interest rate setting, say, for political reasons, it may well imply that the market will operate at a lower level of allocative efficiency than if left unfettered. Though this may only be the case if market intervention is not correcting for some form of credit market failure.

In the case of deregulated credit markets the interpretation that should be put on rationing is less clear. One view is that the existence of rationing in free markets is evidence of market failure which justifies corrective intervention by the authorities. An alternative view is that rationing, whether of an equilibrium or disequilibrium nature, either does not occur or is an efficient response to the costs of imperfect information and adjustment costs and that attempts to eliminate it by direct intervention will lower welfare.

Theoretical support for the market-failure view of equilibrium credit rationing rests on being able to demonstrate that, from the welfare point of view, there is too little or too much lending at the credit-rationed equilibrium. The potential non-optimality of equilibrium has been demonstrated by De Meza and Webb (1987) in the context of the Stiglitz-Weiss model. They show that depending on the relationship between the supply of funds to lenders and the rate of return from borrowers there can be too little or too much lending.

As explained in the annex, under-investment can arise in rationed equilibria because adverse selection causes projects which are poor from the point of view of the lender to drive out good projects. This result depends on borrowers differing only by the riskiness of the projects they wish to finance. Low risk investors withdraw from the market when the rate of interest rises. If projects differ in their expected returns good projects may tend to draw in bad projects.

Other theoretical studies have, however, demonstrated that credit rationed equilibrium can be optimal. Williamson (1986) and Keeton (1979) have developed models in which individuals cannot borrow as much as they would like for given loan-contract conditions but where such rationing is optimal in that it prevents over investment in risky projects due to limited information on the part of the lender.

ii) Policy implications

Given the existing financial structures of OECD economies, if free-market credit allocation can be proved to be efficient in welfare terms does this mean that there is no scope for welfare-enhancing policy interventions? Clearly the answer depends on whether any direct controls remain in credit markets and whether the underlying financial framework is one that is consistent with minimising market imperfections. There must be a presumption that remaining direct interventions, in the form of interest rate controls, loan subsidies and guarantees and loan ceilings, unless they are targeted at removing or correcting for known free-market failure, will be welfare reducing and, therefore, that their removal will improve the allocation of capital.

Even if credit allocation is efficient given the "rules of the game" scope may exist for adopting "better" rules. In the current context the question arises whether the importance of Stiglitz-Weiss information based credit rationing could be lessened by allowing lenders to have a more direct role in the management of the firms that they lend to. Could agency costs associated with asymmetric information in the United States and the United Kingdom be reduced significantly by allowing the type of equity and management involvement with corporate borrowers that intermediaries in Japan and Germany are permitted? Prima facie it would seem that banks in Japan and Germany can exercise significantly more control over the firms that they lend to and also, because of their "insider" role as equity holders, have superior knowledge about the investment activities of these firms.

Assuming that asymmetric information based credit rationing is important, and remains important, because the costs of monitoring and controlling borrower activity prohibit the complete elimination of the lender-borrower information gap, what types of intervention could reduce this source of inefficiency? Stiglitz and Weiss (1981) have suggested that an interest rate ceiling could reduce the importance of credit rationing. The rationale for this type of intervention is that the participation of low-risk borrowers would be maintained at a high level and reduce the risk of lenders' loan portfolios. Ordover and Weiss (1981) have proposed that all banks be required to lend to all borrowers at some rate of interest. But this could lead to inefficiently high lending and investment levels or prohibitively high interest rates. Mankiw (1986) has advocated the use of credit subsidies in the form of loan guarantees, which effectively make the loan rate a risk-free rate for the lender.

A common experience in many OECD countries is the existence of classes of potential borrowers who cannot obtain loans in private credit markets but who are deemed to be engaged in socially useful activity. Students, small businesses and farmers are examples of such classes of "rationed" borrowers.

Such potential borrowers may be "rationed" out of private markets because individually they are regarded as being involved in activities with high default rates (small businesses and farming) or involve unusually high administrative costs relative to loan size (students). Again this could lead to "excessive" lending

While the expected social benefits of these activities are high in the aggregate, especially over the medium to long term, at the individual level the expected value may be low, especially in the short run. Under these circumstances, individual lenders in competitive credit markets will tend to avoid such loans, but would, nevertheless, prefer other lenders to provide loans, from which they may stand to benefit via economy-wide improvements in productivity and economic activity. The overall result is that private investment in such activity falls below the social optimum level.

OECD governments have attempted to overcome this type of inefficiency in private credit markets by intervening directly to provide loans targeted to those who are denied access to private credit. Usually, such credit is made available on more favourable terms than can be obtained by unrationed borrowers in the open market. Gale (1989) has developed a model (with asymmetric information) in which targeted credit assistance reduces welfare by increasing the overall level of rationing. One source of this higher level of rationing is higher levels of open market rates that result from government financing of credit programmes; this may lead to crowding-out, on a more than one-to-one basis, in the private credit market. Gale has shown that, within his model, this inefficiency can be avoided if loan subsidies are not targeted but are available to all borrowers.

Most of the policy recommendations for overcoming the social inefficiency of credit rationing are second-best solutions. They usually involve measures which lead to a general expansion in the supply of credit rather than to a more efficient allocation of the existing supply of credit. In general terms, allocation of a given supply of credit can only be improved by reducing the importance of the sources of agency costs. In the context of asymmetric information induced credit rationing this involves measures to reduce the information gap between lenders and borrowers. This may be achieved by allowing financial structures which permit direct monitoring and control of borrower activity by lenders, as is possible in bank-orientated financial systems, or by developing effective screening devices which can separate-out loan applications into the correct risk classes. This latter development may involve the introduction of contract terms which reduce the incentives to borrowers to understate risks.

It is worth noting that attempts to overcome rationing in the ways mentioned above may create new agency costs. Financial systems which permit lenders to hold high equity interests in the companies they lend to and to participate in the management of companies, if this activity is not sufficiently diversified, may simply transform the agency costs which arise from conflicts of interest between banks and firms into agency costs associated with conflicts between banks and their depositors. Obviously, this is more likely to happen in banking systems which are not very competitive, or where opportunities to securitise loans are limited. In addition, the use of screening devices, such as collateral requirements, will create an inefficiency if the collateral is of more value to the borrower than the lender.

B. Macroeconomic implications of credit rationing

Interest in credit rationing as a phenomenon of macroeconomic significance stems mainly from its potential importance in the transmission of monetary policy to the real sector of the economy. In circumstances where interest rates do not adjust rapidly, or at all, to clear the loan market, changes in the availability of loans may have a direct impact on the level of expenditure.

In the 1950s the practice of imposing ceilings on interest rates raised questions about the efficacy of monetary policy. In free markets interest rates are potentially important channels for the transmission of monetary policy: if monetary policy can influence interest rates, especially long-term interest rates, the cost of capital can be influenced and, thereby, investment expenditure; consumer expenditure may also be influenced by changes in the short- and medium-term cost of finance. Interest rate ceilings remove this potential cost of finance/cost of capital channel. Adherents of the so-called "availability doctrine" argued, however, that, far from weakening the effects of monetary policy, interest rate ceilings could increase the influence of monetary policy on expenditure by bringing into play powerful credit availability effects (Roosa, 1951). Thus the effect of interest rate controls was seen as substituting a quantity transmission mechanism for a price transmission mechanism.

The gradual removal of interest rate ceilings and quantitative restrictions on lending and their replacement by market-methods of monetary control raised the prospect that in such deregulated financial systems credit availability would no longer play a direct role in determining aggregate expenditure and that the authorities would have to rely on the strength of "price" effects, such as interest rates and exchange rates, in order to influence expenditure. This view rests on the assumption that in deregulated financial markets interest rates will always adjust sufficiently rapidly to clear markets. It ignores the possibility that market-based sources of interest rate inertia might be present.

If capital markets exhibit Stiglitz-Weiss-type information imperfections, or there are costs of adjustment which make loan rate adjustment to market rates sluggish, then monetary policy may be effective in influencing real economic activity. For example, a contractionary open market operation, in which the central bank sells bonds, will limit the loans that banks can make, and cause curtailment in investment activities. For these effects to be avoided prices would have to be perfectly flexible or there would have to exist an ample supply of close substitutes for bank loans (Blinder and Stiglitz, 1983). Price rigidity is widely accepted as a stylised feature of contemporary OECD economies (see Chouraqui *et al.*, 1989) and only larger firms have access to commercial bond markets and to foreign capital markets. Though in deregulated financial markets it might be expected that the emergence of a significant pool of "rationed" borrowers would create pressure for the development of new financial instruments or the development of pathways to existing but not formally universally accessible sources of credit.

Mankiw (1986) argues that equilibrium credit rationing can have dramatic implications for restrictive monetary policy. In models with full information or limited but symmetric information restrictive monetary policy moves the

economy smoothly along the marginal efficiency of capital curve. In models with Stiglitz-Weiss asymmetric information, credit markets that can be operating efficiently at a given interest rate can disappear if interest rates are increased, driving out socially beneficial investment. This discontinuous nature of the relationship between credit demand and interest rates can cause restrictive monetary policy to lead to financial collapse. Mankiw suggests that such discontinuities may underlie the propensity for financial market instability and collapse documented by Kindeleberger (1978).

It should be mentioned here that many of the policy interventions that have been recommended to overcome credit rationing -- interest rate ceilings, loan guarantees, loan subsidies etc. -- and achieve a more socially efficient level of investment involve an expansion in the level of credit. This implication of many of the policy recommendations may conflict with macroeconomic objectives, especially the objective of price stability. There are probably few OECD countries that would view the aggregate level of lending in their credit markets as being insufficient. Interventions which have credit expansion implications are, therefore, unlikely to appear attractive. But the leverage over expenditure that credit rationing may provide is a welcome support to monetary policy. Under market-based equilibrium credit rationing interest rates may have potentially powerful effects on expenditure, not through their influence on the cost of capital but rather on limits that are placed by lenders on the availability of loans.

IV. EMPIRICAL EVIDENCE ON CREDIT RATIONING

Despite the potential importance of credit rationing there has been a paucity of empirical studies testing for its existence and attempting to quantify its macroeconomic significance. One reason for this has been the lack of suitable microeconomic data with which to undertake direct tests of credit rationing. Ideally panel data, detailing the precise terms of lending contracts, should be used. Although there is one recent example of such a study of credit rationing employing micro-data (discussed below), such data are not generally available. Another possible reason for the comparative neglect of the empirical evaluation of credit rationing may have been the widespread presumption that deregulation of financial markets would render this phenomenon obsolete, leaving asset prices and expectations to play the major roles in the transmission of monetary policy.

A. Evidence with macro data

Most of the evidence on credit rationing using macroeconomic data has been based on attempts to test the central implication of credit rationing, namely that there is inertia in the lending rate in relation to the open market rate. The speed of adjustment in lending rates to changes in market rates has been the main focus of this work. In early work on the United States, Goldfeld (1966) and Jaffee (1971) reported significant inertia in the commercial loan rate. However, more recent studies by Solvin and Sushka (1983) and King (1987) for the United States, Martin (1990) for the United Kingdom and Artus (1984) for France have found the loan rate to be less sticky and the supply of loans to be relatively sensitive to the loan rate, contradicting the rationing hypothesis. But Berger and Udell (1989) have questioned Solvin and Sushka's interpretation of their own results, claiming that the reported statistical

evidence reveals significant loan rate inertia. Also Sofianos, Watchtel and Melnik (1989) claimed that King's rejection of credit rationing was based on his failure to distinguish between loans that are contractually "committed", and therefore insulated from rationing, and other "non-committed" loans; they found evidence of rationing for "non-committed" loans. The proportion of loans made under commitment is high. For example, in the United States over 70 per cent of commercial and industrial loans are made under commitment. It is perhaps also worth noting a feature of King's results not mentioned by him, namely that the elasticity of loan supply with respect to the loan rate of interest declines over the most recent period, suggesting that, even if credit rationing is not becoming more important, the rate of interest is playing a less direct role in the allocation of credit.

In contrast with the inconclusive macro-data evidence for rationing in the market for commercial and industrial loans, evidence from studies of the residential mortgage market has tended to be more consistent in its support for rationing [see Jaffee and Rosen (1979), Kent (1980) Rosen and Rosen (1980) and Duca and Rosenthal (1989) for the United States; Anderson and Hendry (1984), Wilcox (1985) and Hall and Urwin (1989) for the United Kingdom and Browne (1988) for Ireland]. One possible reason for this stronger evidence of rationing in the mortgage market is the more limited opportunities that the personal sector have for alternative finance. In some countries, notably the United States and the United Kingdom, mortgage lending was until recently the preserve of specialised institutions -- Saving and Loan Associations in the United States and Building Societies in the United Kingdom -- which were segmented from the rest of the loan market. Deregulation has increased competition in ways that should reduce the incidence and severity of rationing (assisted also in the United States by FHA mortgage insurance and the development of a secondary market for mortgages in the United States and the development of mortgage lending by banks in the United Kingdom).

One problem with tests of credit rationing based on identifying loan rate inertia or interest-inelastic loan supply is that confirmation of such phenomena, while consistent with credit rationing, is not sufficient to establish the existence of credit rationing. Interest rate inertia may be consistent with risk sharing between lenders and borrowers (see Fried and Howitt, 1980). Borrowers obtain below market rates when rates are high and in exchange lenders get above market rates when interest rates are low. Such risk sharing may mean, however, that non-repeat borrowers and new borrowers may be rationed. Loan recontracting aimed at avoiding insolvencies may also account for loan-rate inertia while not implying rationing (Sharpe, 1988). When high market rates threaten loan default the return on loans to distressed borrowers may be increased by lowering rates or not increasing them by the full extent of the increase in market rates. Another problem with existing tests of credit rationing using macro-time series data is that the data samples used often include periods when there were administrative controls on interest rates and alternatives to bank loan finance and mortgage finance from specialised institutions were not well developed. The recent deregulation of financial markets and the development of alternatives to loans from traditional sources and greater competition weakens the relevance of such tests as a guide to current circumstances.

B. Evidence with microeconomic data

Berger and Udell (1989) used the Federal Reserve Survey of the Terms of Bank Lending, which contained detailed information on the contract terms of over one million loans made between 1977 and 1988 in the United States, to undertake more direct tests of credit rationing than is possible with macroeconomic data. They find evidence to support earlier macro-data studies which report significant loan-rate inertia. Unlike earlier studies, however, they were able to carry out further tests aimed at establishing the meaning of this inertia, whether it is explicable by rationing or not. When a number of non-interest rate features of loan contracts are taken into accounts this "...suggests that most of the stickiness (in loan rates) is not in fact symptomatic of credit rationing" (Berger and Udell, 1989, p. 25).

A more definitive test of the significance of credit rationing undertaken by Berger and Udell exploited the availability of disaggregated data in the Bank Lending Survey which distinguishes between "committed" and "non-committed" loans. A committed loan is an extension of credit which occurs through the exercise by the borrower of a forward contract in which the lender agrees to extend credit on request up to some specified amount, and possibly over an agreed time period. Such overdraft facilities provide borrowers with insurance against rationing that arises from changes in general market conditions (2). If rationing is important the proportion of total loans accounted for by committed loans should rise as market rates of interest rise. The reason for this is simply that borrowers who do not have an overdraft facility will be rationed, but those borrowers with such commitments will not be rationed. Berger and Udell find that market interest rates have only a weak effect on the proportion of committed loans suggesting that credit rationing is of little macroeconomic importance.

V. FINANCIAL MARKET STABILITY AND FINANCIAL FRAGILITY

In recent years OECD countries have experienced a number of episodes of financial market instability which have threatened to undermine continued economic recovery. Failures of depository financial intermediaries, notably in the United States and the global stock market breaks of 1987 and 1989 are notable among these episodes. Some observers of financial markets claim that there has been a marked increase in all forms of financial instability. If this observation is accepted the question arises: how can we account for financial market instability and for its secular rise in the post-war era?

Although it is possible to identify a number of potential contributory causes for each individual episode an idea has recently emerged that there is a common underlying force at work, namely financial fragility. A financially fragile situation is one in which the non-financial sectors in the economy find it difficult to meet debt repayment commitments and, as a result, lending institutions face increased defaults. Financial fragility measures the extent to which the financial system is vulnerable to financial instability, but is itself not to be equated with financial instability. Financial fragility increases the likelihood of financial shocks and the likelihood that shocks will lead to financial instability and crisis.

A. Sources of increased financial fragility

Three potentially important sources of financial fragility can be identified. First, the growth of debt financing over the business cycle. Second, the reduced liquidity of corporations and financial institutions. Third, changes in institutional and regulatory structures associated with financial market deregulation (3).

As economic recovery and expansion proceeds experience shows that there is a tendency for firms to become more dependent on debt finance than equity finance, reflected in rising debt-equity ratios. Furthermore, the maturity of new debt tends to shorten and the balance sheet of firms becomes less liquid. As economic recovery falters profits decline and debt servicing becomes more difficult. In addition, declining profits make it difficult to finance essential ongoing projects out of internal funds, and so there is a need for further borrowing.

In such circumstances banks become increasingly reluctant to meet such "distress" borrowing as they expect to experience increased losses from loan defaults as the business climate worsens. On top of this understandable reluctance to incur losses, the ability of banks to meet loan demands has frequently been reduced sharply by the imposition of credit restrictions and in some cases, in the United States, for example, in the loss of depositor confidence following corporate or bank failure. The occurrence of such events has often precipitated a financial crisis and halted economic recovery. The imposition of credit restrictions by the authorities and loss of depositor confidence, though proximate causes of financial crisis in the corporate and banking sectors, are themselves responses by the authorities and the personal sector to the increasing fragility of the financial system.

The development of financial fragility over the business cycle in the way described does not explain why financial fragility should have become a more prominent feature of a number of OECD countries, in particular why it should have become so marked in the 1980s. A number of secular changes in the institutional and regulatory framework may have played a role.

The traumatic experience of financial crisis in the 1920s and 1930s led to the development of financial systems that were highly regulated and to conservative attitudes towards debt. By the early post-war period war-financing had left the private sector with a low level of debt and in a highly liquid position. The liquidity of financial institutions was also high as a result of high levels of government securities that had been built up.

The robustness of the financial system immediately after the War meant that systemic instability was unlikely to develop. Internal financing did not rely heavily on profits; holdings of securities could be liquidated as a secondary source of finance. Even when debt finance had to be resorted to, banks had little difficulty in meeting this in the absence of direct lending restrictions. The Bretton Woods system of fixed exchange rates, with the dollar providing the anchor for price stability, and the low level of capital mobility, which helped to make interest rate stability possible, added to the robustness of the financial systems of OECD countries.

As OECD economies expanded rapidly in the post-war period a number of the underpinnings to financial robustness began to unwind. Attitudes to debt became less conservative and debt financing became more important. At the same time corporations and financial institutions began to run down "excess" holdings of comparatively low yielding government securities, thereby diminishing the liquidity of their asset portfolios. These developments alone tended to make corporations more dependent on retained profits for finance and made it more difficult for banks to easily meet "distress" borrowing should they wish to do so. Firms responded to the new circumstances by trying to establish guaranteed lines of credit with banks, an objective more easily met by large corporations than small firms. Banks responded to the inflexibility caused by reduced liquidity by innovating in liability management, in particular by developing various forms of purchased funds, such as negotiable certificates of deposit.

Arguably, the erosion of the large liquidity cushion of government securities, in pursuit of higher corporate and bank profits has increased the fragility of the financial system by increasing the reliance of firms on debt finance and by reducing the ease with which loan demands can be met immediately by banks. Also the collapse of the Bretton Woods system opened up a new area of uncertainty in international financial markets, as did the gradual dismantling of other credit market controls, including interest rate ceilings. Sharp adverse movements in interest rates and exchange rates created new reasons why firms might be forced to seek additional temporary debt finance. Variable rate loans mean that the level of debt service costs are uncertain and also that near the peak of the business cycle such costs are likely to be rising at the same time that corporate profits are declining.

The dismantling of controls and regulations on the cost and availability of finance, in pursuit of more competitive and more efficient financial systems, has meant that the authorities have had to rely more on macroeconomic policy to stabilise financial markets and mitigate the effects of financial disturbances on the real sector. The lender-of-last-resort role of central banks has taken on a heightened importance in the new financial environment. The reliance on the emergency provision of liquidity to markets by the authorities and on macroeconomic policy to sustain confidence in the face of financial market instability is personified by the behaviour of the United States Federal Reserve following the 1987 Stock Market "break". These policies have generally been adjudged a short-run success; despite the gyrations that have been experienced in asset prices and interest rates and exchange rates, OECD economies have enjoyed continuous growth since the early 1980s.

However, the very success of macroeconomic policy may have added to the financial fragility of financial systems in the medium term. By preventing bankruptcies and financial collapse such policies have avoided the need to resume economic growth on the basis of a lower level of outstanding debt. Moreover, the use of the lender-of-last-resort provision and expansionary monetary and fiscal policies to reduce the spill-over effects of financial instability may have the effect of inducing the moral hazard of encouraging corporations and banks to take "excessive" risks and to rely more heavily on debt finance. The underwriting of the liquidity of the financial system by the authorities further removes the need for corporations and financial institutions to maintain liquidity positions that are, of themselves, capable

of coping with financial instability. In these ways the increased reliance on macroeconomic policy has contributed to the fragility of the financial system and reduced the ability of credit markets to cope with instability.

Deregulation of cross-border trade in financial assets and the resulting growth in the globalisation of financial markets has contributed to increased financial fragility. This has meant that national financial systems are affected by surprise events which occur in other countries as well as the home country and can import financial instability from abroad. The developing country debt crisis and the stock market breaks are good examples of how global financial intermediation and global asset trading have made financial fragility and financial instability into international phenomena.

B. Corporate debt and financial fragility

A number of indicators of financial fragility have been used to assess the exposure of financial markets to crisis. Most of these indicators relate to the "gearing" or "leverage" of whole economies or major sectors of the economy. In the context of OECD countries, most attention has recently focused on changes in the leverage and gearing of the non-financial corporate sector. Levels of government debt in OECD countries, though a cause for concern, mainly because of the effects that the growth of such debt might have on borrowing costs and on inflation expectations, have not been viewed as risking sovereign default in the way experienced in third world countries. Also, personal sector gearing ratios have tended to be lower and more stable than in the non-financial corporate sector, though there have been some noticeable rising trends in the 1980s.

Table 1 shows the recent development of the ratio of gross debt to total assets of non-financial corporations, a commonly-used measure of leverage in the major OECD countries. What this reveals is that there is a marked difference in corporate leverage between groups of countries. The United States, the United Kingdom and Canada have significantly lower levels of leverage than Japan, Germany and France. In most countries leverage has remained stable or declined since the early 1980s. Only in the United States has there been a marked and sustained increase in corporate leverage in the recent past. It is this development which has raised concern in some quarters [see Kaufman (1986) and Friedman (1986)].

A number of factors have played a role in this recent rise in corporate debt equity ratios. First, it is well-accepted that tax deductibility for interest payments but not dividend payments biases corporate finance in favour of debt and that recent changes in the U.S. tax code have enabled corporations to further reduce their after-tax cost of capital by switching from equity to debt finance. Second, supply shocks in the commodity and energy sectors and widespread deregulation, by increasing uncertainty, may have increased agency costs associated with limited information. Debt financing may help to mitigate these costs. Third, these supply shocks and deregulation altered relative prices and created pressures for the restructuring of real assets. These pressures provided opportunities for the introduction of new debt instruments such as "junk bonds" and marketable loans. Arguably, without the development of new debt instruments many leveraged buy-outs could not have occurred and the pace of corporate restructuring would have been much slower as firms found themselves liquidity constrained and unable to exploit positive net present

value investment opportunities. Fourth, reform of merger guidelines in the early 1980s eased restrictions and encouraged take-overs, which were often financed by debt.

The sort of macroeconomic-downturn scenario that has been envisaged by those who have expressed concern about the rising level of U.S. corporate debt is as follows (see Bernanke and Gertler, 1989, 1990): an adverse supply or demand shock reduces the net worth of corporations and, thereby, reduces their collateral and, hence, their ability to borrow; investment becomes dampened as liquidity and profits fall, propagating the slowdown in economic activity caused by the supply shock; in extreme cases leading to the type of debt-deflation induced depression envisaged by Fisher (1933). Such scenarios assume that the monetary and financial authorities will not intervene to supply markets with liquidity and prevent the cost of capital from rising, or that firms will not be able to raise loans directly in the capital market. While the argument that firms that find themselves rationed from debt markets will also be rationed from equity markets seems reasonable [see Mayers and Majluf (1984) and Greenwald, Stiglitz and Weiss (1984)], the idea that the monetary authorities would not exercise their role as lender-of-last-resort to avoid a large wave of potential bankruptcies seems, on the basis of recent experience, unlikely. The outcome is more likely to be inflation, stemming from the monetary authorities attempts to offset the adverse effects of macroeconomic shocks on the net worth of borrowers (see Friedman, 1990). This is likely to be the case despite the possibility that this may increase financial fragility in the future because inflation will increase the tax advantages of debt financing.

The main immediate problem for the authorities is to distinguish between firms which are solvent but temporarily illiquid because of an economy-wide shock and those that become insolvent because of firm or industry-specific factors (see Goodfriend, 1989).

If high corporate leverage adds to financial fragility the question arises: why has financial market instability tended to be more a feature of some low-leveraged countries like the United States rather than in some high-leveraged countries like Japan and Germany? One possible reason that has been suggested is that in Japan and Germany a high proportion of corporate debt is in the form of borrowing from banks (see Table 3) and that at the same time the banks exercise a higher degree of monitoring and control over firms' activities in these latter countries. Hoshi *et al.* (1989) report evidence showing that firms which rely heavily on bank finance in Japan have exhibited investment behaviour which is less sensitive to changes in liquidity than firms which have reduced their reliance on bank finance in favour of raising money directly from the capital market. This suggests that access to finance at times of distress may be more limited in market-orientated financial systems like that of the United States.

The increased leverage in the United States has been associated with a wave of mergers, leveraged buy-outs, defaults and the corporate restructuring which has resulted in a significant substitution of debt for equity financing. Between 1984 and 1986, U.S. non-financial corporations borrowed \$800 billion and bought back \$425 billion of their own equity. One consequence of this substitution of debt for equity has been a gearing-up in corporate interest payments in relation to operating cash flow. Table 2 shows that after a sharp

increase in this ratio at the beginning of the 1980s, it has remained fairly stable since and even declined slightly in the recent past.

A clearer picture of the financial structure of the U.S. corporations is provided by Bernanke and Campbell (1988) and Bernanke, Campbell and Whited (1990) who use a microeconomic data base (the COMPUSTAT files) covering a large sample of firms. These data allow an examination of the distribution of debt-asset ratios in addition to the aggregate figures. The size of the upper tail of the distribution of gearing ratios arguably provides a better indication of the default risk in the corporate sector.

In the sample of firms examined by BCW over the period 1969-1986, there was little upward trend in the leverage ratio of debt to assets nor in the values of this ratio at the upper end of the distribution. In general, large increases in debt in the 1980s were matched by increased asset values. Set against this apparent lack of support for a deterioration in corporate financial structure, BCW nevertheless estimate that a recession of the size experienced in 1973-74 would now lead to unprecedented high debt-asset ratios and to the bankruptcy of more than 10 per cent of the sample of firms.

In an extended study similar to that of BCW, Warshomsky (1990) estimated that: if a severe recession were to occur, as many as 25 per cent of corporations, corresponding to as much as 16 per cent of total corporate assets, would be placed in severe financial straits, given the financial structure existing in 1988.

The concerns that might be drawn from these rather startling simulation results should be tempered by the expectation that the greater efficiency of the financial system may have reduced the probability of recession and the chance of any recession being as deep as those experienced at the beginning of the last two decades. If this has indeed been the effect of financial market liberalisation, and if the "long recovery" since the early 1980s has been a manifestation of this, then simulations based on historical data and historical structures may be irrelevant.

A longer view of corporate financial structure in the United States tends to suggest that the current use of debt financing during the 1980s is not abnormal. Chart 1 shows that debt financing has been no greater in the 1980s than during the 1961-1975 expansion. This observation, coupled with the observation that the debt to asset ratio in the U.S. corporate sector is lower than in the corporate sectors of other major countries, notably in Japan and Germany, where similar concerns about financial fragility do not appear to have been raised, tends to suggest that the U.S. economy has not become excessively fragile. This view is reinforced if account is taken of the relatively high holdings of financial assets in relation to bank debt by U.S. corporations (two to three times higher than that of other major economies) which, in book value terms, is more than twice that of the level of their indebtedness to banks. Furthermore, there has been a tendency for the average maturity of borrowing to lengthen. Some other indicators, however, offer a less optimistic picture as discussed below.

Summers (1988) has argued that, in the search for potential sources of financial fragility, the emphasis that has been placed on the non-financial corporate sector has been misplaced:

"Large corporations are a lightly levered sector of the economy. More problematic are the thrift institutions that are far under water and the money centre banks that have a substantial fraction of their capital still tied up in sovereign loans, and more of their capital tied up in leveraged buy-out financing and in real estate and energy loans. Other examples are real estate developers who need the proceeds from past sales to be able to undertake new construction. Still others are the farm and energy-producing areas of the country." (p. 104)

The argument that high corporate debt-equity ratios is detrimental to the health of the corporate sector has not gone unchallenged elsewhere. Jensen (1986), argues that the use of debt financing by firms and the substitution of debt for equity may improve corporate performance. Corporations that are involved in activities that generate substantial, what Jensen calls, "free cash flow" -- cash flow that is in excess of that required to fund all projects that have positive net present value -- may be less likely to follow efficient policies which are in the interests of the shareholders. He argues that free cash flow leads to unprofitable investment (i.e. projects which have a rate of return below the cost of capital) or waste on organisation inefficiencies. These agency costs can be reduced by debt financing.

Firms with free cash flow can pay out dividends or repurchase their own stock as an alternative to unprofitable investment. However, even if increased dividends are paid-out, future cash flow still remains under the control of the firm. Commitments to permanently raise dividends may not be credible because dividends can be reduced in the future. Also dividend reductions tend to cause sharp falls in stock prices and, therefore, represent another aspect of the agency costs of free cash flow.

Financing through debt creation enables firms to credibly commit to pay-out future cash flows. Thus, for the investor acquiring corporate debt can be a substitute for receiving dividends. But, unlike having claims on dividends, holders of debt can instigate bankruptcy proceedings if payments of principle and interest are not made. Debt, therefore, reduces agency costs by reducing the cash flow over which firms can exercise discretion. The threat caused by defaulting on debt service payments should also motivate firms to be more efficient. So rising debt-equity ratios may signal improved future corporate performance rather than greater fragility and instability.

If debt financing carries with it lower agency costs, then policies which encourage stock repurchases for debt, such as tax deductibility of interest payments, as in the United States, or leveraged buy-outs, should help to improve corporate performance. Generally the control role of debt will be more important in slow growing (low investment opportunities) firms that generate large cash flows. Such firms are likely to be the most desirable target for leveraged buy-outs. In fast growing firms with no free cash flow the monitoring and control role of debt can be carried out by equity markets when such firms go to the market to obtain capital.

C. Evidence on the role of financial fragility in financial instability

Although the idea that financial fragility may have an underlying role in the bouts of financial instability recently experienced in OECD countries,

obtaining orthodox econometric evidence on this issue is fraught with difficulties. First, the concepts of financial instability and financial fragility, especially when applied to the financial system as a whole, are difficult to define in a way that will make them amenable to measurement. Second, even if this definitional problem can be overcome, the likelihood that the data needed for econometric testing would be readily available would seem to be low. Undaunted by such obstacles, Wolfson (1989) has undertaken a pioneering study of the role of financial fragility in post-war United States. For empirical purposes he constructs an index of financial instability based on four time series: i) a one/zero dummy variable series for financial crises; ii) a measure of bank failures; iii) a measure of thrift institution failures; and iv) a measure of insolvent (but not failed) thrift institutions. This index when plotted over time has three important features (see Chart 2):

1. financial instability is low throughout the whole of the post-war period up to the mid-1960s;
2. from the mid-1960s a cyclical pattern emerges in financial instability rising sharply in recessions; and
3. the level of financial instability has remained high in the 1980s.

Wolfson (1989) constructs his measure of financial fragility from a measure of the difficulty that corporations have in servicing debt (the ratio of net interest payments to gross capital income) and a measure of defaults on bank loans -- the loan loss ratio (ratio of net loan losses to average loans outstanding). When plotted over time, this index exhibits a strong cyclical pattern -- rising in recessions -- overlaid on a secularly rising trend, which has steepened significantly since the mid-1970s (see Chart 2).

Formal econometric analysis using this measure of financial instability and the measure of financial fragility reported above revealed that the secular growth in financial fragility and its cyclical pattern could be explained by the interaction of corporate debt with interest rates and profits and that increasing financial fragility could explain the growth in financial instability. In keeping with intuition, interest rates are positively related to financial fragility and profits are negatively related.

In another recent study of financial structure and financial stability, Davis (1987) has examined the relationship between private sector debt/income ratios and loan default risk in major OECD countries. Overall, he finds that rising debt ratios raise the risk of default. However, he is at pains to point out that "in itself debt does not cause economic instability: ...increasing debt can be continually offset by changes in other variables. However, the greater the debt owed, the worse will be the consequences of falling income or a deterioration of other components of agents budget constraints as might happen in a recession" (Davis, 1987 p. 92). In other words, rising debt to income ratios are seen as exacerbating the financial stability of the economy. In extending Davis' work to France, Bordes and Melitz (1989) find further support for the idea that corporate insolvencies are induced by high debt to income ratios.

It is perhaps interesting to note here that despite a rise in the rate of corporate insolvencies in the United States there have been no major

corporate bankruptcies. One explanation for the finding that defaults have increased with rising debt-equity ratios in the recent past is that financial market deregulation has provided more opportunities for firms to start up and for small firms to expand using debt finance. So the association between defaults and debt-equity ratios may signal competitive vigour rather than potential instability.

Even if high levels of private sector debt do increase the fragility of the financial system and this is reflected in greater instability in financial markets, it is not clear that this has made the real sectors of OECD economies more unstable in practice in the 1980s or that the real sector will be more prone to instability and recession in the future. The long period of recovery since the early 1980s does not support the idea that a more robust financial system -- one in which the private sector holds high levels of liquid assets, issues little debt, and financial markets are less linked domestically and internationally and, therefore less prone to the systemic transmission of shocks -- would yield improved real economic performance. In previous decades when the financial system was arguably more robust, recessions were not avoided and were not less frequent.

VI. CONCLUSIONS

Financial market deregulation has been accompanied by developments which have raised new questions about the allocative efficiency of capital markets and economic stability. This paper has addressed two of these issues. The first issue concerns the importance of credit rationing in deregulated financial markets. The second issue concerns the effects of deregulation on the proneness of financial markets to instability and the risks that this poses for macroeconomic stability.

Though circumstances can exist in which free credit markets will exhibit credit rationing, evidence on its recent importance in practice is inconclusive. Though the existence of financial intermediation is itself evidence of credit market imperfections, it is not clear if these imperfections lead to under- or over-investment. Where there is a strong presumption of under-investment most policy recommendations aimed at overcoming this tend to involve a general expansion of credit which could conflict with stabilisation policy. Bank-orientated financial systems seem best equipped to overcome credit rationing and the agency costs associated with market failure resulting from asymmetric information.

Concerns have been expressed that financial market deregulation, by unleashing a wave of innovation, has enabled rapid growth to take place in debt financing which is making the financial system more fragile. Recently the main focus of this concern has been the rise in U.S. non-financial corporate debt. Close examination of debt equity ratios and other features of corporate sector financing reveal that this concern may be exaggerated and that there are other sectors of the U.S. economy that are potentially more problematic. Moreover, there are sound economic reasons for the growth in corporate debt and there are reasons, connected with the incentive effects of debt finance, for thinking that this should aid improved performance. If concerns about financial fragility turn out to be well-founded this is likely to make the U.S. economy more inflation prone than recession prone.

NOTES

1. Rationing by price is taken here to mean the elimination of excess demand via the adjustment of any or all aspects of loan contracts, including, for example, collateral requirements, and not more narrowly to cover rationing by interest rate alone. Adjusting the non-interest terms of loans may be a more profitable alternative for lenders than altering the rate of interest and, therefore, does not constitute "non-price" rationing in the sense of there being continuing excess demand in the market. Rationing refers to situations in which "borrower's demand is unfulfilled, although he is willing to pay the ruling market price (in a broad sense including all aspects of the loan-term vector)" (Baltensperger, 1978, p. 173). For a narrower usage of the term rationing, where excess demand is not eliminated by interest rate adjustment, see Guttentag (1960), Hester (1967), Luckett (1970), Harris (1974) and Otas and Zahn (1975). Altering the non-interest rate terms of loan agreements can eliminate excess demand by raising the effective price to the borrower.
2. It does not, however, offer a guarantee against changes in the conditions which affect individual borrowers. The continued availability of overdraft facilities may depend on there being no material deterioration in the circumstances facing borrowers.
3. The account in this section draws heavily on Wolfson (1989).

Table 1

RATIOS OF GROSS DEBT TO TOTAL ASSETS (a)
(Non-financial corporate sector)

Countries	1970	1975	1980	1985	1986	1987	1988
United States	0.45 (0.45)	0.45 (0.52)	0.44 (0.50)	0.48 (0.50)	0.50 (0.49)	0.51 (0.51)	-
Japan	0.85 (0.86)	0.85 (0.83)	0.84 (0.84)	0.81 (0.73)	0.81 (0.63)	- (0.59)	-
Germany	0.65 (0.72)	0.65 (0.76)	0.66 (0.81)	0.63 (0.71)	0.62 (0.70)	0.60 (0.77)	-
France	0.66 -	0.70 -	0.69 -	0.71 -	0.67 -	- -	-
United Kingdom	0.53 (0.51)	0.54 (0.64)	0.53 (0.63)	0.53 (0.52)	0.53 (0.48)	- (0.48)	-
Italy	0.66 -	0.68 -	0.65 -	0.68 -	- -	- -	-
Canada	0.54 (0.50)	0.61 (0.58)	0.59 (0.54)	0.58 (0.47)	0.57 (0.45)	0.57 (0.45)	-

a) Figures not in parentheses are book values and figures in parentheses are market values.

Sources: OECD Financial Statistics and BIS.

Table 2**INTEREST EXPENSES AS A RATIO OF CASH FLOW
UNITED STATES NON-FINANCIAL CORPORATIONS**

Year	
1969	0.12
1970	0.14
1971	0.13
1972	0.12
1973	0.12
1974	0.13
1975	0.15
1976	0.14
1977	0.14
1978	0.14
1979	0.14
1980	0.18
1981	0.21
1982	0.22
1983	0.18
1984	0.18
1985	0.18
1986	0.18
1987	0.17
1988	0.17

Source: Bernanke and Campbell (1988) and Bernanke, Campbell and Whited (1990).

Table 3

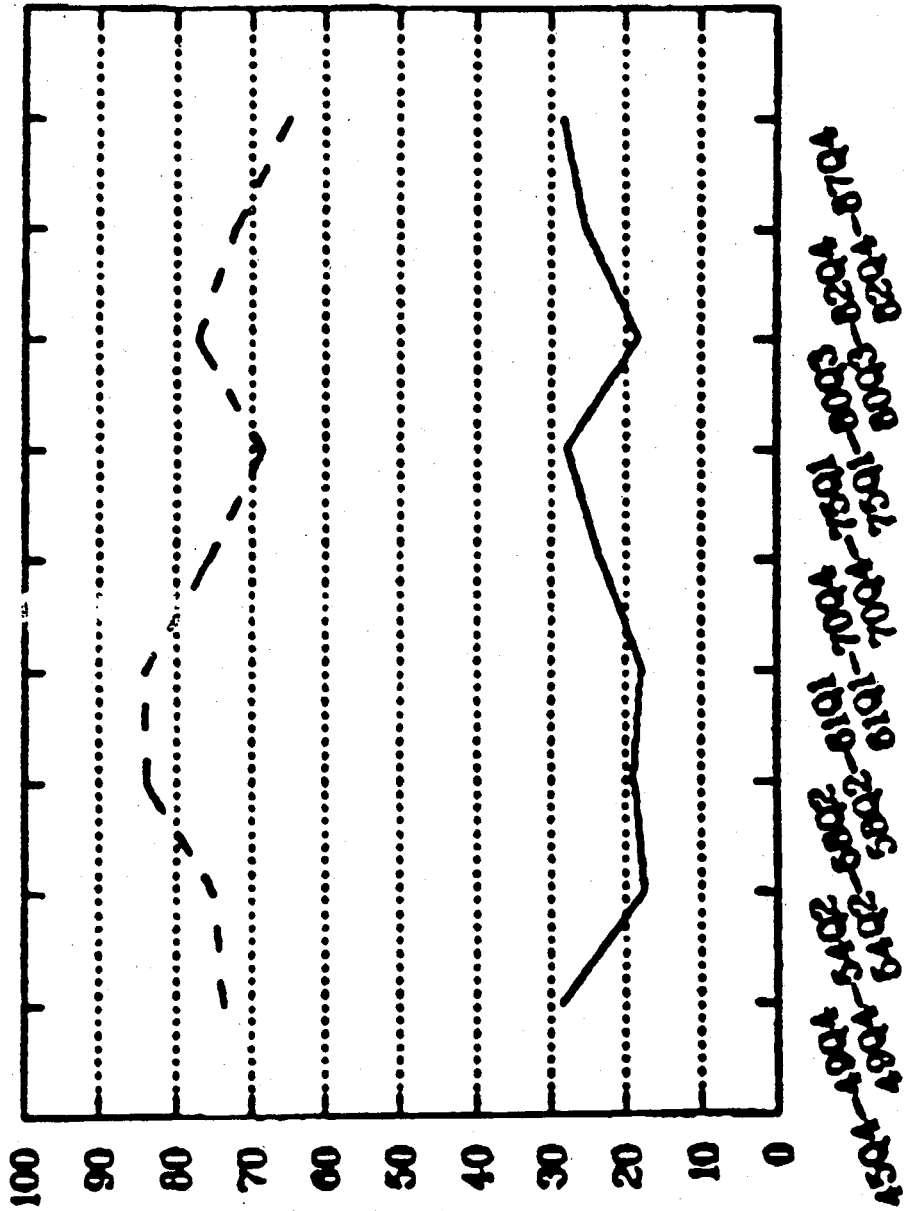
PROPORTION OF NON-FINANCIAL CORPORATE DEBT
SUPPLIED BY DOMESTIC BANKS IN MAJOR OECD COUNTRIES: 1985

Country	Percentage
United States	32
Japan	53
Germany	73
France	58
United Kingdom	62
Italy	56
Canada	40

Source: BIS.

Chart 1

DEBT AND EQUITY FINANCING OF U.S. NON-FINANCIAL CORPORATIONS: 1945-1987

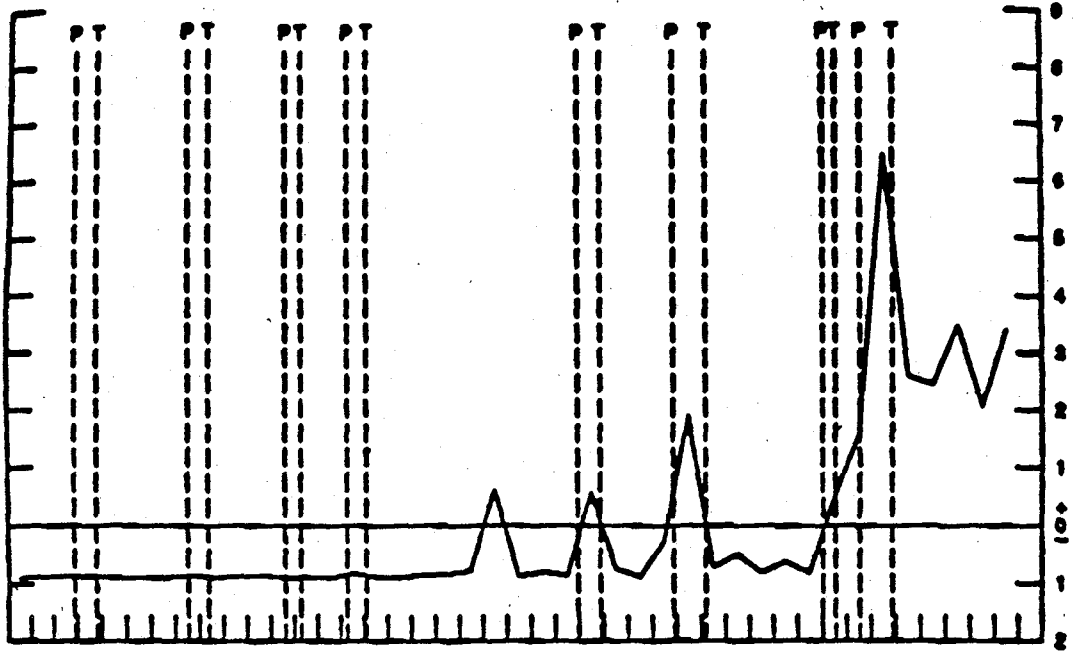


-- -- Equity
 ——— Debt

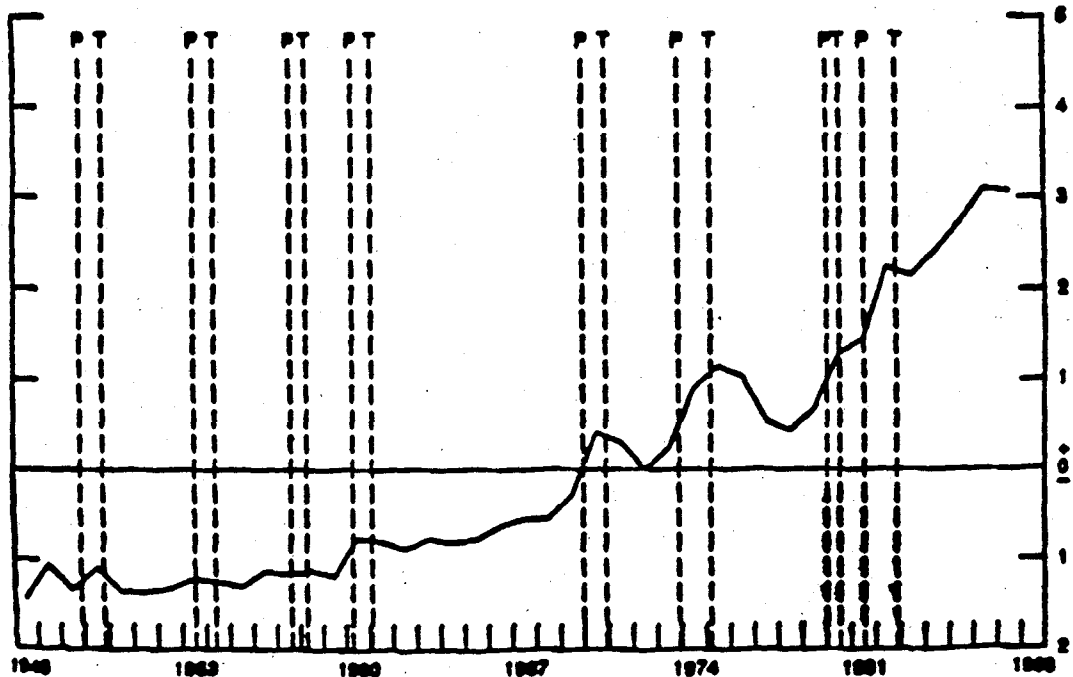
Chart 2

FINANCIAL INSTABILITY AND FINANCIAL FRAGILITY IN THE UNITED STATES

FINANCIAL INSTABILITY



FINANCIAL FRAGILITY



P and T indicate peaks and troughs of NBER-defined business cycles.

Source: Wolfson (1989)

ANNEX

EQUILIBRIUM CREDIT RATIONING

If excess demand is equated with disequilibrium, then all credit rationing is, by definition, disequilibrium rationing. Here the distinction between equilibrium and disequilibrium is based on the distinction between the permanent and temporary nature of excess demand. Permanent excess demand in the loan market corresponds to equilibrium credit rationing. There are a number of potential sources of equilibrium credit rationing: i) market interventions by the authorities; ii) borrower heterogeneity and constraints on differentiation of lending rates; iii) limited and asymmetric information; and iv) risk sharing.

i) Market intervention

In many OECD countries the monetary and financial authorities have, over long periods, attempted to keep the cost of borrowing down by imposing interest rate ceilings and, at the same time, have attempted to control the growth of credit by placing quantitative restrictions on the level and distribution of bank lending. Under these circumstances it is easy to see how credit rationing can arise and persist. Potential borrowers either find that they cannot borrow as much as they would like to at current interest rates or are unable to borrow at all even though they feel able to satisfy all the loan-contract criteria. Credit rationing that limits the size of individual loans is sometimes referred to as "Type I" rationing, while differences in the treatment of observationally-identical borrowers, with some being granted loans and others not, is sometimes referred to as "Type II" credit rationing. Jaffee and Russell (1976) and Gale and Hellwig (1984) analyse "Type I" credit rationing.

For market intervention to result in credit rationing, and not simply in a lower interest rate or lower quantity of credit, certain conditions need to hold. First, as in the case of disequilibrium rationing, the scope for the elimination of excess demand, by altering the non-controlled features of loan contracts, must be limited. Also, there must be less than perfect substitutability between loans from controlled intermediaries and other sources of funds. Borrower access to foreign capital markets and domestic equity and bond markets will limit the impact of credit ceilings and reduce excess demand. The internationalisation of capital markets and the development of equity and commercial bond markets should have reduced the persistence of any rationing that might result from interest rate or loan ceilings, especially for large corporate borrowers.

The process of financial market deregulation and the adoption of market mechanisms of monetary control that have been pursued in recent years in OECD countries have been widely expected to remove credit rationing as a significant permanent or equilibrium phenomena in the loan market. The demise of credit rationing was announced in a BIS report in the mid-1980s in the following terms:

"...the process of deregulation, increasing interest-sensitivity of financial institutions liabilities and assets, maturity shortening and, more generally, increasing competition in the financial intermediation process have rapidly been reducing the

role of availability or 'rationing'. ...Constraints on credit availability no longer appear to be an important transmission channel in the United States, the United Kingdom, Germany and Canada", BIS (1984) p. 18.

However, recent analyses of credit markets have raised the prospect that deregulated financial markets may be subject to sources of equilibrium rationing other than controls by the authorities. Indeed, if this is the case then the former interest rate and credit controls may have had the effect of suppressing and overriding other market-based (endogenous) sources of credit rationing. The existence of credit rationing in deregulated financial markets suggests that optimising lenders prefer to use "non-price" means, in addition to, or instead of, "price" means, to allocate credit. It also implies that because interest rates are not being prevented from being used to clear markets and that other loan terms can be adjusted for the same purpose, the resulting allocation of credit may be an equilibrium one.

It may be noted, however, that the feasibility of endogenous credit rationing was recognised by Keynes (1930):

"...If we assume that the lending of money takes place according to the principles of a perfect market, it is evident that, given the demand schedule of borrowers, the effective bank-rate and bond-rate must uniquely determine the production of capital goods and hence, generally speaking, the volume of investment. So far, however, as bank loans are concerned, lending does not -- in Great Britain at least -- take place according to the principles of a perfect market. There is apt to be a fringe of unsatisfied borrowers, the size of which can be expanded or contracted, so that banks can influence the volume of investment by expanding or contracting the volume of their loans, without there being necessarily any changes in the level of bank-rate, in the demand schedule of borrowers, or in the volume of lending otherwise than through banks. This phenomenon is capable, when it exists, of having great practical importance."

ii) Borrower heterogeneity and constraints on differentiation of lending rates

Given differences in the risk characteristics and demand functions of borrowers, unless interest rates and other features of loan contracts fully reflect this, some potential borrowers may be rationed. Rationing will be avoided if lenders can discriminate perfectly between borrowers and set individual loan contracts. If lenders do not discriminate but instead, say, charge the same rate of interest and offer the same non-interest terms, possibly based on the average of optimal perfectly discriminating loan terms, to non-identical borrowers, rationing of some borrowers may result [see Jaffee and Modigliani (1969) and Cukierman (1978)].

Limited loan rate differentiation may arise because the costs of a more detailed system may be high if there are substantial costs of gathering the information about borrowers that would be needed for effective screening, and the additional costs of administering a more complex rate structure are

significant. Alternatively, it has been suggested that "social" and "moral" considerations may explain why loan-rate differentiation is not greater; customer relations may be damaged by creating a sense of unfairness. But given scope to lenders to adjust the less visible non-interest rate features of lending contracts, constraints on interest rate differentiation may be a less important source of credit rationing than it otherwise would be.

iii) Limited information

Recent theoretical literature on equilibrium credit rationing has emphasised the limited information that lenders have about observationally-identical borrowers and about the risks associated with the projects that borrowers undertake [see Jaffee and Russell (1976), Keeton (1976) and Stiglitz and Weiss (1981)]. Given the not-unreasonable proposition that borrowers know more about their own risk characteristics, and the risk characteristics of the projects that they are engaged in, than do the institutions they are borrowing from, then credit markets will be characterised by asymmetries in information. The uncertainty arising from the lack of full information and asymmetry in information gives rise to two problems: a) moral hazard; and b) adverse selection. Both of these problems can lead to a situation in which the use of the loan rate to eliminate excess demand can result in a lower expected return to the lender, thus creating an incentive for the lender to use "non-price" means to allocate credit. A diagrammatic illustration of how rationing can arise in these circumstances is given in Figure 1.

a) Moral hazard and credit rationing

A problem of moral hazard can arise when a borrower, say a firm, can go bankrupt, in which event the lender gets back only a portion, and possibly none, of the loan. Firms may willingly risk bankruptcy, especially if protected by limited liability, so that the most that can be lost is any loan collateral. Under these circumstances raising the rate of interest in order to eliminate excess demand for credit may, by reducing current profitability, increase the incentive the borrower has to invest in higher yielding, but more risky, projects. If higher interest rates increase the chances of bankruptcy in this way, the expected return to the lender may fall. In such cases the optimising lender will ration credit by non-price means. The seriousness of this problem and its importance as a source of equilibrium credit rationing will depend on the extent to which the lender can monitor and control the projects undertaken by the borrower.

b) Adverse selection and credit rationing

A problem of adverse selection can arise in the loan market when rising interest rates drive out risk-averse investors, thus lowering the average degree of risk aversion in the remaining pool of potential borrowers. Insofar as less risk-averse investors have a greater chance of bankruptcy, the expected return to lenders falls as interest rates on loans rise. In much the same way as with moral hazard, the seriousness of adverse selection will depend on the ability of the lender to monitor the projects undertaken by borrowers. With full information about borrowers this problem would not occur.

In addition to limited and asymmetric information the underlying cause of Stiglitz-Weiss equilibrium credit rationing is the typical nature of the loan contract. Lenders stand to make a return on any loan which is at most the return associated with the agreed interest rate terms, irrespective of the success of the project. If, however, the project is a failure the lender may lose both interest and principal (less collateral). Thus the lender shares disproportionately in the failure of projects relative to their success. This asymmetry in the contractual arrangements for loans coupled with the inability of the lender to monitor riskiness of each loan underlies equilibrium credit rationing in deregulated markets.

In the presence of asymmetric information then, credit rationing may arise as a result of lenders' use of the rate of interest as a screening device, to screen-in low-risk borrowers. One alternative to interest-rate screening would be for lenders to try to close the information-gap between themselves and potential borrowers. This could be done by closely monitoring or controlling the activities of borrowers.

Apart from directly monitoring and controlling the projects undertaken by borrowers, which may be very costly, other methods of reducing the importance of moral hazard and adverse selection are available to lenders. In particular, collateral requirements can be used to screen-out high-risk borrowers. Betster (1985), Chan and Kanatas (1985) and Besanko and Thakor (1987) argue that borrowers with unlimited collateral (either existing tangible collateral or collateral based on the prospect of future labour and non-labour income) will not be rationed. High-risk borrowers (who know that they are high-risk borrowers) are likely to be reluctant to offer collateral against a loan. The introduction of collateral requirements by lenders at any level of interest rate should drive out some high-risk borrowers and lower the overall level of risk in the remaining pool of borrowers. If, in addition, interest rates are lowered, this should encourage more risk-averse borrowers with available collateral to seek loans and thus further lower the average level of risk on loans. The possibility exists, therefore, that in the face of excess demand for credit, lenders can raise their expected return by lowering interest rates and introducing collateral requirements. Whether the profitability of lenders rises or not from setting collateral requirements depends on the loss of revenue from high-risk borrowers and the gain in revenue from low-risk borrowers. Collateral will be a profitable way of overcoming limited information about borrowers. The greater the proportion of low-risk borrowers to high-risk borrowers, the more competitive the banking system and the greater the bankruptcy rate among high risk borrowers.

Milde and Riley (1988) show that loan size can be used in a similar way to collateral to screen-out high-risk borrowers. In their analysis they argue that borrowers with less risky projects will be able to "signal" to lenders that they have low-risk projects by selecting larger rather than smaller loans.

Three objections have been made to the idea that the use of collateral requirements can overcome credit rationing. The first objection is that wealthier individuals, who are most able to furnish large amounts of capital, may be less risk averse than poorer individuals, especially if their wealth has been acquired from risky ventures in the past. Obviously, this is only of relevance to the extent that new loans exceed the proportion of wealth that is pledged as collateral. Berger and Udell (1990) report empirical results which

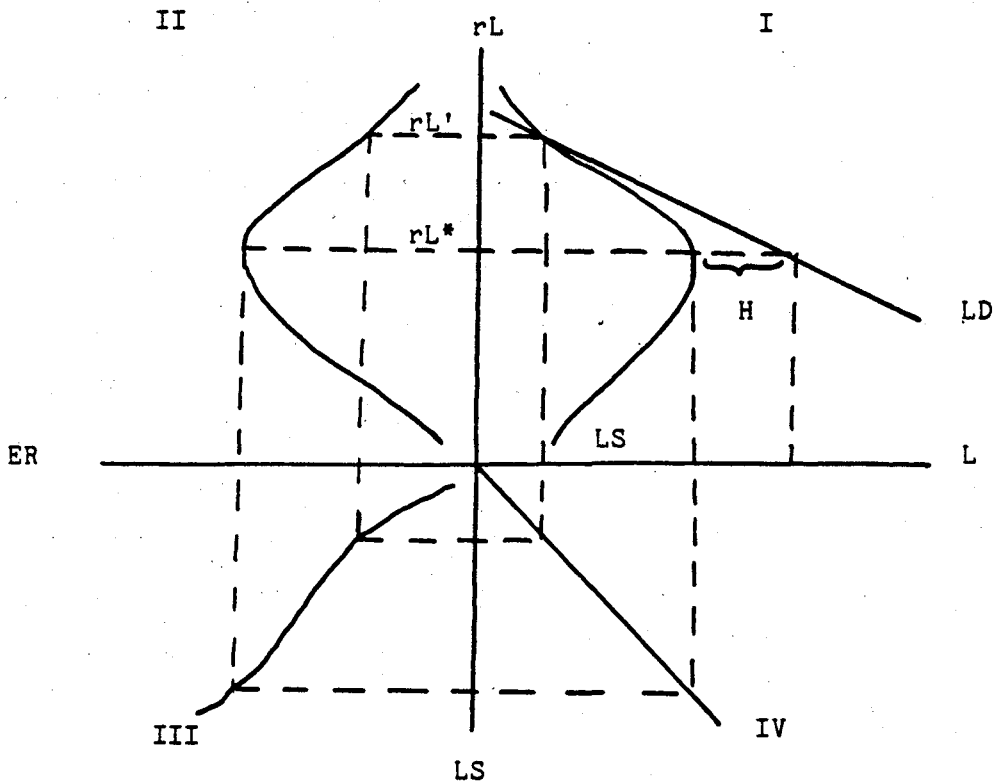
show that collateral is systematically pledged more often by riskier borrowers. Collateral requirements may, therefore, result in a lower expected return (see Stiglitz and Weiss 1981). The second objection is that if borrowers have collateral to pledge against a loan then they could reduce the size of the loan by the amount of collateral they have available (see Blanchard and Fisher 1989). On this argument, a borrower able to supply 100 per cent collateral would not borrow at all. This argument, however, ignores the fact that wealth or capital is often tied up in non-liquid forms like housing or productive plant but that such equity is frequently accepted by lenders as collateral against default by borrowers. Indeed, using liquid wealth to reduce borrowing makes little sense. The third objection is that collateral can only be used as a filter to the extent that potential borrowers have sufficient wealth to meet lender's requirements: low risk borrowers with low wealth may be driven out of the market by collateral requirements. Calomiris and Hubbard (1990) point out that limitations on collateral may be most important in limiting credit availability to information-intensive industries where asymmetries in information between borrowers and lenders and limited information will be greatest.

iv) Risk sharing

Fried and Howitt (1980) have suggested that credit rationing could arise because of implicit contracts between lenders and borrowers to share risks. In financial systems dominated by short-term variable rate loans lenders may offer implicitly to stabilise loans in return for an implicit offer of repeat business. So that when market interest rates are high some potentially new customers are rationed.

Figure 1

EQUILIBRIUM CREDIT RATIONING



The demand for loans, LD , is depicted in quadrant I of the above figure; loan demand is negatively related to the loan rate, rL . Quadrant II shows the relationship between the expected return on loans, ER , and the loan rate implied by Stiglitz-Wiess asymmetric information. Quadrant III describes a normal positive relationship between the expected return on loans and loan supply, LS . The 45-degree line in quadrant IV enables the loan supply schedule to be constructed in quadrant I. rL^* is the loan rate which maximises expected returns - higher or lower levels of lending are sub-optimal for the lender. The amount of rationing is given by H . The Walrasian equilibrium (given by $LD=LS$) at rL' is clearly less profitable. As long as $H > 0$ the volume of loans will be determined by the lender alone and borrowers will be rationed.

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