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**Instability in the euromarkets
and the economic theory of financial crisis**

by

E P Davis

October 1989

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The object of this series is to give a wider circulation to research being undertaken in the Bank and to invite comment upon it; and any comments should be sent to the author at the address below.

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CONTENTS

1	Introduction	2
2	Theories of financial crisis	4
	(a) The monetarist approach	4
	(b) Debt and financial fragility	5
	(c) Rational expectations	7
	(d) Uncertainty	9
	(e) Credit rationing - and a partial synthesis	10
3	Financial disorder in the euromarkets	17
	(a) The interbank crises of the mid-70s	17
	(b) The debt crisis	19
	(c) The crisis in the FRN market	22
	(d) The equity market crash	23
4	Prices and quantities in the euromarkets 1973-88	26
5	A comparative empirical analysis of the periods of instability	29
6	The theory of crises viewed in the light of empirical evidence	37
7	Conclusions	44
Appendix 1	Euromarkets during the 1987 crash	48
Appendix 2	Further testing of the features of crisis	51
References		53

Abstract

This paper seeks to assess the causes, nature and consequences of instability in contemporary financial markets by means of an examination of the features of four periods of financial disorder in the euromarkets in the light of the various theoretical approaches to financial crisis that have been proposed in the literature. Were the periods of financial instability "unique events" or can common features be discerned? How well do the predictions of the theoretical paradigms fit the actual data? It is suggested that their "free market" status make the euromarkets particularly suitable for such an analysis.

Comparative analysis shows that the various periods of financial instability had many features in common. On the other hand, overwhelming support is not given to any one theory of crisis, but instead elements of each have had a part to play, for example debt accumulation, monetary tightening, uncertainty and increased credit rationing. These results imply that a selective synthesis of the theories may be called for in order to give an overall view of financial disorder under current market, technical and regulatory conditions. It is suggested that the results have a clear relevance both for participants in the markets and for regulatory authorities. Such a synthesis also offers pointers for vigilance as regards potential future crises.

1 Introduction

Recent financial problems such as the debt crisis and the equity market crash have refocussed attention on the causes, nature and consequences of periods of financial disorder. What is the appropriate policy response, and how can such potential crises be avoided? This paper attempts to cast light on these issues by analysing four periods of financial instability in the euromarkets in relation to the economic theory of financial crisis (much of which has been developed as part of the analysis of the Great Depression). In the course of the study, the paper also offers a literature survey of the theory of crisis and a comparative analysis of recent periods of disorder, [in contrast to most extant analyses of financial crises which assess only one theory and/or event].

The euromarkets are felt to be a particularly suitable vehicle for analysis, because intermediaries, borrowers and lenders have not historically been subject to restrictive regulations on entry, capitalisation or lending practices. In other words, a free and non-segmented market exists and financial market behaviour can be observed largely untrammelled by regulations and directions of domestic authorities. National markets are themselves becoming more like the euromarkets as increased competition, innovation and deregulation proceed, implying a wider relevance to behaviour patterns observed in the euromarkets.

The paper is organised as follow: in Section 2 monetarist, financial-fragility, rational-expectations, uncertainty and credit-rationing paradigms of financial crisis are outlined and compared. In Section 3 the events of the principal periods of disorder in the international capital markets of the last 20 years (Herstatt, the Debt Crisis, the FRN crisis and the Crash) are outlined as they affected the principal euromarkets⁺ (interbank, syndicated credits and eurobonds).

Section 4 sets these crises in the context of the long-run behaviour of prices and quantities in the euromarkets with a graphical illustration of the 1973-88 period. The behaviour of key economic indicators as well as market prices and quantities surrounding these events is examined in more detail in Section 5. These sections permit a qualitative evaluation in Section 6 of the theories of crisis. The results also cast light on the behaviour of financial markets under stress and give indications of appropriate policy responses. Section 7 draws together these

⁺ Certain other crises largely confined to domestic markets (Penn Central, US thrifts; the UK secondary banking crisis) are thus omitted from the main analysis. However, a brief summary of features of selected domestic crises is given in Appendix 2.

conclusions, suggesting which aspects of the various theories are relevant under current conditions and suggesting implications for policy as well as indicating potential future areas of stress in the light of theory and past occurrences.

Before commencing, it is appropriate to clarify terms. "Disorder" or "instability" are used to describe a disturbance in financial markets which entails unanticipated changes in prices and quantities in credit or asset markets, which may disrupt the capacity of the financial system to allocate capital and lead to a potential for systemic risk. Financial disorder should be distinguished from turning points in the trade cycle (though they may sometimes coincide); equally the theories of the trade cycle and transmission mechanisms [see Miles and Wilcox (1989)] have many parallels with theories of financial disorder, but should nonetheless be seen as distinct.^ø It should be noted that use in the title[✕] of the terms disorder or instability rather than crisis to cover events in the euromarkets of the past two decades is deliberate, and attempts to contrast these events, which though serious did not lead in themselves to macroeconomic depressions, widespread financial collapse and dysfunction of the payments mechanism, with prewar crises that did entail such results. In this the paper follows Schwartz (1986) who described recent events as "pseudo financial crises", although it disagrees with her conclusion that such pseudo crises are matters of little import.

Finally, it should be noted that the approach of the paper is largely qualitative, in that a degree of causation is inferred without rigorous statistical tests, albeit with theoretical support; in addition, the analysis does not probe the extent to which a combination of circumstances has occurred without precipitating a crisis. In support of this approach, it is suggested that a more rigorous empirical approach using econometrics is difficult to employ given the infrequency of crises. However the limitations of the analysis need to be borne in mind.

ø Nevertheless one approach to the trade cycle based on credit rationing is important in the context of this paper [see Section 2(e)].

✕ In the text we use terms more loosely for the sake of brevity.

2 Theories of financial crisis

In this section the principal approaches to financial crises are outlined and compared. Two "traditional" views which attempt to explain exclusively the totality of financial crises, namely the monetarist and financial fragility approaches, are followed by three more recent paradigms which seek to clarify the mechanisms involved in crises, viz rational expectations, uncertainty and credit rationing.

(a) The monetarist approach

Monetarists identify financial crises with banking panics, which may cause monetary contraction or may worsen effects of prior monetary contraction on economic activity. For example Friedman and Schwartz (1963) noted that of six major contractions in the US over 1867-1960, four were associated with major banking or monetary disturbances. Banking panics were held to arise out of public loss of confidence in banks' abilities to convert deposits into currency. This loss was often caused by failure of an important institution, which in turn may have been triggered by failure of the authorities to pursue a steady and predictable monetary policy.* Given fractional reserves, attempts by the public to increase the fraction of its money holdings can only be met by a multiple contraction of deposits unless there is a suspension of convertibility of deposits into currency or intervention of the authorities (eg open-market operations). A panic may lead to widespread bank failures, unless the central bank acts to expand the money supply, as sound banks are forced into insolvency by falls in the value of their assets caused by a scramble for liquidity. Failures in turn affect economic activity via reductions in the money stock as the deposit/currency and deposit/reserve ratios fall. Of course the introduction of deposit insurance does much to alleviate the dangers of such a syndrome, as it removes the public's fear for its ability to convert deposits into currency. International transmission from the monetarist point of view occurs via the price-specie-flow mechanism for fixed exchange rates. In their view countries with flexible rates could avoid contagion.†

* Hamilton (1987) suggested failure of the Fed to hold the nominal money supply constant was the major cause of the Great Depression. Schwartz (1987) discussed the problems that inflation caused by monetary laxity can cause to financial institutions. On the monetary transmission mechanism in crises see also the discussion of Greenwald & Stiglitz (1986)(1987) in Section 2(e).

† For a discussion of theories of international transmission see Bordo (1985).

Cagan (1965) again suggested that panics were caused by failures of major institutions and declines in public confidence in banks, which led to contractions in the money supply. He noted the "inverted pyramid of credit" resting on New York prior to 1914, the absence of emergency reserves provided by a central bank (and inadequacy of private clearing houses as lenders of last resort) and sharp outflows of money forcing banks rapidly to contract credit. He noted that crises did not tend to cause economic downturns as they tended to follow peaks in activity, though the attendant monetary contraction could aggravate the downturn. In addition, some panics occurred without severe downturns, some severe downturns without panics, proving that panics were not necessary or sufficient for a severe contraction.

The policy prescriptions of the monetarists are for a stable and predictable path for the money supply, but a readiness for authorities to expand the money supply in the case of crisis. Deposit insurance may also serve a useful purpose.

(b) Debt and financial fragility

The monetary approach stresses only monetary factors, tends not to focus on borrowers' balance-sheets and views real effects of crises as mainly being the acceleration of downturns caused by other forces. An alternative approach regards financial crises as an essential component of the turning point of the business cycle - a response to previous "excesses" of borrowing which can operate through a variety of financial markets.

Fisher (1932) attributed the downturn in the business cycle to overindebtedness and deflation. The upswing is caused by an exogenous event leading to improved opportunities for profitable investment (what Kindleberger (1978) called a "displacement"). This leads to increased fixed investment as well as speculation in asset markets for capital gain. The process is debt-financed, mainly by bank loans, which increases deposits, the money supply and the price level. Velocity also increases, further fuelling the expansion. Rising prices reduce the real value of outstanding debt, offsetting the increase in nominal debt and encouraging further borrowing. This leads to a state of "overindebtedness", ie a degree of indebtedness which multiplies unduly the chances of being insolvent (or alternatively a state of indebtedness implying a negative present value of borrowers in a wide variety of states of nature). When agents have insufficient liquid assets to meet liabilities, a crisis can be triggered. Debtors unable to pay debts and refinance positions can be forced by creditors to liquidate assets ("distress selling"). If this is widespread, and in the absence of lender-of-last-resort intervention by the monetary

authorities, it triggers further crises and a deep depression⁺; distress selling by the whole community leads to falling prices, bank deposits declining as loans are withdrawn. Deflation increases the real value of outstanding debt. Creditors see the nominal value of collateral declining with prices so they call loans; the real debt burden of debtors increases and they continue to liquidate.* Each individual hopes to be better off by liquidating but the community is worse off due to deflation. If nominal rates are "sticky" real rates increase. Bank runs may be triggered as fears for their solvency increase, especially as falling prices reduce companies' net worth and profits and lead to bankruptcy. Output and employment fall until bankruptcy has eliminated overindebtedness or reflationary monetary policy is adopted. The process then repeats itself.

Minsky (1982) elaborated Fisher's approach and introduced the concept of "fragility" to attempt to clarify the problem of overindebtedness during an upswing. Fragility depends on; first, the mix of hedge, speculative and Ponzi finance; second, the liquidity of portfolios; third, the extent ongoing investment is debt financed. Hedge financing occurs when a unit's cash flow commitments to debt servicing are such that cash receipts exceed cash payments over a long period; speculative financing entails cash flow payments over a short period that exceed cash flow receipts; Ponzi finance occurs when a unit has interest portions of its cash payment commitments exceeding net income cash receipts. A Ponzi unit has to increase its debt to meet outstanding commitments. For speculative and Ponzi units a rise in the interest rate can entail negative net worth and insolvency.

How does the mechanism operate? In the upswing, the demand for new investment leads to an excess demand for finance, which increases interest rates, though this is partly offset by monetary financial innovations (giving an elastic money supply and velocity) which increase the supply of finance for further investment. Higher interest rates create fragility via an increase in debt finance, a shift from long to short-term debt, a shift from hedge to speculative or Ponzi finance and a reduction in margins of safety for financial institutions. Further rises in interest rates** can cause a refinancing crisis with firms unable to roll over their

⁺ See also Bernanke (1983), who suggests that the main transmission mechanism of bank failures was disruption of the ability of the financial sector to allocate funds.

* Of course recent experience has shown that deflation is not a necessary precondition for a protracted debt crisis, especially if contracts are set in real terms (eg floating rate debt).

** The cause of such increases (not spelt out by Minsky) could plausibly be increased inflation late in the cycle and the response of the monetary authorities thereto.

debt, leading to Fisher's "distress selling" cycle unless the central bank intervenes. For Minsky, international transmission was likely to occur via defaults on international loans.

Kindleberger (1978), (1988) stressed the importance of "euphoria" in the upturn, which leads banks to make insufficient provision for risk and also to a high degree of speculative activity among investors.* Asset prices start off in close touch with reality but become progressively more excessive.⁷ He also noted further international transmission mechanisms. As well as money, capital and trade flows (as for monetarists), he stressed psychological factors, linkage of stock markets, commodity arbitrage and interest arbitrage which by linking banking systems can offset the price-specie-flow mechanism. Unlike monetarists, a flexible exchange rate was seen as a conduit for international transmission of crises rather than a barrier.

Besides the focus on lender-of-last-resort intervention, the policy implications of the financial-fragility approach include limitation of tax advantages to debt relative to equity.

As noted, the monetarist and financial fragility approaches are long-established alternative approaches to interpretation of economic history, (although in principle the mechanisms could be reconciled, eg if monetary tightening triggers a crisis in a financially fragile economy). The three approaches discussed below are more recent developments which elaborate and expand aspects of the traditional theories without necessarily attempting to supplant them.

(c) Rational expectations

Some attempts have been made to model crises in a rational-expectations manner. According to such models, manias (as stressed in financial fragility approaches) are viewed as rational speculative bubbles, runs (the key monetarist conduit) being a speculative attack on a price fixing scheme and a panic is a run whose timing is imperfectly foreseen. However, as discussed below, those emphasising the importance of uncertainty in crises would tend to dismiss such models.

As discussed by Flood and Garber (1982), when expectations are rational in the sense of Muth (1961), agents' anticipations of price movements are mathematical

* Cutler, Poterba and Summers (1989) characterised this type of behaviour as "positive feedback trading" ie traders whose purchases respond to rising prices rather than falling or low prices.

⁷ Loans based on asset values in periods of speculative excess may of course be highly risky.

expectations, conditional on an information set that may include structural knowledge of the economic model underlying the process concerned. However, if the expected rate of market price changes influences the current market price, as is normal in asset markets, there is no unique expression for agents' expectations; although there is only one market equilibrium condition, solutions are required for two endogenous variables - market price and the expected rate of market price change. Under such conditions a bubble can arise. As agents using rational expectations do not make systematic prediction errors, a positive relation between price and its expected rate of change implies a similar relation between price and its actual rate of change. In these conditions expectations can drive prices independently of fundamentals - a price bubble (though of course a bubble cannot be defined independently of the definition of the fundamental price behaviour).

Definitions of a rational bubble [Blanchard and Watson (1982)] typically incorporate an assumed probability that the bubble will remain or crash. While the bubble lasts, the average return must exceed the risk free rate to compensate for the risk of a crash. This will be true a fortiori for risk averse agents - indeed as the probability of the crash may increase over time, the price will have to increase exponentially to compensate both for the increased probability of a fall but for the large risk in holding an asset. (This theory may be contrasted with Kindleberger's looser definition of "euphoria" where asset prices progressively lose touch with the fundamentals in an "irrational" manner.)

Runs are also explicable in terms of rational expectations [Flood and Garber (1982)] - a run being an event that terminates a price fixing scheme. An agent (eg a bank) may be ready to buy or sell an asset at a given fixed price (ie fixes the price of deposits in terms of government currency). The viability of the scheme depends on the agent holding a stock of the asset. If other agents see the price fixing as temporary, and that prices will rise eventually (they will take a capital loss on their deposits) they will draw down the stock (of reserves) backing the price fixing scheme. Alternatively put, they draw down the stock when the net worth of the institution is exhausted. If the stock is depleted rapidly, this is a run (leading to closure) although all depositors (having perfect foresight) are paid off without loss. The theory can be extended by introducing calculated risks to allow losses to depositors (panics), but only to the extent that a sudden event led directly and proportionately to real losses exceeding the net worth of the institution. (Compare the discussion of uncertainty in Section 2(d).) A similar analysis can be applied to national foreign-exchange reserves in a currency crisis.

(d) Uncertainty

Economic uncertainty as opposed to risk was suggested by Knight (1921) to be central to economic activity. Meltzer (1982) pointed out its importance in understanding financial crises. Uncertainty pertains to future events not susceptible to being reduced to objective probabilities and also provides opportunities for profits in competitive markets. These aspects are discussed in turn below. Meltzer notes that events not susceptible to probability analysis are excluded from rational-expectations models of decision making and optimal diversification of risks. Rational expectation models have not in his view provided a basis for reliable predictions concerning behaviour of macroeconomic financial prices such as exchange rates, nor has it provided convincing explanations of financial crises.

Uncertainty reflects the changing economic environment in which the random element is not well represented by stationary probability distributions. Hence the future is not knowable either precisely or probabilistically (inferring from past data). Uncertainty applies also to events whose implications resist purely objective analysis such as wars, major changes in policy regime, financial crises and their economic consequences. These alter the economic environment in a way that cannot be anticipated, diversified or hedged against.

There is no precise economic theory as to how decisions are made under uncertainty. It may be ignored (if events are felt to have a sufficiently low probability and information is costly to obtain). Alternatively, subjective probabilities may be applied, together with a risk premium to cover unspecified adverse events. In each case people tend to watch others and do not deviate widely from the norm in terms of factors taken into account and weights given to them. When the crowd is wrong, there is the making of a financial crisis, but there is no objective basis to prove before the event that the crowd will be wrong. [Herding may be rationalised to some extent in finance if all (large) banks expect to be rescued in a systemic crisis, whereas one bank going alone in a different direction would be allowed to go bankrupt (Price 1985).]

In terms of opportunity for profit, uncertainty rooted in change was suggested by Knight to be its main source in competitive markets. If all probabilities were known and risks diversified, profits would be bid away. Profits are earned by innovating and seeking opportunities where there is uneven information and uncertainty. These processes [which Shafer (1986) noted are similar to "creative destruction of innovation" of Schumpeter (1942)] increasingly characterise financial

markets. Whether the process leads to crisis depends on the form of the "destruction" - if innovators take market share from inefficient firms and firms are adequately capitalised it may not, but it will if deteriorating balance sheet quality follows the innovation process or if financial intermediaries fail to understand the properties of financial innovations.⁴ Uncertainty is likely to be increased by this innovation process, and hence it may be greatest in unregulated markets like the euromarkets where innovation is untrammelled by restrictions on product design. When uncertainty is reduced in one area and profits are competed away, innovation may recur, exposing the market to new uncertainties. (See also the discussion of innovation and risk in BIS (1986).)

An increased level of uncertainty may lead to a loss of confidence in financial institutions (it is notable that confidence plays no role in a model with stationary probabilities). Confidence increases as innovators receive profits and their practices are emulated. Adverse surprises, given uncertainty and imperfect information, may trigger shifts in confidence and hence runs which affect markets more than appears warranted by their intrinsic significance* because they lead to a rethinking of decision processes as well as to decisions themselves. This helps explain the wide variety of proximate causes of financial crises.

Policy recommendations based on the lessons of the uncertainty approach (Shafer (1986)) include reduction of uncertainty by avoidance of unstable macroeconomic policy (and also micro - for example sudden changes in the level of assistance to particular sectors such as agriculture). To check risky behaviour of financial institutions, that can lead to crisis if uncertainty worsens, it is argued that supervisors and markets may need greater influence over intermediaries. As well as acting through traditional capital adequacy and asset-quality examination, supervisors should have greater power to reorganise financial firms which are acting in an unsafe manner, though such a policy is of course difficult to implement at a suitably early stage. The power of markets to check (via high costs of credit) any risky behaviour of financial institutions can be increased by more disclosure and limitation of depositor protection only to retail markets.

(e) Credit rationing - and a partial synthesis

Although in many ways based in the financial-fragility approach, as well as incorporating the lessons of uncertainty theory, some recent work [Guttentag & Herring

⁴ Risk premia on new financial instruments may in any case be harder to set accurately because there is no experience of their behaviour in recessions.

* For example, runs on banks which, unlike in the Flood and Garber paradigm, lead to losses out of proportion to proximate events.

(1984a)] on rationing of credit, together with relaxation of credit standards during periods of calm, casts further light on financial crises distinct from the mechanisms outlined above. Meanwhile Greenwald and Stiglitz (1986) (1987) have developed a monetary transmission mechanism incorporating credit rationing that complements this work. Essential background for these approaches are the economic theories of price and quantity rationing of credit as developed in the standard capital asset pricing model and in the work of Stiglitz and Weiss (1981) respectively; a brief outline of these is given in Davis (1987).^{*} The basic point is that in price rationing paradigms lenders faced with heightened risk of default will charge higher interest rates. However, if there are information asymmetries (ie the borrower knows more about his financial position than the lender and the lender cannot distinguish between borrowers) it may be more profitable for lenders to quantity-ration credit rather than increasing interest rates, because the latter would (i) lead borrowers to undertake riskier projects and (ii) drive low risk borrowers from the market.

Guttentag and Herring (1984a) offer a model in which financial crises are characterised by an abrupt increase in the extent of credit rationing. The suggestion is that there are two classes of borrower, characterised by price and quantity rationing. As is emphasised in the underlying theories, rationing depends both on lenders' subjective expectations of default, and on the state of the borrower's balance sheet, which determine the likelihood of default and the returns to lenders should default occur. Specifically, the Guttentag-Herring analysis focusses on the borrower's capital adequacy (where "capital" is measured at book and not market value - the latter may be inflated by speculative activity in asset markets). A high level of capital adequacy implies a "prime borrower" who can obtain credit close to the risk-free rate. An intermediate level entails price-rationing - the borrower faces a mark-up on the risk-free rate in line with default risk. Below a certain level of capital, however, moral hazard considerations mean that the lender finds it rational to quantity-ration credit, as in the Stiglitz and Weiss paradigm. A key insight is that increases in the borrower's capital position limit the scope for such conflicts of interest. When the borrower's capital equals the contractual amount due, the borrower cannot raise his expected return by shifting to riskier projects. When capital is zero, the incentive to undertake risky projects is strong.

* See also Brealey & Myers (1981), Robinson & Wrightsman (1980), Malkiel (1985) for descriptions of price rationing of credit; Altman (1968), Jaffee (1975), Hickman (1958) for associated empirical evidence; Stiglitz and Weiss (1981) (1986), Hart (1986) for an analysis of equilibrium quantity rationing and Fried and Howitt (1980), Jaffee and Modigliani (1979), Cukierman (1978), Jaffee and Russell (1976) for alternative views of credit rationing.

There is likely to be a minimum capital requirement below which the borrower is quantity-rationed in a Stiglitz-Weiss manner - there being an optimal rate of interest above which losses to the lender exceed gains due to higher interest income. At this interest rate the borrower cannot trade-off a lower capital ratio against a higher interest rate. The minimum capital ratio also depends on the distribution of investment returns and the subjective probability of a financial crisis (entailing widespread losses). The section now goes on to discuss the determinants of expected returns for the lender (who may be a bank, as in the case described here, or alternatively a bondholder or depositor).

In the price-rationing paradigm of the capital asset pricing model the distinction is made between unsystematic and systematic risk. The former is project-specific and can be minimised by holding a diversified portfolio of bonds or loans. The latter affects all projects and cannot be hedged in this way. Two examples of systematic risk are recessions and financial crises. As in Section (d) above Guttentag & Herring argue that there is a further crucial distinction between the risk to individual projects and of recession on the one hand, and financial crises on the other. In the former cases, it may be reasonable to assume both that objective probabilities are known* and that the subjective probabilities of market participants tend to the objective probabilities, because unfavourable outcomes are sufficiently frequent that any participants following incorrect subjective probabilities will face losses and withdraw from the market.

On the other hand, the state of knowledge with respect to the probability of financial crises (wars, etc) is less complete - market participants know there is a small finite probability of such a disaster but not the parameters of the distribution - a case of uncertainty instead of risk as outlined above. There is no presumption that subjective probabilities converge to objective ones and thus market discipline is unlikely to ensure correct expectations. In fact competition may drive "prudent" creditors from the market as they are undercut by those who disregard the likelihood of financial crisis either due to ignorance or willingness to leave risks uncovered for competitive advantage.†

* Either because participants know the mechanisms underlying investment returns or because objective probabilities can be inferred from the frequency distribution of the returns.

† An example may be "predatory pricing" to drive other firms from the market [see Davis (1988) for an analysis of such competitive behaviour and associated risks in the eurobond market].

The hypothesis is that creditors' expectations in the case of these uncertain possibilities is characterised by three psychological mechanisms, the "availability heuristic", the "threshold heuristic" and "cognitive dissonance". The availability heuristic is employed when a person calculates probabilities by the ease with which instances are brought to mind - which depends in turn on the time which has elapsed since the last occurrence and the intensity of the experience.^ø At some point after the occurrence of a previous crisis the subjective probability of occurrence becomes so low it is treated as zero. This is an example of the threshold heuristic, a rule whereby the scarce resource of managerial attention is allocated. A third factor may be cognitive dissonance, which comes into play when new information becomes available to suggest that, contrary to prior assumptions, a serious hazard does exist. The mechanism protects the decision maker's self-esteem when information arises that casts doubt on the wisdom of past decisions, and leads them to ignore or reject the information. For example in 1980-81 evidence accumulated that ldc's were likely to experience difficulties, but most banks ignored the signs or explained them away, and supported their opinion with new loans.

These biases may be reinforced by institutional factors, namely the short periods over which performance of loan officers is evaluated and the weakness or absence of measures of risk-adjusted rates of return. There may also be an asymmetry between outcomes for managers and shareholders due to salary bonuses. Profits may accrue to managers - losses are paid by shareholders. These may lead again to the disregarding of low-frequency events or "disaster myopia" (Guttentag & Herring 1984b). These factors may operate more rapidly at times of intense competition in financial markets.

This hypothesis may explain why, during periods when no major shocks occur in an expanding economy, capital positions may decline and creditors become more vulnerable to shocks. They lend to borrowers with low capital, allow outstanding loans to rise, and allow their own capital to fall with no increase in the subjective probability of their insolvency (capital ratios decline via implicit decisions in an expanding economy, as growth in asset valuations exceeds growth in retained earnings). One would expect to observe these tendencies in such phenomena as declining spreads on

ø For example, in assessing probabilities of defaults by ldc's, the ease with which decision makers could imagine such events would decline as the period since the last default in the 1930s lengthened and as fewer managers who experienced the 1930s remained active.

debt claims and a lack of diversification* of claims, with frequent "large exposures" or risks concentrated in one class of customer.

A financial crisis is a condition in which borrowers who in other states were able to borrow freely are unable to borrow at any rate, while others who were formerly "prime borrowers" face heavy default premia. In terms of the model outlined above, a significant proportion of agents have capital positions below the "minimum" for price-rationing, which may reflect either a sharp increase in subjective probabilities of a crisis or occurrence of a shock that has reduced capital positions.

Correspondingly, many prime borrowers become "risky" and are price-rationed. For newly quantity-rationed borrowers, outstanding loans may be above the level lenders find acceptable, so no new loans are made and creditors take steps to reduce outstanding loans. When many lenders have previously made short-term loans in response to (perceived) low probability hazards "runs" from debtors may occur.[†]

Units subject to runs encounter liquidity problems that may spill over contagiously to other similar units. It is not possible to dampen a run by offering to pay higher interest rates, because moral hazard means that for a quantity rationed borrower the loan rate is already at the point to maximise the lender's return^ø and/or insolvency probabilities are too high to make an offer to pay higher rates acceptable.**

* On the other hand, as pointed out by Shafer (1986), there may often be a danger of excessive reliance on diversification rather than detailed credit analysis, especially in securitised markets where borrower-lender relationships are unimportant.

† The main exception is when there is only one creditor and when exposures are so large that pressures for public action are strong.

ø ie interest rates may be viewed as a risk indicator.

** An extension of the credit rationing paradigm by Bond and Briault (1983a) differentiates between types of borrower. It emphasises the control aspects of quantity rationing which may operate more successfully in the case of corporations than sovereigns. Their argument starts from the observation that banks cannot directly control the actions of borrowers, especially when they have many banks (lack of conditionality). In this context, when banks are concerned about the borrowing policy of an existing debtor they are likely to apply quantity rationing of credit to future lending rather than price rationing, given the incentive and adverse selection problems of increasing price rationing. Such quantity rationing is initially likely to be in the form of shorter maturities rather than quantity limits. This is an adequate signal for corporations of loss of bank confidence, and hence that less borrowing should be undertaken and/or less risk taking, because of the possibility of bankruptcy (and recovery of assets) if credit lines are withdrawn altogether. Sovereigns do not face the bankruptcy constraint, and repudiation of debt would involve banks in irrecoverable loan losses. Given this balance of self interest, the influence of shortening maturities on sovereigns is likely to be slight. BB concluded that given these structural features of banking markets, inability to impose conditionality, a central role for banks in sovereign lending was inappropriate. But the problem may generalise to corporations which are large in relation to banks, which can access bond markets or where bankruptcy costs are significant (Dome Petroleum, AEG).

The key insight related to the psychological mechanisms noted above is that subjective and actual probabilities need not correspond. While subjective shock probabilities decline in the way shown capital ratios decline, default premia fall and actual vulnerability increases, as outlined above. However, perceived vulnerability does not increase (ie confidence does not decline) till a "shock" occurs. Once such a shock has occurred, a further shock of non crisis proportions may be sufficient to cause a sharp increase in credit rationing entailing an actual crisis. A shock will have a more serious impact on the risk premium, the higher the initial level of the subjective probability of disaster ('vulnerable' conditions are more susceptible to crises than "benign"). An increase in subjective probability also has a greater effect on credit rationing for weakly than strongly capitalised borrowers - hence tiering whereby the range of default premia paid by risky borrowers rises, and a significant proportion are quantity rationed.

Policy recommendations based on the Guttentag-Herring analysis are for direct control of bank capital ratios (ie prudential supervision) - but with the proviso that additional mechanisms may be needed to prevent "disaster myopia" - in this context insufficient risk weights.* The onus may be both on the supervisors to remain vigilant and on the banks to evolve strategic planning structures to offset the tendencies outlined above towards short-termism [Guttentag and Herring (1984b)].

In a separate series of papers Greenwald and Stiglitz (1986) (1987) have developed a version of the monetary transmission mechanism which operates via credit rationing. Although largely a theory of the trade cycle, this approach complements Guttentag-Herring by illustrating how policy can trigger credit rationing, which as shown by Guttentag-Herring in appropriate circumstances of debt burdens, low capital ratios and uncertainty may lead to a financial crises. The Greenwald-Stiglitz approach thus partly reconciles the monetary and other approaches to financial crisis. In essence, it is suggested that the factors underlying the observations, first, that tightening of the monetary stance reduces economic activity[†], and second, that real interest rates vary little[∅] in such circumstances, can be explained by appeal to credit rationing. As in Guttentag-Herring, it is assumed that borrowers face credit constraints (by price or quantity). Further, the monetary authorities can control, via banks' reserves, the "working capital" of the

* See also Flemming (1982).

† The "monetarist black box".

∅ The "Keynesian" transmission mechanism.

banks and hence their willingness to lend. Because of specific information concerning borrowers that banks have acquired, the cost to borrowers of raising funds from other sources (such as the equity market) will in general be higher than that of obtaining bank loans. Restricting bank credit may thus increase the marginal cost of funds to previously price-rationed borrowers even if the bank does not sharply increase the interest rate it charges. Meanwhile previously quantity-rationed borrowers will find their constraints tightened. This pattern may (in a trade-cycle context) reduce aggregate investment, while in financially fragile states it could help lead to financial crisis.

Five approaches to financial crises have been outlined. Although partly substitutes (particularly the monetarist vs financial-fragility and rational expectations vs uncertainty approaches) these approaches are also to some extent complementary. Uncertainty and credit rationing may add to understanding of how crises triggered by the earlier macroeconomic mechanisms come about. Even the main macro theories may illuminate each other: a monetary tightening could help trigger a collapse of a financially fragile economy. Finally, the credit-rationing approaches make some attempt at general reconciliation.** In the following sections some instances of financial disorder in the euromarkets are examined and the realism of these mechanisms assessed in the light of them.

** Credit rationing paradigms are the only reconciliations that have been proposed. For example, a question not fully addressed in any approach is why banks have historically been so prone to runs (the main monetarist mechanism). A possible explanation is given in Diamond and Dybvig (1983), who also showed that insolvency (financial fragility) is not a necessary condition for bank runs. The nature of bank assets (illiquid and only realisable at considerable cost) and liabilities (liquid and callable at notice) gives incentives for runs to occur even if the bank is not insolvent. Runs can be provoked by any event, however extraneous, but including failures of similar institutions (as in the uncertainty approach). Incentives for runs arise from the process whereby claims are distributed to depositors. Until a bank declares insolvency, it must meet withdrawals on demand. On insolvency, depositors join a pool of creditors who may or may not receive payment in full. Therefore, there is an incentive to be first in the queue, and the chance that others may withdraw may cause a panic regardless of the underlying financial position. Runs lead to economic disruption via interruption of production and destruction of optimal risk sharing (as in the financial fragility approach). As in the monetarist paradigm, this result was felt to support deposit insurance as a means of maintaining investors' confidence in the banks, while allowing banks to perform their maturity transformation function (a protection absent in the euromarkets) - though the moral hazard this induces might also necessitate bank regulation.

3 Financial disorder in the euromarkets

This section offers a brief outline of the events of the four main euromarket crises of the past two decades, namely the Herstatt crisis of June 1974, the advent of the Debt Crisis in August 1982, the crisis in the FRN market of December 1986 and the equity market crash of October 1987, as material for their analysis in the light of theory. Those already familiar with these events should proceed to sections 4 and 5 where comparative graphical and numerical analyses of the crises are presented.

(a) The interbank crises of the mid-1970s

The interbank market is one of the largest components of international banking business. Johnston (1983) reported that in the early 1980s two-thirds to three-quarters of banks' total cross border liabilities were in the form of claims with other banks (this pattern is also believed to have held in the 1970s). Interbank trading serves several functions.[†] First, for any bank the inflow and outflow of funds from deposits or loans will not always match, and interbank lines form an alternative to holding liquid assets. Since such precautionary balances can be reduced, transactions costs can be lower. Second, there are intramarginal transfers of liquidity from one bank to another. Given depositors may often prefer to hold funds with larger rather than small banks, the latter often need to borrow via the interbank market to finance their lending. Third, interbank lending may be necessary to enable the currency composition of deposits to match that of loans. Fourth, one can identify a global liquidity distribution function whereby the interbank market channels funds between market centres.

As long as banks' credit standing is not in doubt, the interbank system efficiently directs funds from surplus to deficit banks. Even if deposits are switched from international to domestic markets it can continue to function. But in a crisis funds may not be available if depositors switch deposits between different classes of banks (ie groups that are easily distinguished). This may be a particular risk if the depositor base of the euromarkets is concentrated and information is imperfect. Withdrawals of deposits may cause losses to a bank, affect solvency and liquidity and make other banks unwilling to lend. The cost of funds in the interbank market may rise, or banks be refused funds, ie there may be "runs". The alternatives are then sale of assets or bankruptcy. In crises the behaviour of the interbank market may also lead to systemic problems given that the quality of one

[†] See also Ellis (1981), Bank for International Settlements (1983).

bank's balance sheet is related to others it lends to. Not that banks are unaware of this; interbank risk assessment gives rise to the phenomenon of tiering of rates for different credit risks.

The interbank market grew rapidly in the early 1970s - foreign currency interbank credits to European BIS reporting banks rose from \$9 bn in 1970 to \$21.8 bn in 1974.[†] In this context, in 1974, losses by several banks were linked to rash foreign exchange dealing and inadequate appraisal of risks. After the generalised floating of exchange rates in March 1973, many commercial banks expanded their foreign exchange positions. For example, currency instability increased the demand for forward cover for non-bank firms. Since contracts could not always be matched in the forward markets, banks would often accommodate their customers by "covering" themselves by spot exchange transactions plus euro-currency borrowing. The oil price increase heightened volatility of markets and disrupted patterns of capital flow. Several banks were caught by unexpected depreciation in some currencies together with a tightening of US monetary policy. One serious banking failure was at Bankhaus Herstatt in Cologne in June 1974. Foreign exchange losses also occurred at Franklin National Bank, Lloyds Bank in Lugano, the Banque de Bruxelles and Westdeutsche Landesbank. Accounts emerged of unauthorised foreign exchange dealings by relatively junior staff, and of high-risk speculation as banks tried to recover their losses.

The Herstatt crisis raised questions about banks' international exposure and operations. Initially, confidence fell in the interbank market, and many banks began to assess their interbank lending in much more detail. They tended to discriminate sharply between the credit standings of different institutions, causing interbank interest rates to experience marked tiering. Interbank deposit rates indicated the existence of at least six tiers* of banks in the Euromarket, and the range of rates also expanded significantly. Up to six weeks after the failure of Bankhaus Herstatt, only the strongest European and US money centre banks (prime borrowers) could raise interbank funds at pre-existing spreads. Substantial tiering existed in other cases, with premia as high as 2% being faced by "risky" Japanese and Italian banks and certain smaller banks which relied heavily on interbank funding. It is reported that they were virtually excluded from the market, suggesting some degree of quantity rationing also. Depositors moved funds from the eurocurrency market to national markets, the London market shrank temporarily in

[†] Source: BIS (1975).

* Arguably such a large number of tiers approximates to a continuous distribution.

mid-1974, and interest rate differentials between the Euro and the US domestic markets widened sharply.

For a while, there was widespread concern for the stability of the international banking system.* Consequently, in September 1974, the central bank governors of the G10 and Switzerland expressed their commitment to the continued stability of the markets. This move did not guarantee automatic lender of last resort intervention, but did indicate the willingness of central banks to intervene in a crisis. The absence of further banking failures also helped to stabilise the eurocurrency market by early 1975.

After 1974, banks in the euromarket made more use of back-and-forth interbank trading, and set interbank lines and limits with much greater care. Sometimes, limits on the amounts or maturities of loans to any particular bank were related to the borrower's net worth or another quantitative guideline - as they arguably should always have been. However, by the late 1970s, the typical interbank market range of rates was reduced to only about 1/4% overall. In contrast with the situation in 1974, concern was expressed at the narrowness of the range, and it was suggested that market liquidity had created abnormal compression, with potential for a further crisis. As shown below, the crisis when it came was largely concentrated in the syndicated credits market.

(b) The debt crisis

During the 1970s, inflation in many countries rose well above the accepted norm; freely floating exchange rates were widely adopted by industrialised countries; nominal interest rates were volatile and sometimes very high; and there were

* As reported in Mayer (1982) the minutes of the US Federal Reserve Board of Governors (1974, pp41-42) state that: "There was widespread concern in financial circles that such evidence of financial difficulty at a few firms might represent the tip of the iceberg ... Lenders responded ... by tightening their credit standards. In the squeeze that followed, many lesser-rated borrowers found their access to security markets partially or completely curtailed, and they were forced to fall back on standby lines of credit at banks. Since banks experiencing these unexpected loan demands were also finding it necessary to pay sharply higher costs for ... funds, they increased their own loan rates ... Stock prices ... fell dramatically during the spring and summer period of maximum financial strain. The composite stock index of the New York Stock Exchange ... at the low was nearly 50 per cent below the record high reached in early 1973."

Lepetit (1982) notes "In the Herstatt affair, it seems the German authorities wanted to teach speculators, as well as banks dealing with speculators, a lesson. But the US clearing system nearly collapsed with Herstatt on 26 June 1974; the CHIPS computer was switched off, and it was necessary for the clearing US banks to barter checks during the whole night and afterwards to use the impossible device of conditional transfers."

substantial changes in the pattern of wealth holding, largely because of sharp increases in the price of oil relative to other commodities and manufactured goods. Many countries increased their demand for external finance. Meanwhile, the OPEC surpluses were invested through the banking system*** and not in securities markets.** Partly as a result of these developments, the syndicated credit⁺ became the preferred means for international lending by banks. The syndicated credit enabled banks to cope with the demands made on the financial system during the 1970s, by mobilising substantial quantities of funds with little complexity or delay. However, viewed in retrospect, the simplicity of syndicated credits may also have drawn into international lending a wider range of banks than would have been ideal while many were made at excessively fine spreads, ie there was a form of bull market and slippage in credit standards.

An outline of the debt crisis must commence a significant time before 1982.* Following a period of disruption over 1974-75, partly associated with the Herstatt crisis discussed above, conditions in the syndicated credits market began to ease in 1976, with lower spreads for prime borrowers and a higher average loan size. Lower spreads^Ø and longer maturities for other borrowers followed in 1977 and 1978. Many borrowers began to tap the syndicated loan market regularly, and a much wider range of borrowers entered the market, including heavy borrowing by ldc's. Some borrowers renegotiated or refinanced loans which had been taken out under tighter conditions. Virtually all borrowers were able to negotiate successively finer terms. By 1979 the following conditions were established; high levels of lending, low spreads, little consideration of capital or ability to pay of borrowers, a wide range of borrowers of varying credit quality obtaining loans (but a concentration of loans in Mexico, Brazil, Argentina and South Korea).

*** Though some banks built up holdings of eurobonds financed by these deposits.

** However, as noted by Bond and Briault (1983b), it would be wrong to see banks as mere recyclers of funds. First, the correlation between ldc loans and OPEC deposits is highly imperfect. Second, banks evidently bid aggressively for deposits and also for loans, stimulated by such factors as; an increasing focus on balance sheet growth rather than only profitability; the shift from asset to liability management; ability to cross subsidise international business from profits made in oligopolistic domestic markets and from the "insurance" provided by banks to depositors via their capital; as well as misjudgment of the risks - notably of the potential correlation between sovereign risks when economic conditions deteriorated - and of the intensity of competition in the market, which kept spreads low.

⁺ A eurocurrency syndicated-credit represents a loan or credit facility, generally at floating rates, which is arranged on behalf of a borrower from another country and is made by a consortium of banks.

* Bond (1985) offers a detailed account of the behaviour of the market over the 1970s and early 1980s.

^Ø Johnston (1980) noted a negative relation between growth of volume of lending and euromarket spreads over this period and attributed it to portfolio adjustment.

The oil shock of 1979-81, and subsequent slower world economic growth, damaged prospects for developing countries. The cost of servicing debt rose sharply as alterations to US monetary policy in late 1979 (the shift to a system of targetting non-borrowed reserves) lifted dollar interest rates to unusually high levels and the dollar appreciated strongly. As debt servicing difficulties emerged, market confidence was increasingly undermined. Spreads rose for non-prime borrowers, maturities shortened and the number of credits fell. The debt crisis effectively began with the "shock" of Mexico's sudden suspension of external debt servicing in August 1982.[†] Borrowing subsequently became more difficult for a number of heavily indebted countries, particularly in Latin America (ie quantity rationing applied strongly). However, central banks intervened to prevent a crisis in the interbank market by persuading creditor banks to roll over their claims on Mexican banks [Price (1985)] and the Fed relaxed monetary policy, reducing interest rates sharply.

The level of "spontaneous" syndicated lending (loans syndicated normally in the market) fell sharply after the middle of 1982 and remained low throughout 1983 and 1984. The level of loans to OECD borrowers did not alter significantly, but Latin American and Eastern European borrowers virtually disappeared as takers of "spontaneous" credits (though the latter returned to the market during 1984). Even when "unspontaneous" lending* is included, the market downturn is still evident.

In terms of realised spreads the effect on general market conditions was only temporary, with the increase in average spreads in the latter part of 1982 reversed in the first half of 1983, and no clear evidence of shorter mean final maturities. However, the syndicated loans market demonstrated an increasing tendency to be a source of funds only for favoured borrowers such as OECD corporations who were price-rationed, while all others were quantity-rationed (at zero) and thus did not affect observed spreads. This was shown by the relative stability, from the start of 1982, of both average spreads and mean final maturities for those borrowers still having access to the market. From mid-1983, there were even signs of slightly improved conditions for such borrowers, with spreads falling and maturities lengthening. By 1987, developing countries, evidently still quantity-rationed, accounted for 10% of syndicated lending, while Eastern bloc countries, which withdrew entirely from the market by the end of the year, accounted for only 2%. Over 1982-87 most syndicated credits were arranged by companies in OECD countries.

† Due to lack of "control" by banks over sovereigns, assets could not be directly recovered in the case of such suspension (see the footnote on p13).

* Not syndicated freely, but arranged with a predetermined group of banks for predetermined amounts based on banks' existing exposure and backed by massive official support programmes.

(c) The crisis in the FRN market

The origins of the market in floating-rate notes (defined as medium-term securities carrying a floating rate of interest that is reset at regular intervals in relation to some predetermined market rate) lie in the 1960s when banks used them as a means for raising short or medium-term funds to support their international lending operations. However a major spur was given by the debt crisis (outlined above) which led to a sharp decline in new lending as well as in inflows of funds to international banks. As a substitute for syndicated loans (in bank's asset portfolios and as a liability of companies and sovereigns), FRN issues grew particularly strongly over 1981-85, while the fixed rate eurobond market was relatively subdued. The main issuers of FRNs were governments and banks (companies preferred to issue in the fixed-rate markets). Banks sought to issue subordinated and/or perpetual debt in order to increase their capital bases, but also were attempting to reduce the degree of maturity mismatch in their international lending. Banks also emerged as major investors in the FRN market, holding a large proportion of paper outstanding.

The FRN crisis began with sharp price falls in December 1986 in the perpetual sector, which have been blamed on investors' re-evaluation of the equity characteristics of these instruments as well as fears that the Cooke Committee capital convergence guidelines for international banks would deduct any holdings from capital, excess supply of bonds given the size of the investor base, underpricing of issues in relation to risk and false expectations of liquidity given the size of the market. At the outset of the crisis, it was expected that the problem might be resolved by an issuing hiatus followed by adjustment of terms (Fisher (1988)). But large underwriting exposures undermined the market. Rumours of heavy selling became self fulfilling and prices went into free-fall as market makers withdrew. Short selling worsened the situation.

A similar crisis hit the much larger dated sector a month later, yields soared and issuance became virtually impossible. Although the problems of the perpetual sector helped to trigger this, the problems of capital convergence, oversupply and illusion of liquidity were also present in the dated sector. As described by Muehring (1987) the market had been subjected to relentless downward pressure on yields, which fell below Libor in 1986. This tended to exclude banks as investors (given that their ability to buy FRNs is premised on borrowing funds at Libor) although they held 80-90% of extant bonds. Lead managers tried to compensate for low spreads with innovations which relied largely on risky interest-rate plays, while trading also

increased sharply in an attempt by investors to maintain profits - and which helped further to compress spreads. Underwriters and investors assumed that risks in the market were limited due to the coupon reset mechanism and built up large positions, failing to note that profits were largely a function of the bull market conditions. (There was an illusion of safety in liquidity.) Last, it was assumed that an investor base existed beyond the banking sector. This was not the case, so short-term speculative demand was mistaken for genuine end-buyers.

After the crisis more and more market makers withdrew and liquidity continued to decline. Both the perpetual and dated FRN markets have been largely moribund since then, except for some development of mortgage-related issues.

(d) The equity market crash

Macroeconomic antecedents: During 1987, participants in financial markets became increasingly concerned with the persistence of large current account imbalances between the United States, Japan and Germany. The fear was that the imbalances would lead to investor reluctance to hold dollars, entailing downward pressure on the dollar, and higher US interest rates. In addition there was some increase in world inflation expectations, associated both with a strengthening in commodity prices, and with the build-up of liquidity in countries such as the United Kingdom and Japan with appreciating currencies, the latter being partly a result of official intervention to stem the dollar's decline following the Louvre accord. As a result of fears of inflation, monetary policy was tightened in several countries. Market concern was compounded by the limited macroeconomic policy co-ordination that had been achieved. Although the Louvre accord did help stabilise exchange rates during the first three quarters of 1987, little progress was evident on adjustments to fiscal policy, particularly in the United States and Germany. Adverse US trade figures for July and August sharply reversed the weak improving trend which had prevailed since the spring, with damaging effects on market confidence and (in combination with tighter monetary policy) interest rates. For example, short-term US interest rates rose from 7 1/2% at the end of September to 9% just before the crash. Furthermore, the failure to achieve sustained reductions in current account imbalances was highlighted by renewed and public policy discords between the United States and some other countries in mid-October.

Portfolio imbalance: A notable feature prior to the crash was the widening yield gap between government bonds and equities in the United States, Japan and the United Kingdom. The main theoretical determinant of equity values is the discounted

present value of expected future dividends.* The market's valuation of these dividends will depend on the relative attractiveness of alternative investments, such as bonds. Allowing for risk differentials, the returns on the two assets should tend to equalise over time. The widening of the differentials after 1986 at a time when inflation was relatively constant implied the need for a portfolio shift at some point to re-establish more normal differentials. In the absence of a sharp fall in bond yields, such shifts can require extremely large changes in equity prices. The fall in equity prices may have represented such a portfolio shift.

A speculative bubble? An explanation of the strong rise in equity prices in 1987 may be couched in terms of a deviation from the fundamental determinants of value. The reasons for the over-valuation of equities are difficult to identify, but may have included falls in the number of shares outstanding owing to buybacks and management buyouts in the United States, and the merger wave in many countries. Falling interest rates, buoyant economic prospects and strong monetary or credit growth also fuelled share price growth. More generally, in the United Kingdom and United States, but particularly in Japan, a speculative bubble may have occurred. The key underlying factor was the belief that overpriced shares would always find a buyer at current prices and that the level of liquidity would always be the same. Speculative bubbles throughout history have tended to deflate extremely rapidly, as did the 1987 bubble on 19 October.[†]

The equity market crash had sharp consequences for quantities and prices of credit in the international capital markets. International primary markets in both equities and bonds had also been experiencing bull market conditions, with rapid growth of issuance and intense competition among intermediaries. Corporations' debt/income and debt/equity ratios had been rising over the longer term despite the increase in share prices [Davis (1987), Friedman (1986)]. Leveraged buyouts and the plentiful availability of credit (including junk bonds) secured on inflated asset values left many individual firms with extreme levels of gearing.

After the crash, sales of international equity came virtually to a halt, and new issues remained weak for a lengthy period. Several investment banks were left with large tranches of devaluing international equity after they had applied "bought

* Though corporate asset values may also play a part, notably in Japan.

† It is notable that the consensus at the time was that the price falls were not proportionate to the macroeconomic changes immediately preceding the crash (as rational expectations would predict) but greater than appeared warranted, suggesting a rethinking of decision processes (as the uncertainty approach would predict).

deal" techniques to primary equity issues. There were fears of commercial banks cutting credit lines to such securities houses, with potential systemic consequences, until the Fed announcement that ample liquidity would be provided calmed the markets.

There were also consequences in the international bond market, where issuance fell sharply and there was marked tiering of yields to sovereign and corporate borrowers, the latter finding themselves virtually excluded from the markets. Fears of recession led to sharply increased default premia on heavily-indebted corporate issuers while the most heavily indebted were quantity rationed (for example Bell Resources had to abandon proposed issues). Issuance of equity-warrant bonds, which had been the mainstay of the eurobond markets in previous quarters, virtually ceased, given the lack of attractiveness of the equity component. Problems in the eurobond sector, aggravated by the stock market turmoil, as well as a sharp increase in inflows to banks on deposit of funds withdrawn from the securities markets, left banks flush with funds. This, and the lack of alternative opportunities for income, probably contributed to strong competition among banks in the credit markets, which provided an alternative source of funds to borrowers excluded from the securities markets. The competitive terms attending new credits, and the reduced attractiveness of other means of obtaining finance, also increased the appeal of credits to borrowers, especially to second-tier companies, thus threatening a potential new cycle of inadequate risk pricing. The equity market crash was initially felt to have discouraged syndicated lending on such financings as leveraged buyouts and takeovers, but they soon rebounded in 1987.

A detailed description of the effects of the crash on the euromarkets, which illustrates the heightened linkages between markets in the current financial framework, is given in Appendix 1.

4 Prices and quantities in the euromarkets 1973-88

In order to assess the periods of instability in a comparative manner and to evaluate economic theory in the light of them it is useful to complement description with data which allow one to pinpoint the precursors and effects of the various periods of disorder on prices, quantities and other economic indicators. This is provided in the charts in this section and the tables in section 5. The charts set the crises in context by providing indicators of prices and quantities over the whole period, thus allowing periods of crisis to be contrasted with more quiescent periods. The tables in section 5 focus on developments immediately surrounding the crises. It should be noted that frequent use of US and dollar markets data in sections 4 and 5 is not aimed to imply that these patterns were solely observable in dollar markets or the US. They were common elsewhere; but the United States was the predominant economy and market for most of the period covered.

Chart 1 shows short-term interest rates in US dollars, while Chart 2 shows the differential between the risk-free rate (US Treasury bills) and other rates of the same maturity. A detailed description of these markets and their relationships is given elsewhere [see Stigum (1983), Jeanneau (1989)]. Suffice to say that USCP rates indicate risks to the domestic corporate sector, USCD rates risks to the domestic banking sector while the 3 month eurodollar rate (Libor) shows the risks in the interbank eurocurrency market (where in each case risks may include liquidity and other risks as well as credit risk). The charts indicate a convergence of rates in these markets as integration of financial markets has proceeded. As well as relativities Chart 1 illustrates the periods of tightening of US monetary policy (when short rates increased), notably over 1972-74, 1978-80, 1980-82 and 1987. The periods of crisis are clearly visible in both charts as an increase in rates on private-sector liabilities vis-a-vis public sector risk-free rates. These are related to an increase in perceived liquidity risk and credit risk of eurocurrency claims, and also often to declines in treasury bill yields due to "flights to quality" or loosening of monetary policy. The crisis of mid-1974, which was centred on the interbank market, is particularly apparent, though the effects of the debt crisis and the equity market crash (but not the FRN crisis) are also evident.

Chart 3 shows the average spread over Libor of new syndicated credits, drawn from the Bank of England's ICMS database. As would be expected, spreads for ldc's generally exceed those for OECD countries, although, naturally, realised spreads do not reflect the exclusion of many countries from the market after 1982. These are,

of course, spreads at issue so when there are no loans, there are no observations. The major crisis in the credits market (the debt crisis) is clearly visible in the pattern of spreads for ldc's over 1982-83, but had almost no effect on realised spreads for OECD corporations. The rapid decline in spreads for ldc's after 1983 reflects quantity rationing of countries felt to be poor risks. At the top of the chart, the widening of spreads after the Herstatt crisis and associated macroeconomic problems is clearly visible. In contrast, the crises of 1986 and 1987 appear to have had very little effect on realised spreads in the credits market, which for OECD borrowers continued an apparent long-term decline.

Chart 4 shows secondary market yields for euro and domestic dollar bonds of roughly 10-year maturities, Chart 5 the differential of euro over US domestic rates. The risks of private and public sector eurobonds differ; the former face bankruptcy risk while the latter, though in principle subject to sovereign risk and, for foreigners, exchange rate risk, should generally be less risky. (The ldc debt crisis showed that this was not always the case.) This is generally the pattern here though not, paradoxically, before 1978 (when public issues had higher yields than private).⁷ The earlier crises of 1974 and 1982 are clearly apparent in the eurobond market; by contrast, the FRN crisis and the Crash are revealed in only minor increases in secondary-market spreads for private sector issuers. It is notable that yields on US government bonds (Chart 4) barely changed in 1974, while over 1979-82 they increased sharply and again in 1987-88. Obviously these changes are related to US domestic conditions (expected inflation and the relationship between supply and demand of domestic bonds) rather than financial crises as such, though unstable financial conditions can also increase yields required on government bonds if there is a flight to short-term assets.

Chart 6 shows primary-market yields for straight fixed-rate dollar eurobonds by various types of issuers (OECD banks and corporations, together with supranationals). Differing maturities make the graph difficult to assess; however, the increase in relative yields for banks in 1982 (debt crisis) and end-1986 (FRN crisis) are evident, as is some increase in yields for corporations at the end of 1987 (equity crash).

Chart 7 illustrates the behaviour of the secondary dated FRN market during 1985-88. The steady decline in discounted margins⁸ prior to the crisis and huge increase in spreads afterwards is evident. It is notable that a second sharp increase in spreads occurred after the equity market crash.

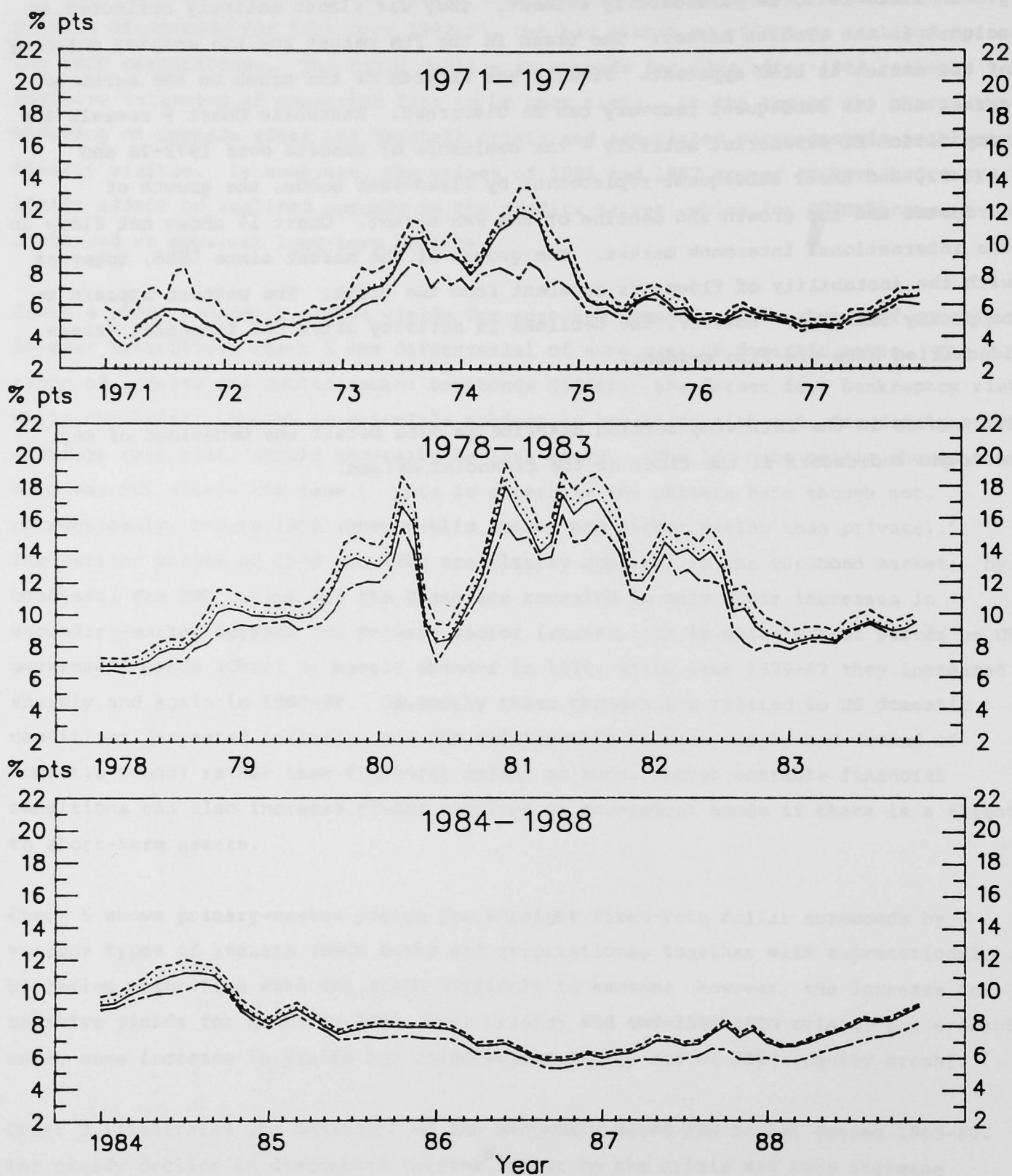
⁷ We attribute this to shifts in maturities and average credit quality of the borrowers in different groups.
⁸ A measure of the rate of return on an FRN relative to an index rate (LIBOR) calculated by discounting future cash flows on a money-market basis.

Charts 8-10 give an impression of total volumes of euromarket activity over 1973-88. In Chart 8 the decline in total gross issuance in 1982, after steady growth since 1975, is particularly evident. They was almost entirely reflected in volumes in the credits market. The crash in the FRN market and the ensuing dormancy of the market is also apparent. Finally the effects of the crash on the eurobond market and its subsequent recovery can be discerned. Meanwhile Chart 9 reveals the composition of euromarket activity - the dominance of credits over 1972-74 and 1978-82, and their subsequent replacement by fixed-rate bonds, the growth of euronotes and the growth and decline of the FRN market. Chart 10 shows net flows in the international interbank market. The growth of the market since 1985, together with the instability of flows, is apparent from the graph. The pattern appears to be partly seasonal; however, the declines in activity after the financial crises identified here are also evident.

The tables in the following section describe in more detail the behaviour of key economic indicators at the times of the financial crises.

Chart 1

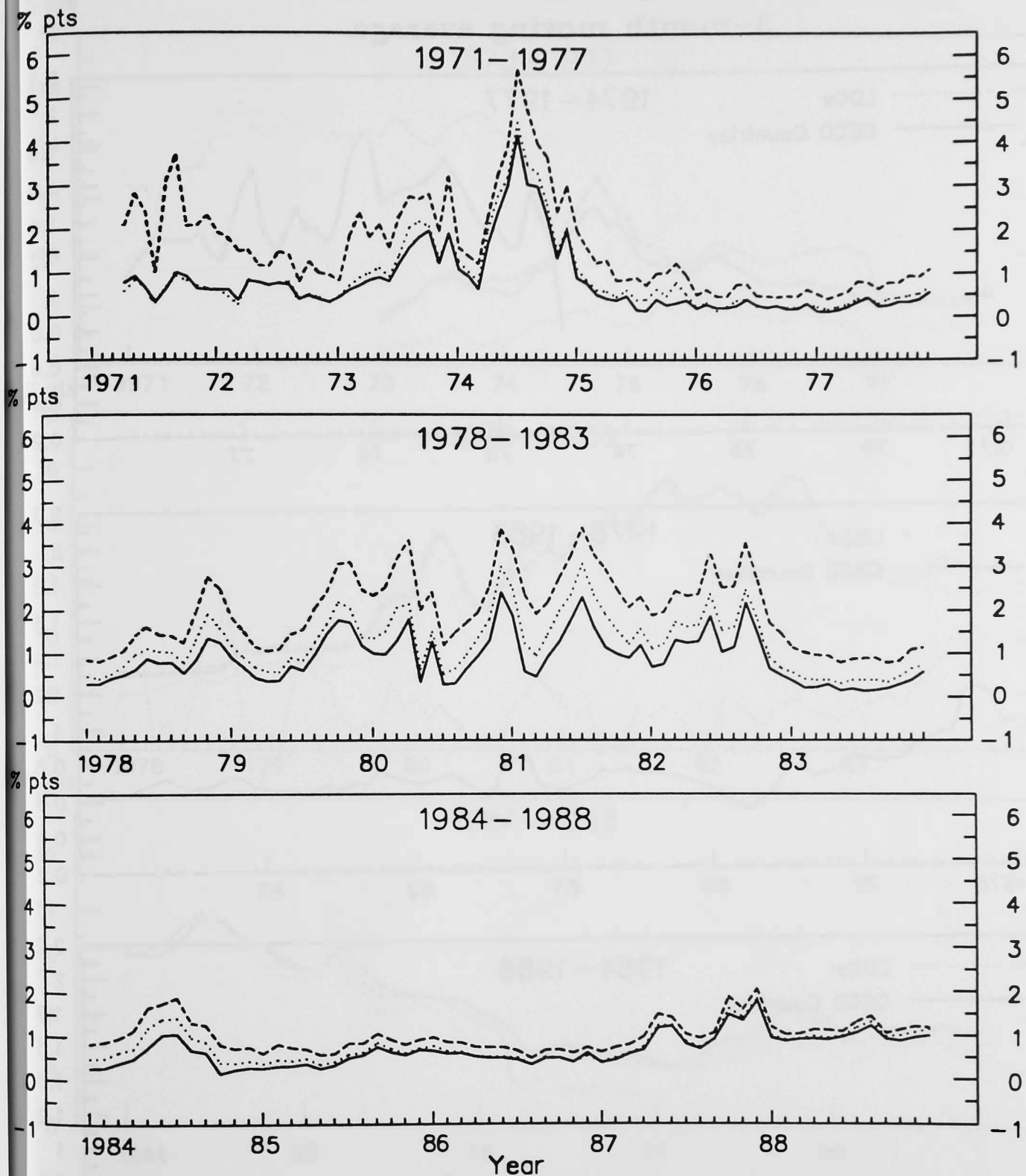
Short-Term US Dollar Interest Rates



Key : — USCP Rates
 - - - Eurodollar 3-month Rates
 . . . USCD Rates
 - . - US Treasury bill Rates (3-Month)

Chart 2

Differentials - Short Term US Dollar Interest Rates



Key : — USCP Rates - US Treasury bills
 - - - 3 Month Eurodollar - US Treasury bills
 . . . USCD Rates - US Treasury bills

Chart 3

Syndicated Credits

Average Spread Over LIBOR

3-month moving average

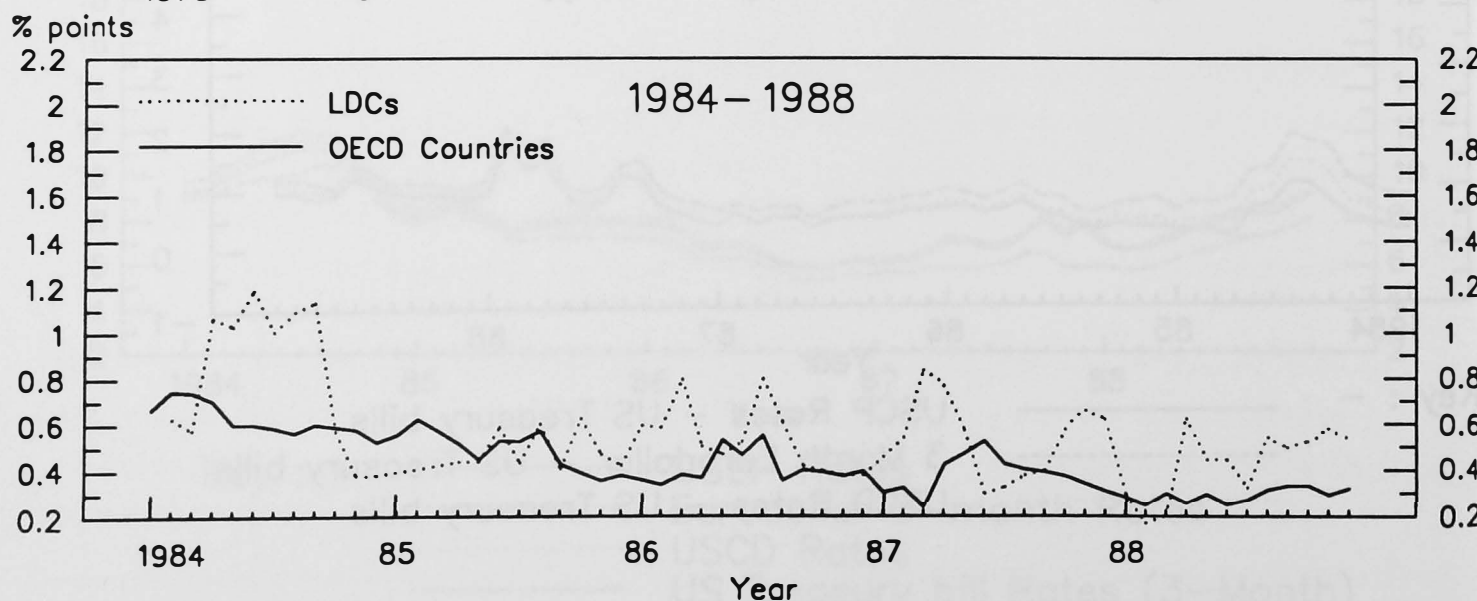
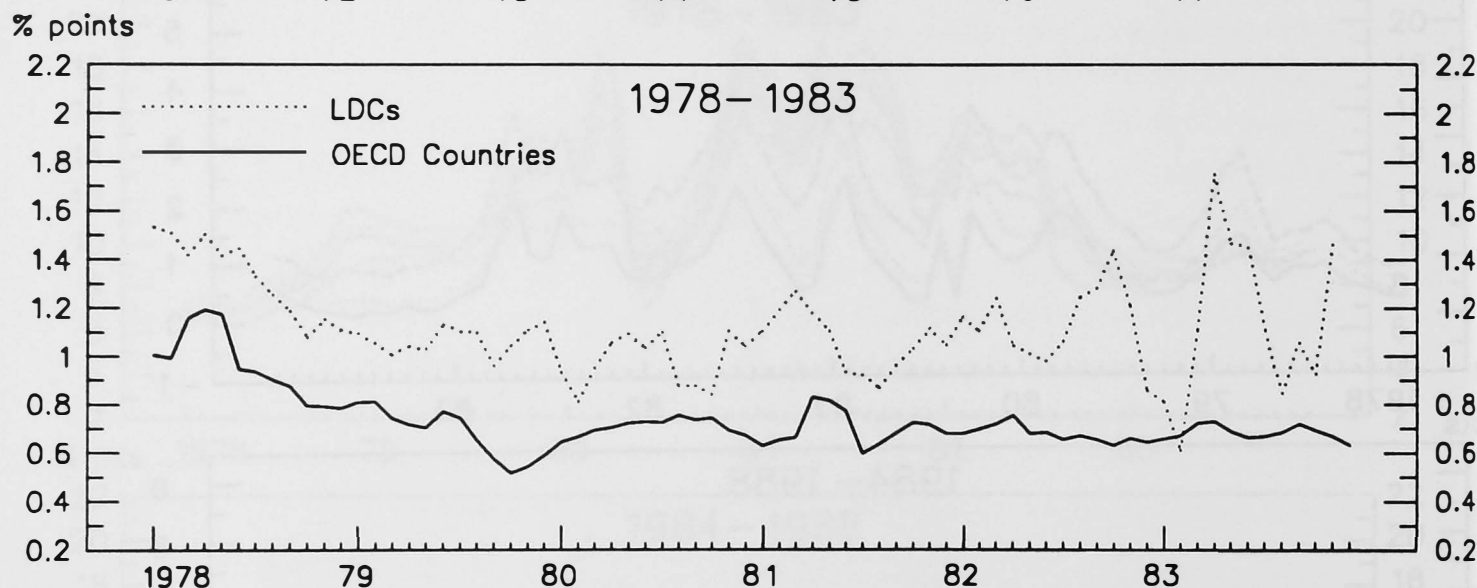
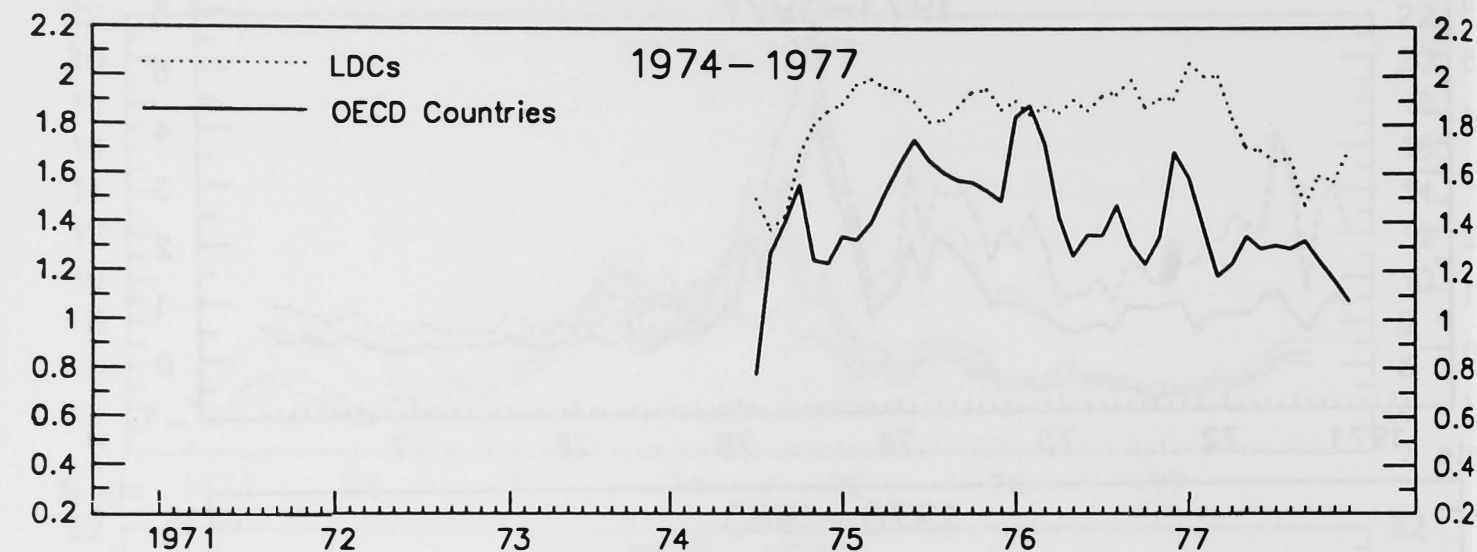
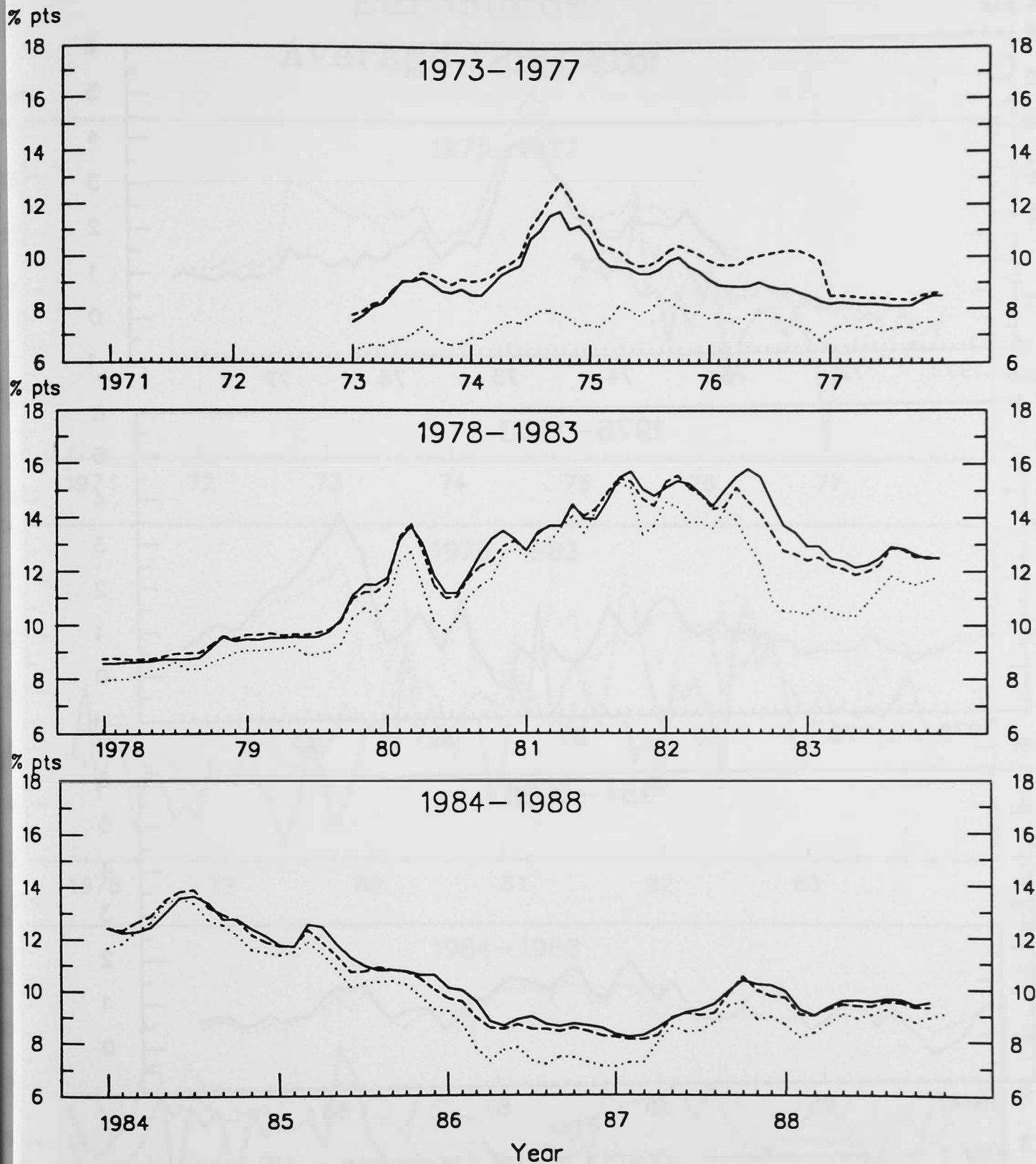


Chart 4

Bond Yields



Key :-

- Eurobond - Public Sector (7-15 yrs)
- Eurobond - Private Sector (7-15 yrs)
- US treasuries (10 yrs)

Chart 5

Bond Yield Differentials

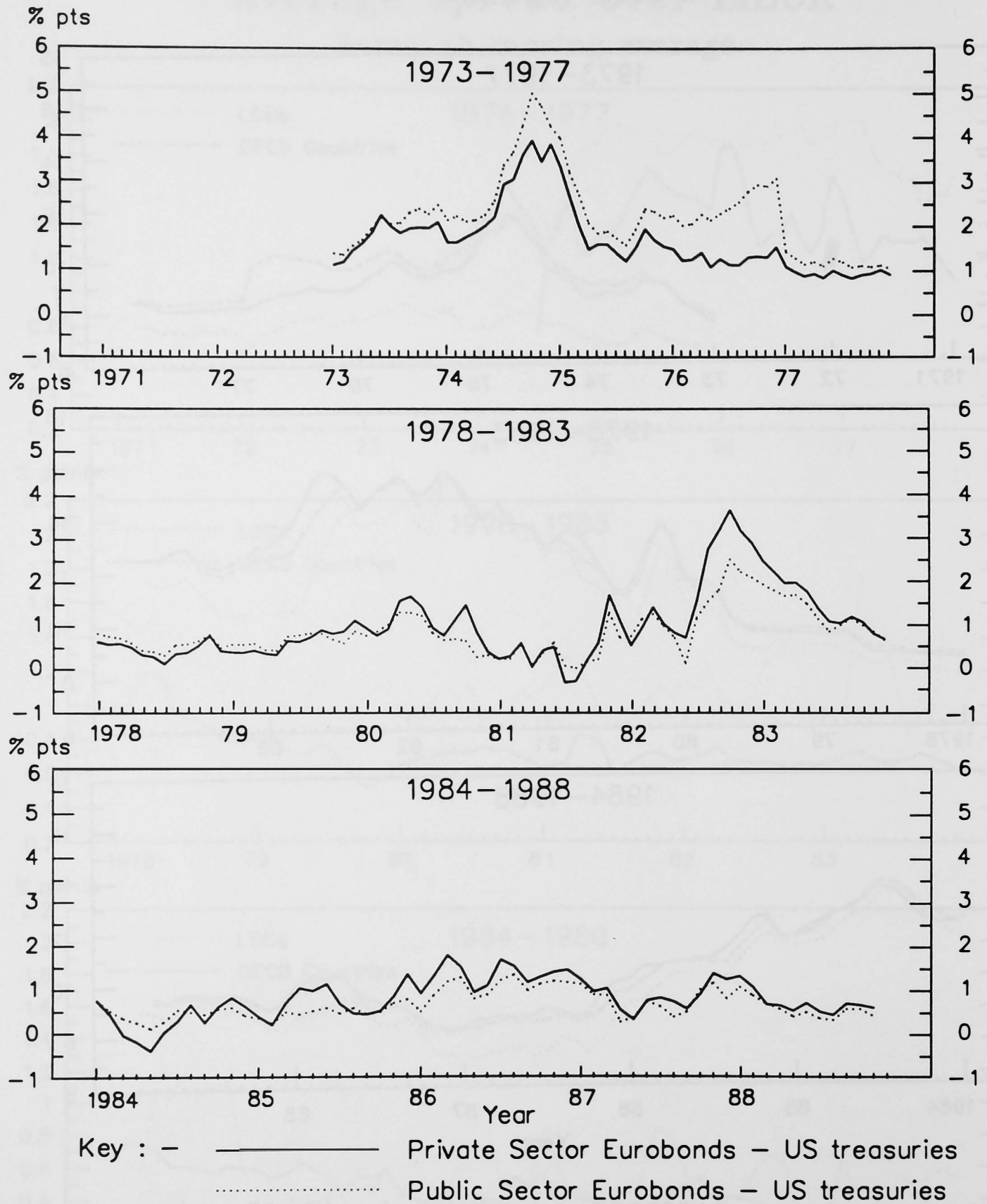
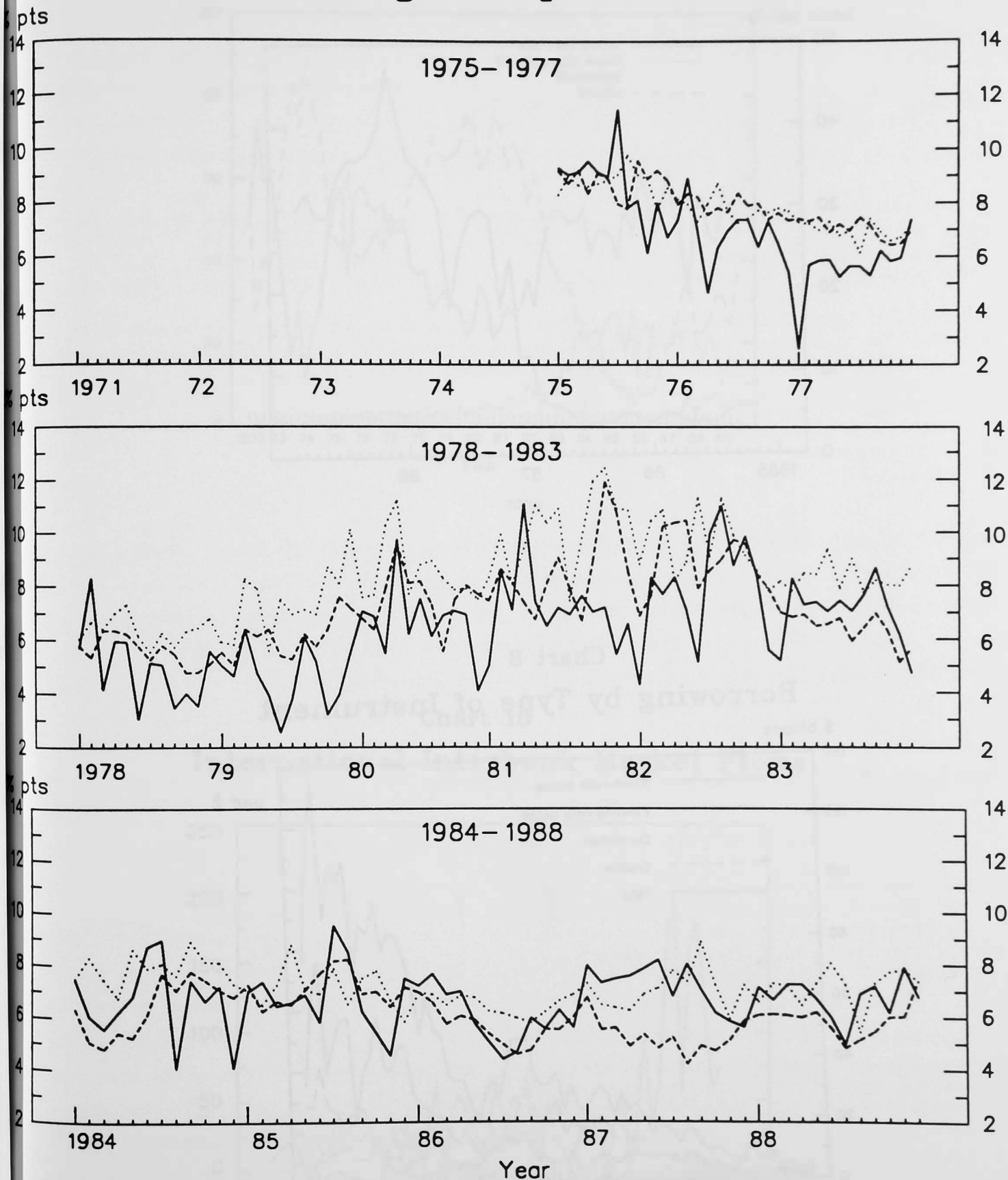


Chart 6

Eurobonds

Average Coupons



Key : — Banks
 - - - Corporates
 . . . Supranationals

Chart 7

Discount Margins for US Bank FRNs

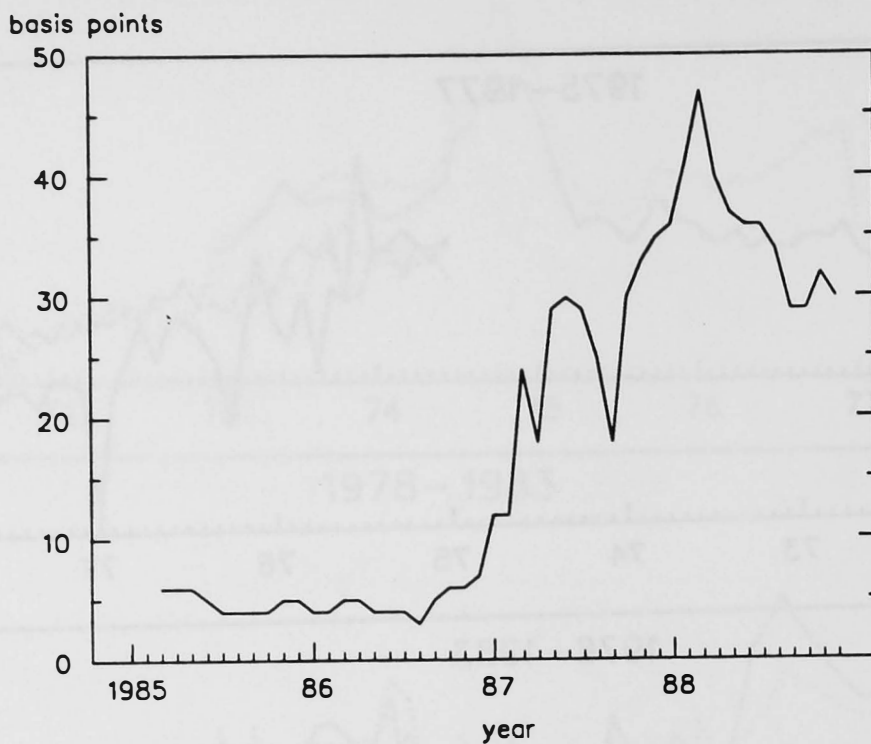


Chart 8

Borrowing by Type of Instrument

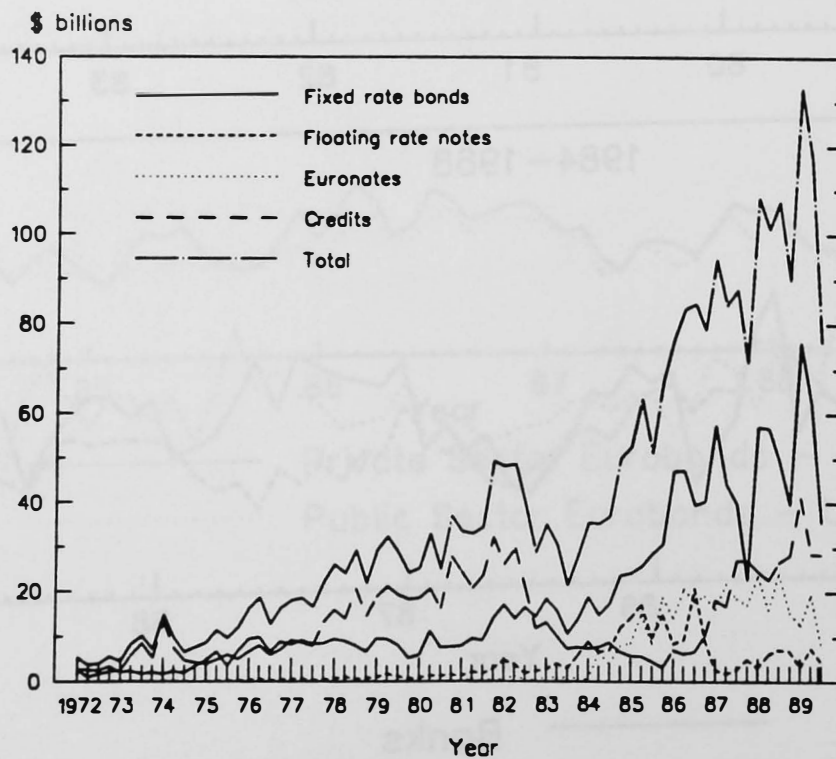


Chart 9

Borrowing by Type of Instrument shown as percentage of total borrowing

% points

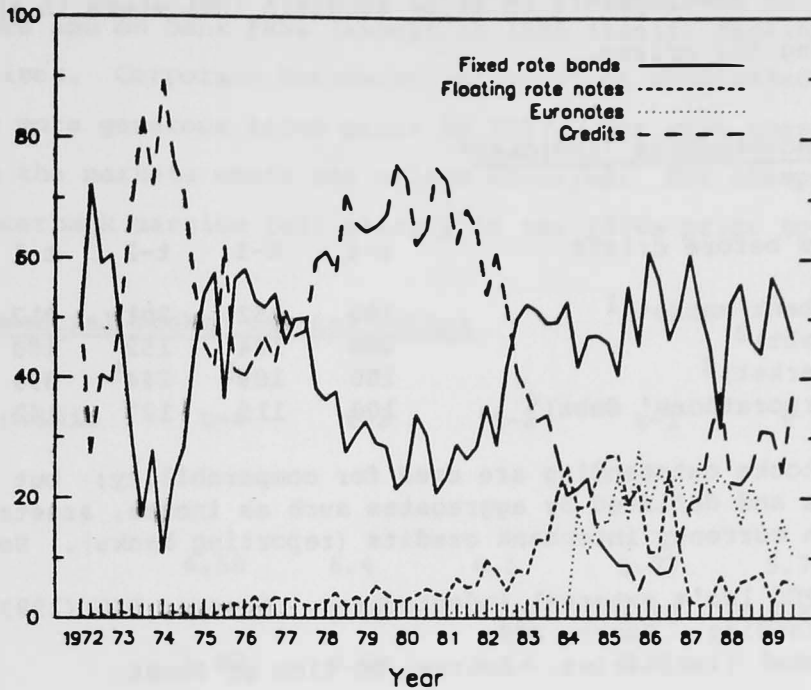
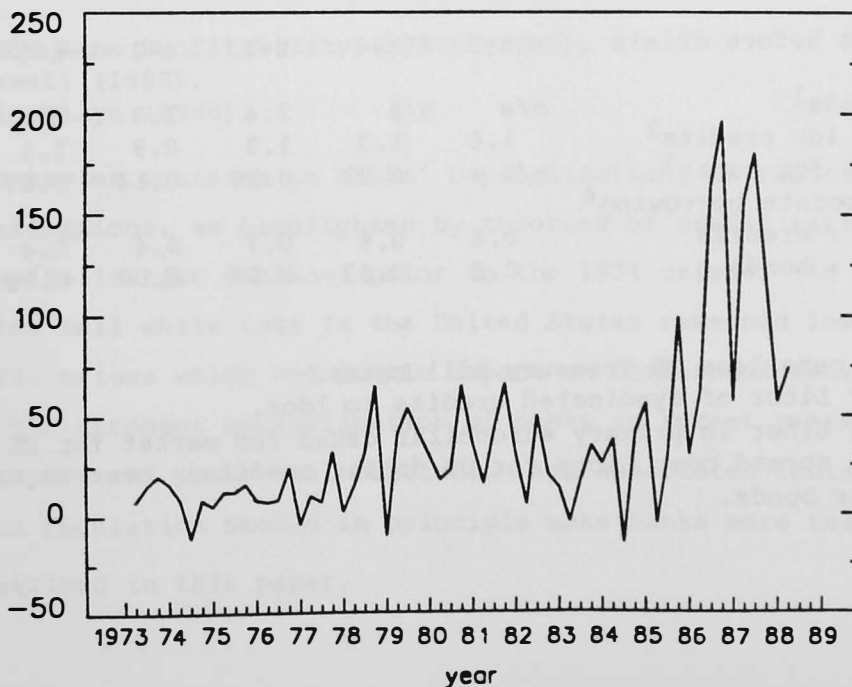


Chart 10

International Interbank Market Flows

\$ bns



5 A comparative empirical analysis of the periods of instability

This section focusses on developments in major economic indicators in the periods immediately surrounding the crises.

Table 1: Growth of indebtedness (indices)*

	years before crisis	t-4	t-3	t-2	t-1	t
1974 (growth of interbank market) ¹		100	152	201	217	232
1982 (growth of ldc debt) ²		100	124	152	180	200
1986 (growth of FRN market) ³		100	109 ⁵	244 ⁵	398	502
1987 (growth of US corporations' debt) ⁴		100	115	127	142	156

*Indices of nominal stocks outstanding are used for comparability; but growth also occurred in real terms and deflated by aggregates such as income, assets and exports.

1 Outstanding foreign currency interbank credits (reporting banks). Source: BIS (1975).

2 Evolution of non-OPEC ldc's external indebtedness. Source: BIS (1983).

3 Stock of FRNs outstanding. Source BIS.

4 US corporations' total liabilities. Source: US flow of funds.

5 Estimated.

Tables 1-4 examine potential longer-term precursors to financial crises. Table 1 illustrates the growth of debt outstanding prior to the crises. The table illustrate the rapid expansion of credit in the years prior to these crises, which as the accounts above have illustrated (and as emphasised by theories of financial-fragility) were an integral part of the crises themselves.

Table 2: Indicators of risk pricing prior to crises

	years before crisis	t-5	t-4	t-3	t-2	t-1	t
1974: interbank spreads ¹		n/a	n/a	2.4	1.3	2.2	3.1
1982: spreads on new ldc credits ²		1.6	1.3	1.0	0.9	1.1	1.0
1986: spreads on FRNs for banks ³		n/a -	0.23	0.19	0.14	0.17	0.19
1987: spreads on corporate borrowing ⁴							
: credits		0.6	0.6	0.7	0.4	0.4	0.3
: bonds		0.8	0.63	0.02	0.09	0.29	0.99

1 Eurodollar 3-month rate less US Treasury bill rates.

2 Average spread over Libor of syndicated credits to ldc's.

3 Average spread over Libor in primary eurodollar dated FRN market for US bank debt.

4 OECD corporations; spread over Libor for US dollar credits; over US Treasury bonds for eurodollar bonds.

What was the pattern of spreads prior to the periods of instability? Although data cannot be conclusive (spreads are determined by a variety of factors), Table 2 offers tentative evidence that standards of risk appraisal were relaxed on each occasion. Interbank spreads in 1972-73 were below those in 1971; spreads on credits to ldc's and on bank FRNs (except in 1986 itself) declined before their respective crises. Corporate borrowing, at least on syndicated credits, was made on progressively more generous terms prior to 1987. Nor were these patterns only observable in the markets where the crises occurred; for example as noted in Section 3, interbank margins fell sharply in the 1970s prior to the debt crisis.

Table 3: Commercial banks' capital ratios

years before crisis	t-4	t-3	t-2	t-1	t
US banks*					
1974	6.58	6.4	6.1	5.77	5.71
1982	5.80	5.75	5.79	5.83	5.87
1986	5.87	6.00	6.14	6.2	6.19
1987	6.00	6.14	6.2	6.19	6.89 [†]
UK banks ^ø					
1974	7.7	7.6	7.3	6.8	6.4
1982	8.0	7.7	7.4	6.9	6.9
1986	6.9	7.3	6.9	8.5	8.9
1987	7.3	6.9	8.5	8.9	8.5

* All insured commercial banks, capital plus reserves/assets.

ø Major UK banks' capital-asset ratios (1974 - primary book capital/asset ratio).

† Estimated.

Sources: OECD Bank Profitability (1987) (1985).

Revell (1980).

Llewellyn (1988).

Table 3 illustrates patterns in banks' capitalisation, an important concomitant of vulnerable situations, as highlighted by theories of credit rationing. Both UK and US banks' capitalisation declined prior to the 1974 crisis; in 1982 UK banks' capitalisation fell while that in the United States remained low. In contrast, in 1986 and 1987, crises which had little impact on commercial banks, capitalisation increased. The stronger capitalisation of banks in recent years is partly a result of the development of prudential regulation and associated increases in capital ratios. Such regulation should in principle make banks more resilient to the type of crisis outlined in this paper.

Table 4: Shifts in regime prior to financial crises

Date	Event	Indicator	Statistics	Prior period	Following period
May 1971	Shift fixed-floating exchange rates	\$/DM exchange rate	Mean coefficient of variation	3.82 0.05	2.98 0.12
(Observation period) (1968.6-71.5) (1971.6-74.5)					
October 1979	Change in US monetary policy	US Treasury bill rate	Mean coefficient of variation	8.29 0.16	12.32 0.17
(Observation period) (1976.1-79.9) (1979.10-82.8)					
December 1986	Basle agreement on treatment of bank FRNs	US bank FRN discount margin	Mean coefficient of variation	4.75 0.23	24.58 0.31
(Observation period) (1986.1-.12) (1987.1-.12)					
November 1986	(Introduction of programme trading techniques)	US share prices	Mean coefficient of variation	131.9 0.07	162.6 0.08
(Observation period) (1985.11-86.10) (1986.11-87.1)					

Table 4 shows shifts in regime prior to financial crises, the effects of which were acknowledged to be important at the time of the events (see Section 3) and effects of which on systemic vulnerability are highlighted by theories emphasising uncertainty. The shift from fixed to floating exchange rates and the United States switch to monetary targeting based on non-borrowed reserves both increased volatility in markets, though the latter was probably more important for its effect on the level of interest rates. Announcement of new measures for banks' capital increased volatility in the FRN market. The case for a regime shift in equity markets in 1987 is less clear cut, but the data show that there were increases in volatility which coincided with the widespread introduction of market innovations such as portfolio insurance (as well as the bull market itself).

Table 5: Share price* movements and financial crisis (percent changes)

Crisis	12 months prior	1 month prior	1 month after	12 months after
1974 (Jun)	-14.3	0.0	-7.8	+2.9
1982 (Aug)	-15.4	0.0	+11.7	+48.1
1986 (Dec)	+20.0	+1.4	+6.4	-3.1
1987 (Oct)	+18.0	-12.1	-12.5	1.0

* US Standard and Poor's 500-share.

Tables 5 and 6 examine some factors often held to be directly associated with financial crises. Thus Table 5 shows share price movements before (and after) the crises as highlighted by the financial-fragility approach. Each crisis except 1986 was associated with a sharp downwards movement in share prices - most obviously the crash of 1987 which was centred on the equity market. This followed a sharp upward movement in share prices over the previous year which many have characterised as a speculative bubble, and entailed declines of 20-30% in world share prices. The 1974 and 1982 crises followed sharp falls in share prices over the previous year. In 1982 an extremely strong recovery in share prices followed the crisis (48%) but in 1974 prices were flat for the following year. These data suggest that share price weakness may, directly or indirectly, be associated with disorder in the euromarkets. Whether it is a causal factor rather than an indicator of deteriorating economic conditions is of course less clear (though declines in equity prices tend to entail strong quantity-rationing in new issue markets, thus aggravating funding problems for those quantity-rationed in credit markets). Table 6 illustrates some other potential causal factors.

Table 6: Developments in US monetary growth and GNP prior to financial crises

Crisis	US monetary growth (M1) (real, change on same quarter a year before)					US GNP growth (real, change on same quarter a year before)				
Quarter	t-4	t-3	t-2	t-1	t	t-4	t-3	t-2	t-1	t
1974 (Q2)	2.8	-0.3	-2.4	-3.5	-5.0	5.4	4.1	3.1	0.1	0.2
1982 (Q3)	3.2	-1.4	-1.0	-0.2	1.3	3.4	0.3	-2.7	-2.2	-3.3
1986 (Q4)	8.5	8.7	10.0	11.1	14.3	3.8	4.0	3.4	2.5	2.3
1987 (Q4)	14.3	12.0	7.2	3.8	-1.5	2.3	1.8	3.1	4.1	5.1

First, real monetary growth was low or declining prior to the 1974, 1982 and 1987 crises, suggesting a degree of monetary restraint by the authorities (given the prevailing level of inflation) and concurring with the descriptions in Section 3. Thus in 1974 and 1987 real M1 growth fell monotonically in the year ending with the crisis period and growth was negative in the crisis period itself; in 1982 real money rose 1% in the quarter of the crisis; year-on-year growth was negative in the previous three quarters. 1986 is again the exception - monetary growth was consistently rapid over the preceding year - suggesting the FRN crisis was a localised rather than general macroeconomic phenomenon.

As for the economic cycle, the data show that in 1974 and 1982 the crises came several quarters after the turning point in GNP. The later 1986 and 1987 crises came amid rapid economic growth. The timing of the earlier crises in relation to the cycle suggests strongly that they were not causal factors in relation to GNP;

if anything the contrary (ie weakened economic activity may have created the conditions in which the crisis could occur).

Table 7: Percentage changes in the flows of euromarket lending during crises

	change in gross flow (per cent)	Quarter of crisis on previous year /	Following year/ on quarter of crisis	Year beginning crisis on previous year
1974 (Q2) Credits	-8.6	-40.8	-38.0	
Fixed rate bonds	+15.2	+60.7	+43.8	
FRNs	-	-	-	
Interbank claims*	-44.8	-57.8	-82.7	
1982 (Q3) Credits	-25.7	-49.2	-50.0	
Fixed rate bonds	+28.3	-17.2	+19.4	
FRNs	-43.7	+62.5	-16.4	
Interbank claims*	+37.4	-75.5	-44.1	
1986 (Q4) Credits	+78.1	+117.4	+214.4	
Fixed rate bonds	-7.1	-9.4	-5.3	
FRNs	-31.2	-68.0	-75.1	
Interbank claims*	+120.4	-34.4	+66.1	
1987 (Q4) Credits	+49.4	-3.5	+39.7	
Fixed rate bonds	-40.0	+101.1	+9.5	
FRNs	+23.5	+17.0	+30.2	
Interbank claims*	-17.5	-45.0	-43.4	

* Net flow

/ Quarterly averages.

Tables 7 and 8 show quantity and price developments in the major euromarkets at the times of the crises. As might be expected, Table 7 shows that the markets directly concerned in the crisis were worst hit in each case - interbank claims fell by 45% in the quarter of the crisis of 1974 compared with the previous year; credits by 26% in 1982, FRNs by 31% in 1986 and bonds by 40% in 1987. It is also evident that in 1974, 1982 and 1986 the crises were prolonged in the market concerned - there was no rapid recovery. Thus, interbank claims declined by a further 58% in the year

following the 1974 crisis compared with the quarter of the crisis itself; credits by a further 49% in 1982 and FRNs by 68% in 1986. In contrast, the fixed-rate bond market recovered strongly in the year after the crash (doubling issuance), showing that the crisis was rapidly overcome and its effects largely concentrated in the fourth quarter of 1987.

The Table also gives indications of effects in other markets - did quantities decline (suggesting systemic dimensions) or increase in order to substitute for the worst-hit market? Patterns for the earlier crises suggest some degree of contagion (though of course general economic conditions also affected issuance). In 1974 the credits market declined sharply along with interbank claims over all the sub-periods analysed. By contrast, fixed-rate international bond issuance remained buoyant, largely due to activity in foreign bond markets (the eurobond market was severely depressed). In 1982 there was an initial increase in fixed-rate bond issue and interbank claims in the quarter of the crisis, but comparing the year beginning the crisis with the previous year only the fixed rate bond market showed any increase (the beginning of the securitisation process). The FRN crisis appeared to be more localised. In the quarter of the crisis credits and interbank claims increased sharply while fixed-rate bonds declined marginally. Over the longer term similar patterns were observable. Again, in 1987 activity in the credits market increased sharply while bond issuance plunged, and issuance of FRNs also recovered. Over the following year, there were increases in all but interbank claims.

These data suggest that in no case was contagion pervasive (though of course all borrowers could not freely substitute between markets). One can nonetheless distinguish between 1974-82 on the one hand and 1986-87 on the other in that a greater substitutability between instruments (ie a lesser degree of contagion) is apparent during the later crises, possibly because the markets were more developed - or conversely that systemic effects in the euromarkets were more muted in these cases. Saunders (1985) also found little evidence of contagion between groups of banks in the interbank market in the crises of the early 1980s.

Table 8: Changes in interest rate relationships during crises (percentage points)

	Month	t-12	t-3	t-2	t-1	t	t+1	t+2	t+3	t+12
1974 (June)										
Credits ¹		0.1	0.3	0.5	0.5	0.7	0.6	1.3	0.9	1.2
Fixed rate bonds ²		1.8	1.8	1.9	2.0	2.2	3.0	3.1	3.6	1.2
FRNs ³		-	-	-	-	-	-	-	-	-
Interbank ⁴		1.6	1.2	2.3	3.3	3.9	5.7	4.8	4.0	0.9
memo: US Treasury bills		7.2	8.0	8.2	8.4	8.2	7.8	8.7	8.4	5.2
1982 (August)										
Credits ¹		1.0	0.9	1.1	0.9	1.0	0.9	0.9	0.9	0.7
Fixed rate bonds ²		-0.3	0.9	0.7	1.6	2.8	3.2	3.7	3.2	1.1
FRNs ³		-	-	-	-	-	-	-	-	-
Interbank ⁴		3.3	2.4	3.3	2.5	2.5	3.6	2.7	1.7	0.9
memo: US Treasury bills		15.6	12.2	12.1	11.9	9.0	8.2	7.8	8.0	9.4
1986 (December)										
Credits ¹		0.3	0.3	0.4	0.3	0.6	0.3	0.6	0.6	0.3
Fixed rate bonds ²		1.3	1.2	1.3	1.4	1.4	1.2	0.9	1.0	1.2
FRNs ³		0.03	0.06	0.07	0.07	0.07	0.12	0.12	0.24	0.38
Interbank ⁴		0.9	0.7	0.7	0.6	0.7	0.6	0.7	0.8	2.1
memo: US Treasury bills		7.1	5.2	5.2	5.4	5.5	5.5	5.6	5.6	5.8
1987 (October)										
Credits ¹		0.4	0.7	0.2	0.3	0.3	0.4	0.3	0.4	0.3
Fixed rate bonds ²		1.3	0.8	0.7	0.6	0.9	1.4	1.2	1.3	0.6
FRNs ³		0.07	0.32	0.28	0.25	0.2	0.32	0.38	0.36	0.28
Interbank ⁴		0.7	1.0	1.0	1.1	1.9	1.6	2.1	1.2	1.2
memo: US Treasury bills		5.2	5.8	6.0	6.4	6.4	5.8	5.9	5.7	7.3

1 Average spread over Libor (US dollar credits).

2 Secondary market - private sector eurodollar bonds minus US treasuries.

3 Secondary market - discounted margin* over Libor (US banks' dollar FRNs).

4 3 month eurodollar rate less US treasury bill rate.

Table 8 shows in more detail the price responses illustrated in the graphs, for example, the sharp increase in Libor relative to US Treasury bills (illustrating stress in the interbank markets) in 1974. It is notable that secondary market yields on fixed rate bonds and (to a lesser extent) spreads on new syndicated credits also increased over this period, suggesting a degree of contagion^ø between markets and concomitant price-rationing of credit.

The other crises are less clear-cut in terms of price responses. During the debt crisis, average realised spreads on syndicated credits did not increase, suggesting the existence of quantity-rationing of credit to account for the decline in lending

* The discounted margin is a measure of return from an FRN relative to that on its index rate (LIBOR), calculated by discounting future cash flow on a money market basis.

ø The alternative hypothesis in the credit market, that funding costs rather than the shock were responsible for higher margins on syndicated-credits, was found weaker; in empirical work by Johnston (1980).

shown in Table 7. Fixed-rate bond yields increased, suggesting concerns over default risk, but the increase in borrowing over the year of the crisis suggests there were still willing borrowers at these rates. Finally, although interbank claims declined sharply there was no strong increase in Libor compared with the US Treasury Bill rate. As with syndicated credits, this may imply some quantity rationing.

For the 1986 crisis, there was little detectable effect in markets other than the FRN market*. (Some slight upward pressure on spreads on credits is also apparent.) Chart 7 in Section 4 shows the sharp contrast between the period before and after the crisis. In October 1987 the increases in yields on fixed-rate bonds is marked. Pricing in the credits market appears unaffected, but Libor relative to US Treasury Bills increased sharply from 1% to 1.9%, perhaps reflecting perceptions of risks in international banking relative to domestic government paper.

Finally, it is notable that the US Treasury bill rate itself fell sharply after the 1987 crisis, reflecting relaxation of monetary policy and the flight-to-quality by investors. A similar pattern is evident after the advent of the debt crisis.

* There is a striking contrast between FRN discount margins prior to the 1986 crisis (seven basis points) and issue spreads on FRNs to the same class of institution (20 basis points). This may show the high degree of speculative activity in the market.

6 The theory of crises viewed in the light of empirical evidence

This section assesses the realism of the theories of financial crisis in the light of the four periods of instability in the euromarkets outlined and illustrated in Sections 3-5 above. The results are summarised in Table 9. These suggest that while all of the theories have important contributions to make to the understanding of recent financial disorder, none are all embracing and a form of synthesis would seem to be called for. Some attempt at this is made in the concluding section.

Table 9: Summary of features of periods of instability*

<u>Crisis:</u>	<u>1974</u>	<u>1982</u>	<u>1986</u>	<u>1987</u>
<u>Paradigm:</u>				
<u>Monetary</u>				
Prior monetary tightening	yes	yes	no	yes
Occurred beyond cyclical peak	yes	yes	no	no
Banking panics	yes	no	no	no
Aggravated downturn	no	yes	no	no
Caused reduction in money supply	no	no	no	no
<u>Financial Fragility</u>				
Prior 'displacement'	(no)	yes	(no)	(no)
Accumulation of debt	yes	yes	yes	(yes)
Occurred at cyclical peak	no	no	no	no
Speculation	yes	yes	yes	yes
Distress selling in credit markets	no	no	(yes)	no
Deflation/increased real rates	no	no	no	no
<u>Rational expectations</u>				
Bubble in asset/security prices	no	no	yes	yes
<u>Uncertainty</u>				
Regime shift	yes	yes	yes	(yes)
Competitive Innovation	no	yes	yes	yes
Crowd psychology (low risk premia)	yes	yes	yes	yes

*The more debatable points are bracketed.

(Table continued
overleaf)

<u>Credit-rationing</u>	<u>1974</u>	<u>1982</u>	<u>1986</u>	<u>1987</u>
Declining risk premia	yes	yes	yes	yes
Declining "capital ratios"	yes	yes	no	yes
Increased quantity rationing	yes	yes	(yes)	(yes)
Long-term quantity rationing	yes	yes	(no)	no
Increased price rationing	yes	yes	yes	yes
Concentration of risk	(yes)	yes	(yes)	(yes)
Intense competition between intermediaries	yes	yes	yes	yes

General

International transmission	yes	yes	yes	yes
Intervention of authorities	(yes)	yes	no	yes
Contagion between markets	yes	yes	(yes)	yes

(a) The monetarist approach

The acknowledged influence of monetary tightening* on the crises of 1974, 1982 and 1987 and the fact the 1974 and 1982 crises occurred after cyclical peaks (see Table 6) lends at least partial credence to monetarist views of financial crisis. However, it is less clear that the crises caused a reduction in the money supply, thus aggravating the contraction. The nearest to this may have been in 1974, when the reduced supply of short-term interbank credit may have influenced the price of credit (syndicated credits) to final users,^ø Although the debt crisis may have worsened the recession of the early 1980s, this was due to the effects on global demand of the reduced ability of ldc's to purchase imports rather than enhanced monetary contraction. Central bank intervention to loosen monetary conditions generally helped to prevent adverse macroeconomic changes. Bank panics were not a feature of most of the crises, though the insolvency of Herstatt in 1974 (and the accompanying collapse of Franklin National in the US domestic markets) had many of the features of a panic. The lack of panic may again be partly attributed to the role of central bank intervention, particularly in 1982 and 1987 when bankruptcy of some borrowers was feared. On these occasions, relaxations of monetary policy also helped to offset any tendency for monetary contraction. It was the initial absence of strong intervention in 1974 that led to the Herstatt crisis (while US intervention helped contain the effects of Franklin National), and necessitated the

* Necessitated, according to monetarist views, by inflation caused by earlier monetary laxity.

ø Though Johnston (1980) suggested that the crisis itself (ie heightened default and liquidity risk) was the main underlying factor.

communique by the G10 governors in September 1974 outlining their commitment to continuing stability of the markets (while not committing them to lender of last resort intervention).

(b) Financial fragility

Again, some but not all of the mechanisms highlighted by this approach seem validated by the evidence. There clearly was rapid accumulation of debt in each case; interbank positions in 1974, third-world debt in 1982, FRNs in 1986, and corporate debt in 1987, though evidence suggests that concerns regarding the credit quality of companies in 1987 were rapidly discarded. The nature of the risk concerned differs of course; in 1974 and 1982 concerns were centred on default risk, in 1986 liquidity risk was perhaps crucial, in 1987, a mixture of both. Again, these accumulations were accompanied by speculation in 1986 and 1987. "Speculative" underwriting exposures were a particular problem during the Crash. Foreign exchange speculation caused the 1974 crisis. The ldc debt crisis arguably also had a speculative side, banks always wishing to earn spreads while expecting to be able to exit at the next rollover date (despite the fact that borrowers needed new credits to cover their interest payment obligations). The same false expectations of liquidity of course helped to create the conditions for the equity-market crash. The FRN market collapsed after speculators had become the main holders. Adopting Minsky's terminology, some of the episodes could at least partly be characterised as speculative or Ponzi financing, as could reports in 1986-87 that entry of new (intermediary) firms to the bond markets could account for a considerable part of the demand for bonds (ie supply created its own demand).

On the other hand, the crises did not tend to occur at cyclical peaks and cause the following downturn; again, this may partly be due to the policy response (for example, the loosening of monetary policy in 1982 and 1987). This may also account for the absence of widespread distress selling and of deflation with concomitant increased real rates. Equally, wealth effects on consumption which were widely feared in 1987, turned out to be minor as investors had not fully taken into account the previous rise in share prices.

The existence of a prior "displacement", triggering rapid growth in debt and of accompanying monetary innovation is debatable. Arguably the 1974 crisis was triggered by the "displacement" of the switch to floating exchange rates. The period of the debt crisis opened with the displacement of the oil shock though its precise links to the crisis (the need for balance-of-payments financing) are less

direct than in the theories of financial fragility. The relevant "displacement" for the other crises is less clear, though it might be suggested that securitisation was the initial impetus. Innovations with significant monetary effects have been a feature of the 1970s and 1980s (money-market mutual funds in the United States; high interest cheque accounts in the United Kingdom) but apart from development of the interbank market itself were arguably less relevant to these crises than the more general types of financial innovation emphasised by theories noting the role of uncertainty.

(c) Rational expectations

As noted above, several of the crises had features resembling speculative bubbles and runs. However, particularly in the case of bubbles it is less clear that the bubbles were "rational" in the sense that returns increased exponentially in order to encourage risk averse individuals to remain in the market concerned. The bubbles (for example in 1987) are more reminiscent of irrational bubbles where agents were prepared to remain in the market regardless of the pattern of excess returns, so long as they were not strongly negative. A degree of irrationality may have been present, which expressed itself in the beliefs that the fundamentals had changed and that the agent would always be able to exit first (the illusion of liquidity). Such hypotheses are of course difficult to test formally. Rational expectations theory of runs again seems somewhat too precise to characterise the respective crises, given that seemingly trivial causes led funds to be withdrawn (from lower rated banks in the interbank market, the FRN and equity markets) and in each case many lenders/investors were left with disproportionately large losses.

(d) Uncertainty

Most of the mechanisms outlined in Section 2 under the heading of uncertainty had a role to play in these crises; a shift of regime with unforeseen consequences; evidence of crowd psychology in lending and competitive innovation.

In terms of a regime shift, the direct cause of the 1974 crisis was the shift from fixed to floating exchange rates, the dynamics of which were unforeseen by market participants. Similarly, the banks prior to the debt crisis did not foresee the possibility of a second oil shock, the deep recession and the new US monetary policy which drove up interest rates so sharply and increased their volatility. The evidence of a regime shift is weaker for the FRN market; the problem was rather uncertainty of the potential dynamics of the market that was already in existence,

though the Basle guidelines may qualify as a partly unforeseen influence. Finally, and again rather tenuously, the crash showed an unforeseen possibility for equity prices to fall suddenly by a large proportion, thus weakening the asset backing (and increasing the debt/equity ratio) of corporations with international debt outstanding as well as financial intermediaries holding large equity positions.

Crowd psychology, notably reduced risk premia (often associated with intense competition between intermediaries), was evident in each episode; lending on the interbank market in 1974 without careful assessment of credit risk and risky practices in foreign-exchange markets; similar risky lending to ldc's, even when new loans were needed to pay interest on existing ones; launching of ever-greater volumes of FRNs at lower and lower spreads; and the crowd psychology of an equity market bubble and speculative debt finance dependent on high equity values. In each case lenders (or intermediaries) were comforted by the knowledge that others were making the same judgments; in each case they were proved wrong, and risk premia proved too low in retrospect.

Innovation played a key part in the crises of the 1980s - in each case there was a flaw in the market's understanding of the innovation. In the case of the debt crisis the main innovation was the syndicated credit together with sovereign lending itself⁺ as outlined; the securities market crashes of 1986 and 1987 were even more fundamentally linked to innovation, which provided at least part of the driving force behind the move to crisis conditions. The FRN market, as noted, was characterised by a wide variety of innovations which attempted to compensate for declining spreads.* Investors may have failed to understand liquidity risks in the market. The equity market crash has been linked to numerous innovations (programme trading, portfolio insurance) which gave rise to an illusion of liquidity. Similarly in the eurobond market any illusions of liquidity on issues of less than top quality or featuring financial innovations were dashed by the crash.

(e) Credit rationing

Like uncertainty, credit rationing has been a widely observed feature of recent financial crises. Increased risk premia (ie price rationing of credit) for classes of institution affected is evident from the charts and tables, as spreads over risk free rates increased. There is also, however, some evidence of quantity-rationing

⁺ In terms of Bond & Briault (1983a) (footnote, page 13) the market failed to understand the control implications of sovereign lending.

* See Mason (1986).

for lower quality institutions. This was evident for banks such as the Japanese in the interbank market after 1974; while other banks were subject to price "tiering", the lowest class often found themselves excluded from the market altogether. Similarly, the most indebted ldc's have been excluded from the granting of voluntary credits since 1982, while others have faced higher spreads due to increase in perceived risk. The decline in interbank lending with no increase in rates may suggest quantity rationing. In the later crises quantity rationing was again evident - the FRN market virtually closed for new issues in 1986, as did the equity warrant eurobond sector in 1987, and only top quality borrowers could gain access to the straight eurobond sector. Securities houses with equity exposures initially faced severe quantity rationing of bank credit. However, banks in 1986 and corporations in 1987 did not find themselves excluded from credit altogether, but instead shifted to other, more expensive, markets, namely the straight bond and euronote markets in 1986 and the syndicated credit and domestic bond and loan markets in 1987. Again, such quantity rationing as there was only remained for a relatively short time. Though these partly reveal the lesser severity of these crises, they also suggest a declining segmentation of the markets, which makes a "credit crunch" for a borrowing sector (ie closing of all sources of credit) less likely.⁴

Guttentag and Herring also highlighted declines in borrowers and lenders' capital ratios together with concentration of risk - somewhat more precise form of Minsky's "fragility". Declining capital ratios for banks were certainly evident prior to the 1974 and 1982 crises, especially if risks are correctly weighted. Low capitalisation exacerbated the crises when they did occur. Concentration of risk was also apparent, particularly in the ldc debt crisis. Again, in the equity market crash there were concerns over heavily indebted corporations (especially those involved in speculative takeover plays) as well as for investment banks that had taken on concentrated risks (large underwriting exposures). However, commercial banks were in a much stronger condition in 1986 and 1987 thanks to pressure by supervisory authorities to improve capital ratios. Intense competition between intermediaries was also present in each crisis - and helped to prompt risky behaviour.

Finally, the fact that monetary tightening and credit rationing (and/or shifts to more expensive markets) were both features of the 1974, 1982 and 1987 crises lends some credence to Greenwald and Stiglitz view of the monetary transmission mechanism.

⁴ Wojnilower (1980) (1985) examines the nature and implications of credit crunches in segmented markets.

(f) General issues

We conclude with observations on issues common to several of the theories. For example international transmission was a feature of each crisis (the crises were not confined to one national market). This is partly to be expected; the euromarkets are an important conduit for international capital flows; they also involve commercial and investment banks from all the major countries, which if involved in similar business would all be hit in a systemic crisis. The effects of the debt crisis are an example of this. Transnational effects of financial crises are also, however, increasing due to the growing integration of domestic and international markets, with the same borrowers, intermediaries and lenders active in each. This has reduced the insulation of domestic markets from shocks originating in international or other domestic markets, as the 1987 crash illustrated.

Intervention by the authorities was highlighted by most of the theories as the immediate solution to financial crises when they occur. These were not felt to be events that the market can sort out painlessly for itself. Decisive intervention (by the US Fed and other central banks) was particularly apparent in the equity market crash, but was also evident after the debt crisis and the 1974 debacle. Only the FRN crisis was felt sufficiently localised to blow itself out.

Lastly, in terms of contagion between markets, it was shown in Section 5 that this was a feature of all the crises to some extent, although in the FRN crisis it was largely confined to the market itself (effects of the perpetual FRN market on the dated market) and in no case were all the markets simultaneously affected. Nevertheless, the 1974 interbank crisis accompanied sharp declines in syndicated credits, which, though partly resulting from the macroeconomic situation, also resulted from the loss in confidence in international markets and banks' funding difficulties. The debt crisis also closed the eurobond market to ldc's and led to sharp falls in interbank claims; the crisis in the eurobond markets in 1987 was itself a result of contagion from the equity markets, though contagion to other euromarkets and to domestic government bond markets was more muted.

7 Conclusions

Subject to the limitations of the qualitative analytical approach adopted, this paper offers several types of conclusion; first it allows one to assess whether the crises were "unique events" or have common features; second it allows one to evaluate theories of financial crisis under current conditions - which factors should be highlighted, which discarded, and whether a synthesis is possible. This allows an assessment to be made of implications for the authorities and market participants. Third, one can consider present conditions in the light of such a judgment and assess whether there are causes for vigilance.

The data and descriptions presented, informed by the theoretical summary, suggest that the crises studied were not unique events but had discernable common features. Perhaps the most important of these common features of financial instability in the euromarkets over 1974-87* were the following:

- 1 They followed accumulation of debt and substantial speculation in assets which were often characterised by crowd-like behaviour among lenders, low risk premia and concentration of risk.
- 2 They followed a shift in regime which had unforeseeable or unforeseen consequences.
- 3 Innovation was often an important concomitant, as were declining capital ratios of lenders and borrowers.
- 4 They often followed a period of monetary tightening (necessitated by inflationary pressures) and/or recession.
- 5 They were accompanied by sharp increases in price and quantity rationing of credit, but this did not always prevent rationed borrowers from obtaining credit elsewhere.
- 6 International transmission was strong and rapid.
- 7 Contagion between markets was limited - in no case were all euromarkets strongly affected.

* Analysis of selected domestic crises over the same period (Appendix 2) reveals many similar features.

- 8 Decisive action by the authorities prevented the crises from having serious systemic and macroeconomic consequences.

Features 1-6 were also present during the Great Depression. Any synthesis would therefore emphasise the monetary and "fragility" precursors of financial crises, while emphasising the role of uncertainty in the conditions for crisis, the likelihood of credit rationing as a consequence of such crises, and the importance of intervention.

Put more precisely, a synthesis of the theory of financial crises applicable to conditions in contemporary financial markets, drawing on economic theory and recent experience in the euromarkets, should offer predictions regarding the preconditions, causes, nature and consequences of financial crises. For example, a long period of relatively calm conditions with intense competition between financial institutions, increasing debt accumulation at increasingly low risk premia (partly as a consequence of these), financial innovation and declining capital ratios may constitute the preconditions for a financial crisis. Supervisory pressure to maintain capitalisation and prevent excessive risk taking may consequently help to prevent these conditions from arising. The crisis may be triggered by a tightening of monetary conditions and the unforeseen consequences of a shift in regimes (including the unforeseen properties of financial innovations). It may be accompanied by a sizeable deviation of asset values from their fundamental determinants (a speculative bubble). The crisis may entail runs or panics which eliminate such deviations in asset values and a sharp increase in price and quantity rationing of credit. However, it may not lead to strong contagion between markets, further monetary contraction, and economic recession providing the authorities intervene firmly and decisively. Not that such intervention is always required. Some crises are localised enough not to offer systemic risks either because institutions involved are sufficiently robust or because the market concerned is relatively unimportant. Indeed some would argue that minor crises may be salutary in leading intermediaries and the authorities to tighten up control and supervision.

To the extent that the underlying theories are validated by the empirical analysis of crises in deregulated financial markets, it is useful to recapitulate their implications for the authorities and market participants (which were detailed in Section 2). Other policy implications may be drawn directly from the empirical analysis. A summary of these suggestions follows.

For supervisors, it is suggested that the common features of financial crises identified above could be of assistance in helping to assess when heightened vigilance

and examination of financial institutions' balance sheets are required. Theory and analysis suggest that balance sheet examinations could cover not only capitalisation but also indicators of risk such as growth of debt, gearing of creditors, vulnerability to crises in other national or international markets, asset prices, concentration of risk, implications of innovations, intensity of competition, risk pricing, indirect exposures, the strength of control mechanisms over borrowers, and potential liquidity of intermediaries' assets and liabilities in crisis situations. Given that, especially for commercial banks, supervisory regimes covering many of these aspects have been developed and refined recently, and international co-ordination of supervision increased, the possibility of serious crisis may be judged to have been reduced. However, supervisors still need to be vigilant to ensure not only that the institutions they supervise are not becoming subject to disaster myopia but also that they are not becoming complacent themselves, accepting prevailing judgments of risk which may have become distorted by a period of calm financial condition and/or intense competition. A possible indicator of such myopia is declining risk premia (Table 2). Second, regulatory regimes for investment banks may need further development (particularly in the field of international co-ordination). Third, market-based systems to reduce risk (reduced depositor protection to ensure adequate risk monitoring by wholesale depositors, rating agencies and greater disclosure) may have a useful role to play. Finally, an equalisation of the tax treatment of debt and equity may reduce tendencies to overindebtedness.

For macroeconomic policymakers the relationship of crises to shifts of policy regime and turning points in the tightness of policy implies, first, the need for policy to seek to avoid conditions such as rapid inflation which may necessitate such sudden shifts or tightening of policy. Second, should such changes be required, there is a need for vigilance for financial stability. Third, although the lender-of-last-resort function should be retained, its use should be sparing and management (and their shareholders) of financial institutions who have made mistakes should always be sacrificed. Otherwise the existence of the lender-of-last-resort may actually induce the development of financially fragile conditions, that its use is aimed to counteract.

For market participants several of the same implications apply. They need to examine market conditions frequently in the light of the factors identified above, perhaps by use of strategic planning divisions, in order to assess the likelihood of crisis situations and the consequent appropriateness of their pricing of risk. How assured are their credit lines? How strong is their asset backing? Has their exposure to credit or liquidity risk been increasing? Depositors and investors also need to be aware of these potential risks - though as noted above this may require limitation of

depositor protection and of moral hazard created by intervention. Private rating agencies may have an important role to play in monitoring firms exposures as well as taking the longer and broader view recommended in this paper.

Finally, although financial crises by their nature are rarely foreseen, often being triggered by a seemingly extraneous event, this synthesis of the economic theory of crises offers certain pointers for vigilance in the current conjuncture. These include:

- the growth in private-sector indebtedness, particularly in the United Kingdom and United States, beyond the range of historic relations with income and/or asset valuation*,
- the tendency of investment banks to take on large exposures, often of a sizeable proportion of their capital, during LBOs and other transactions,
- the rapid recovery of speculative activity in equity and debt markets after the crash, particularly highly leveraged takeovers and buyouts,
- declining spreads on syndicated-credits for OECD corporations (see Chart 3),
- the rise in global inflation and the need for tightening monetary conditions,
- and the intense competition among financial intermediaries, (partly as a consequence of excess capacity) which often focusses on market share rather than profitability of transactions[†].

* See Davis (1987) and references therein.

[†] See Davis (1988) and references therein.

APPENDIX 1: EUROMARKETS DURING THE 1987 CRASH^{*}

Following the crash, the volatility in global equity markets rapidly spread to the eurobond market. Syndication activity came to a standstill while trading in the secondary market was very thin. In the week ending 24 October, new issues in the international bond markets amounted to just \$1.4 bn compared with a weekly average of near \$4 bn over the previous year. As was the case in most bond markets around the world, secondary market eurobond prices and yields fluctuated violently on 20 October as collapsing share prices led to a reassessment of fixed income securities. Prices of long US treasuries, which dropped to 88 on 19 October because of the uncertainty caused by the crash, rose to 99 on the next day to close at 95. During that week yields on 30-year treasuries fell from 10.5% on the 19th to 9.9% on 26 October as investors moved to the relative security offered by fixed income markets and central banks injected liquidity in the financial system. The sharp price swings made it extremely difficult for dealers to quote realistic prices, and volatility in the eurobond market also made it difficult for investors to evaluate spreads, leading them to require higher risk premia, and causing most euromarket yield curves to steepen. Dealers reported difficulty in launching new eurodollar bond issues (which are mainly swapped) because of the wide disparity in yields between eurobonds and domestic government bond markets.

The crash had the immediate consequence of reducing liquidity in the eurobond markets and accentuated the problems of oversupply. Because of the small size of issues relative to domestic markets it had always been difficult to keep eurobonds liquid, and volatility left traders without recourse to their usual methods of evaluating bonds and protecting their inventories; volatility made it virtually impossible to assess yield spreads and harder to hedge by selling Treasuries short because of the drying up of stock lending by US investors to investment banks. As a result of the lower liquidity, differentials widened, deal sizes were curtailed and bid/offer spreads widened. For example, the most liquid sovereign issues which traded in \$5 mn blocks at b/o spreads as low as 10 bp before the crash saw block sizes reduced to \$1 mn on 30 bp spreads.

The collapse of equity prices brought activity back to the swap market although most transactions were in the secondary market. The bond market rally led corporates to

^{*} This section was originally prepared by J G S Jeanneau for an internal Bank mimeo.

try to arrange low cost fixed-rate funding in exchange for floating-rate funding. Asset swappers also entered the market in order to take advantage of the widening spread between euro-issues and domestic government bonds. The substantial price declines suffered by a number of corporate euro-issues meant that it was relatively cheap for swappers to purchase bonds producing a high yield in exchange for lower yielding bonds. Swaps could then be rearranged on the basis of these newly acquired bonds. However, the US dollar primary swap market made little use of the available windows owing to a number of factors: first, absolute swap rates fell sharply in line with domestic government markets but the excess of supply over demand for fixed rate funds pushed swap spreads to record high levels; second, bond yield volatility made it hard to hedge positions; third, hedging problems were compounded by the inability of dealers to borrow treasuries because holders were concerned about the creditworthiness of investment banks and therefore demonstrated a strong preference for retaining them; fourth, the lack of issues on the euromarket failed to provide counterparties on the fixed-rate receiving side, and finally the swap market was destabilised by concerns about counterparty risk. By the end of November, swap spreads had returned to pre-"Black Monday" levels but primary market activity remained minimal.

Overwhelmed by orders to sell, the largely London based market for dollar-denominated Japanese equity warrants came to a standstill for a day and a half. The major market makers had little choice but effectively to cancel trading in the days following the slump, because a significant proportion of the underlying stocks on the Tokyo stock exchange had moved to their limits and were not traded. Average warrant prices fell from an index value of 409* in the week prior to the crash to 192 (a 53% decline) by the end of the following week. Trading reopened with much wider spreads (from 3/4 of a point to 2 points) and with reduced lot sizes (from 50 to 25 warrants). The stock market crash led to a massive sell-off of Japanese equity warrants by foreign investors. Japanese investors and institutions reportedly purchased most of the warrants because they were more optimistic about local equity prices than were foreign investors. As a result, much of the warrants market, traditionally based in London, effectively shifted in Tokyo. The primary and secondary markets for Swiss franc convertible bonds, mainly used by Japanese companies, also dried up. The major market makers agreed to halt trading as some bonds fell to steep discounts of as much as 25% below a par issue price. Yields on some convertible bonds which had been issued with coupons as low as 1/4% to 1/2% at par moved up to reach almost 6%, higher than equivalent maturity straight Swiss franc denominated bonds.

* Cresvale Index.

In the weeks following the crash, only a handful of top rated sovereign and supranational borrowers were able to take advantage of the international rally in fixed income markets. The lesser liquidity of eurobonds (which has always been a feature of this market) caused eurobond prices to lag behind domestic issues and spreads to widen significantly over their domestic equivalent as yields generally fell (although this was somewhat less pronounced for top rated sovereign issues). The same phenomenon occurred for corporate bonds, more particularly for second ranking corporates, and meant that domestic markets offered less expensive financing for all but top quality issuers. Initial uncertainty over the economic situation also caused a sharp widening of corporate-government spreads in both domestic and eurobond markets. While eurobond activity weakened, some domestic bond markets such as the US market saw very strong issuing activity in the weeks following the crash as issuers took the opportunity offered by bond market rallies to lock in cheap fixed-rate funding. Because of the prevailing exchange rate uncertainty, the marked tiering of funding costs according to credit quality, thin secondary market trading and the resulting lower liquidity, the fixed-rate bond sector remained depressed in spite of the fall in short and long-term interest rates. Nevertheless, by mid-November the situation had become calmer and primary and secondary market activity more orderly. The higher yield available on eurobond issues (especially eurodollar paper) began to attract some investors away from their domestic markets. By the end of the quarter, even Japanese warrant prices had improved by significantly more than the underlying share prices on the Tokyo stock exchange (index value of 305 at the end of December) while trading lots and spreads reverted to more normal levels.

APPENDIX 2: FURTHER TESTING OF THE FEATURES OF CRISIS

1 Domestic Crises

The principal focus of this paper has been on international crises. However, the generality of the principal features highlighted may usefully be tested by brief consideration of the principal systemic crises in the domestic markets of the major countries* in the 1970s and 1980s. These were; the 1970 crisis in the US commercial paper market following the failure of Penn Central; the UK secondary banking crisis of 1973; the US thrifts crisis as it emerged in 1980 due to interest rate spread problems, and as it worsened due to loan quality problems after 1985; the Canadian farm bank crisis. Detailed accounts of these episodes are found, inter alia, in Timlen (1977), Wojnilower (1980) (Penn Central); Reid (1982), Bank of England (1978) (secondary banking crisis); Bellanger (1989) (thrifts); Estey (1986) (Canadian banks), and are not repeated here. Rather, the events were examined for features similar to the list on pages 44-5. The results are summarised in Table 10. Most of the features highlighted in this paper were present for each of the crises, notably debt accumulation, monetary tightening and intervention by the authorities.

* That is, those which affected large numbers of financial institutions rather than those confined to the failure of only one institution such as Continental Illinois, Banco Ambrosiano and Johnson Matthey.

	US commercial paper/Penn Central bankruptcy (1970)	UK secondary banking crisis (1973)	US thrifts - initial "interest spread" crisis (1980-82)	US thrifts - "loan quality" crisis (1985-89) (1980-82)	Canadian regional banks (1985)
accumulation	Rapid growth of CP market.	Expansion of lending to property and financial companies. Rapid growth of wholesale money market.	Fixed-rate mortgages became risky in the context of rapid inflation and high interest rates.	Speculative lending notably on real estate. Continuing problem of interest rate mismatch.	Heavy agricultural and energy related loans, funded by wholesale money.
ime shift	No.	1958 liberalisation of fund raising aided development of secondary banks. 1971 "Competition and Credit Control" aided growth of clearing bank funding to secondary banks.	1979 regime shift in US monetary policy. Deregulation of deposit rates (at a later stage) necessitated by disintermediation.	Collapse of primary product prices. Deregulation of lending and relaxation of capital standards. Raising of ceiling on deposit insurance (1986 tax reform).	Collapse of primary product prices.
vation	Development of money markets.	Development of money markets, and wholesale banking.	Money-market mutual funds, circumvented control on deposit rates.	No.	No.
etary tightening	Yes - tightening of money-market position in Spring 1970.	Yes - base rates increased, call for increased special deposits in late 1973.	Yes - dis- inflationary monetary policy following 1979 policy change. Increase in marginal reserve requirements Spring 1980.	No - though dollar appreciation entailed tightening of monetary conditions.	No.
it rationing markets cerned	Yes - supply of funds to CP reduced sharply, causing flight to bank credit.	Yes - wholesale funding to secondary banks cut sharply.	Thrifts initially found it difficult to raise deposits, but this resulted from dis- intermediation rather than fear of bankruptcy. (Partly due to deposit insurance.) After deregulation the problem was that deposit rates exceeded rates on outstanding loans.	No 'runs' occurred when federal deposit insurance applied, but there were panics when private local insurance was used.	Yes - rationing in interbank market caused collapses. Banks with similar characteristics were threatened with cut-off of interbank lines.
ernational transmission	No.	No - but preceded Herstatt and other international problems.	No - but contemporary with ldc debt crisis.	No.	No.
agation to er markets	Non-financial companies found borrowing in all markets more expensive.	Contagion to other institutions was feared by the authorities.	No.	No - but banks in Midwest and South shared thrifts' problems.	No.
ion of the thorities	Opening of discount window. Suspension of interest rate ceilings on CDs.	"Lifeboat" support operation.	Deregulation of lending powers (adjustable - rate mortgages, ability to offer non- housing loans). Relaxation of capital standards.	Rescue and structural changes now being arranged.	Bailout of CCB prior to final insolvency, but scale was inadequate.
er features		Fall in asset prices followed (and aggravated) crisis.		Fall in asset prices. Low capitalisation. Geographic concentration of risk.	Geographic concentration of risk Low capitalisation.

2 A simple econometric test

Second, although no attempt is made in this paper at formal econometric testing, a simple exercise was performed to assess the relationship between crises in the euromarkets and certain of the precursors noted here. Crises were defined in an ad hoc manner as increases of over 75 basis points in the 3-month eurodollar/US Treasury bill differential. This isolates 11 quarters between 1970 and 1988. The approach employed was the logit model. Crisis periods were labelled one, other periods zero. Independent variables were acceleration of GNP, acceleration of real money, acceleration of share prices and increases in domestic rates. Results after a simplification search were as follows:

$$\begin{aligned} \log \left(\frac{P}{1-P} \right) = & -3.1 & -75.9 & D_1 D_4 \ln \text{GNP}_{-2} \\ & (4.0) & (2.2) & \\ & -60.3 & D_1 D_4 \ln M/P + 0.56 & D_4 \text{RD} \\ & (2.3) & (2.3) & \\ & +12.1 & D_1 D_4 \ln \text{SP}_{-1} & \\ & (2.0) & & \end{aligned}$$

$$R^2 = 0.29, \log \text{likelihood} = -20.9, \text{percent correct predictions} = 88\%$$

$$1968: 1 - 1988: 4$$

where GNP = real US GNP, M = USM1, P = US consumer price deflator, RD = US Treasury bill yield, P = Probability of Crisis as defined above, SP = share prices (Dow Jones Index).

The relationships of the probability of crises occurring with the turning point in the economic cycle and monetary tightening are apparent. Crises also follow accelerations of share prices and coincide with increases in domestic interest rates.

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