

MARKET LIQUIDITY RISK

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Introduction

Emphasis in studies of financial instability is traditionally placed on bank failures, or consequences of sharp changes in equity prices². This paper suggests that market liquidity crises in debt markets may be of equal or greater concern, particularly given the increasing use of such securities markets both by banks and end-users. One example of such a crisis is the "shock" to the ECU bond market after the Danish referendum in 1992, which was followed by effective³ withdrawal of market makers, widening spreads and smaller deal sizes - i.e. a decline in liquidity - together with a collapse in primary issuance. It is suggested that such occurrences are not isolated events but part of a pattern that recurs quite frequently in debt markets - an extreme form of market liquidity risk, similar in some ways to contagious bank runs. In effect, securities are transformed to loans, which may entail severe difficulties for those relying on their liquidity, and which can lead to systemic risk in the financial system more generally. An outline is given of aspects of underlying economic theory, in the light of which the ECU crisis is analysed together with four similar patterns, in the FRN market, junk bonds, Swedish commercial paper (CP) and the Penn Central crisis in the US commercial paper. Implications for financial stability and regulatory policy generally are suggested.

1 Financial instability - banks and securities markets

The suggestion of this paper is that there is a common pattern of collapse of debt securities markets, which has partly been addressed by economic theory. Accordingly, this section offers a brief summary of aspects of recent developments in the theory of financial crises, which have generally been conceived to describe banking crises, and seeks to relate them to theories of securities market structure and dynamics.

(a) Liquidity insurance and runs

The core of financial instability, in the form either of bank runs or collapses in securities markets, has traditionally⁴ been the liquidity crisis. Such liquidity crises are best described in the context of the theory of banking as **liquidity insurance**, originated by Diamond and Dybvig (1983). By pooling risk, banks are able to provide liquidity insurance to risk averse depositors facing private liquidity risks.⁵ In other words, banks offer the possibility of early redemption of deposits at a fixed rate, which hence are "money"; they offer returns superior to hoarding cash, given funds are on-loaned for fixed investment projects, but returns are below those on illiquid direct investment,

² See for example OECD (1991).

³ In that many ceased to answer calls or make markets.

⁴ Bank runs have become less common since the 1930s and the advent of deposit insurance, prompting some to argue that fraud (BCCI), changes in the implicit contract between banks and authorities (Scandinavia) and asset price bubbles may be equally relevant.

⁵ This implies that they do not know when they will require liquidity, but prefer higher returns associated with long term investment to hoarding cash.

reflecting the "insurance" provided. This pattern is held to imply that banks provide "optimal risk-sharing". Meanwhile, reflecting the preferences of borrowers carrying out long term investment projects, as well as the importance of private information specific to the relationship between borrower and lender, banks' assets are long-term and illiquid, except for a small liquid proportion to meet normal demand for withdrawals;⁶ hence banks engage in maturity transformation.

A key aspect of this theory is that the risk-sharing deposit contract combined with illiquid assets may give an incentive for panic runs on banks by depositors, even if the bank is solvent; this is because of imperfect information regarding the bank's assets, inability of the bank to sell or cash illiquid assets (i.e. loans) at par, and the "first come first served"⁷ process whereby claims are distributed to depositors. Until the bank declares closure it must meet withdrawals on demand. But once the run exhausts liquid assets, it must close on liquidity grounds; and its ability to borrow liquidity in normal circumstances is at most equal to the value of capital. Once the latter is exhausted, the bank is likely to be insolvent, given the need to dispose of illiquid assets at "distress" prices.⁸ After closure, depositors join a pool of creditors who may or may not be met in full (implicitly, depositors face variation in the effective seniority of their claim). Therefore, there is an incentive to be first in the queue, and the risk that others may withdraw can cause a panic regardless of the underlying financial position of the bank. Such failures may impinge both on other banks (via contagion) and on borrowers unable to access other sources of funds.

Securities markets offer liquidity insurance in a different way. A liquid securities market provides optimal risk-sharing from a security holder's point of view, by increasing the ease with which assets may be transformed into cash prior to maturity. The counterpart to the lower yield on bank deposits than direct investment is that yields are lower in highly liquid securities markets- and hence the cost of funds is lower for a given maturity, as investors are more willing to hold a claim if they are confident of its liquidity. A striking illustration of this is that "letter stocks" on the New York Stock Exchange, for which trading is restricted for a specified period, can have prices 26% lower than otherwise-identical traded stocks in the same company (Pratt (1988)). Unlike banks there is no guarantee of a fixed rate at which assets can be liquidated but short-term high-quality debt securities approximate to this. Meanwhile, so long as markets remain liquid, the issuer of the security benefits from a longer effective maturity than the investor, thus there is again maturity transformation.⁹

⁶ A criticism of the paradigm, rectified in Diamond (1984), is that it does not specify the nature of bank assets and the importance of monitoring of borrowers as a key function of banks..

⁷ Technically, as well as this "sequential service" feature, there is a need for incomplete markets, ie agents are not allowed to trade claims on physical assets after their preferences for consumption have been realised. But banks specialise in lending to sectors where contracts are incomplete, owing to fixed costs, asymmetric and/or private information.

⁸ Because of the importance of private information to the value of bank loans, outsiders are likely to require a discount due to fear of adverse selection or moral hazard.

⁹ Money market funds active in short term debt markets are intermediate between banks and markets, offering pooling benefits similar to banks but a greater confidence about asset values than an individual investor

Market liquidity depends on all other holders not seeking to realise their assets at the same time, in other words there are externalities to individual behaviour. As noted by Herring (1992), liquidity is likely to be higher in markets which are broad (a diversity of investors and market makers) and deep (with sufficient two way volume to ensure ability to sell in volume without moving the price).

As is the case for banks, if doubt arises over the future liquidity of the securities market for *whatever* reason (it could be heightened credit risk or market risk), it is rational to sell first before the disequilibrium between buyers and sellers becomes too great, and market failure occurs (i.e. yields are driven up sharply, and selling in quantity becomes extremely difficult). The thrust of this paper is that such collapses of liquidity in debt markets (and in derivatives markets - see Section (4)) may have externalities similar to bank failures, particularly if illiquidity makes investors unwilling to accept new issues, there is contagion between markets and if there are creditors who do not have an alternative source of finance.

The nature of such liquidity failure may be clarified by analysis of the role of **market makers**, who buy and sell on their own account, increasing or reducing their inventories in the process¹⁰, at announced bid (buy) or ask/offer (sell) price.¹¹ A market maker provides (to buyers and sellers) the services of immediacy and a degree of insurance against price fluctuations. To be able to satisfy buyers of the asset, the market maker may have an inventory of the asset in question (although the bonds may be borrowed rather than purchased), together with access to finance for such inventories; the spread must obviously cover the cost of finance. Particularly in the case where the asset consists of securities, there is a risk of a capital loss on the inventory through unforeseen changes in prices. These risks may of course be reduced - but rarely removed entirely - by hedging. Accordingly, the response of market makers to "one way selling" where the new equilibrium price is uncertain is often simply to refuse to quote firm prices, for fear of accumulating stocks of depreciating securities, which itself generates a collapse of liquidity. Uncertainty is crucial; if there is a clear new market-clearing price at which buyers reemerge, the market-makers will adjust their prices accordingly, without generating liquidity collapse. Bingham (1992) argues that such collapses are particularly likely when returns to market making are low, and hence institutions are unwilling to devote large amounts of capital to it.

BIS (1986) suggests a number of reasons why one-way selling may occur, for example the increasing concentration of portfolios in the hands of institutional investors, which may react

(undiversified and with no cash reserves) would in a securities market. Their liabilities may hence be viewed as "near money" and may be used for transaction purposes.

¹⁰ Unless they are able to "cross" individual buy and sell orders.

¹¹ Ho and Saunders (1981) suggest one can also see banks as market makers in money, making bids on given terms for funds from depositors and offering loans to borrowers. The difference of bid and ask prices is then the interest rate spread. However, banks have other functions in payments, maturity transformation and monitoring of loans. We suggest treating banks as market makers would omit too many of these relevant aspects, and hence prefer to treat them separately.

similarly and simultaneously to news, transmitted increasingly rapidly by global telecommunication links (these may reduce breadth as defined above); the fiduciary role of such investors; the fact they see their holdings as short-run, low-risk, high-liquidity assets; that they may have less detailed information than would a bank on which to base a credit decision, and less of a relationship reason (than banks) to support a particular borrower or keep a particular market functioning¹².

Market collapse in dealer markets, even in the absence of generalised uncertainty, may result from perceptions of asymmetric information. The dealer faces a set of customers who are more, less or equally well informed about fundamentals relative to him. If the former, he will need to charge a higher spread than in the case of a regular flow of "liquidity" orders from uninformed customers,¹³ to offset losses made on dealings with "insider" traders whose orders reflect private information.¹⁴ Meanwhile, there are sizeable fixed costs in organising markets, and volumes of "liquidity" trading usually respond inversely to costs of transacting. The costs of trading depend in turn on the bid-ask spread, itself related to the volume of "liquidity" trades. This can lead to a virtuous circle of narrowing spreads, new entry of market makers and increased trading. But in the presence of asymmetric information, markets may also enter adverse spirals leading to market failure (Glosten and Milgrom (1985)). A relative increase in insiders leads market makers to widen spreads to avoid losses. This discourages liquidity traders, who withdraw, increasing adverse selection. Some dealers may cease to operate. Once the insiders are too numerous and if their information is too good, bid and ask prices may be too far apart to allow any trade.¹⁵ Since a wide spread in turn prevents the insider from revealing his information by trading, shutting down the market will worsen subsequent adverse selection (i.e. the proportion of insiders relative to liquidity traders) and widen the spread further. The market will stay closed until "the insiders go away, or their information is at least partly disseminated to market participants from some other information source".¹⁶

In both cases (of one way selling and of acute asymmetric information), the secondary market, in effect, ceases to function. The associated decline in liquidity of claims is likely to sharply increase the cost of raising primary debt in such a market (i.e. there will effectively be heightened price rationing of credit), or it may even be impossible to gain investor interest at any price (quantity rationing).

(b) Theories of systemic risk

¹² Because of the loss of positive externalities they may be induced to display club-like supportive behaviour (Davis (1993)).

¹³ Reasons why such individuals may wish to trade could include portfolio adjustment for hedging purposes (Madhavan (1990)), uninformed speculation, or to realise wealth for consumption.

¹⁴ Obviously, if incurring such losses the dealer may also restrict quantities at which he is prepared to deal.

¹⁵ This assumes liquidity trade is endogenous; if not, there will remain a small number of trades.

¹⁶ Madhavan (1990) suggests this implies that circuit breakers such as market closure are ineffective. An auction may be needed to restart the market.

Theories of systemic risk seek to categorise the ways in which liquidity crises as described above may be triggered. In this section we summarise their main features and show their applicability to securities markets as well as banks.

A theory that can be partly dismissed in the present context is the **monetarist** view that financial crises are purely defined in terms of contagious banking crises and their consequences for the money supply.

Theories emphasising **debt and financial fragility**¹⁷ consider financial crises to be a key feature of the turning point of the business cycle, a response to previous "excesses" of borrowing which can operate through a variety of financial markets. Amongst the key components of the theory are, first, the concept of a displacement¹⁸ - an exogenous event leading to improved opportunities for profitable investment - and, second, monetary financial innovations which partly offset increases in interest rates caused by excess demand for finance during the fixed investment boom. However, sharp increases in demand for credit mean interest rate increases eventually occur, which leads to "fragility". Features of fragility include an increase in debt finance; a shift from long to short-term debt; a shift from borrowing which is adequately covered by cash flow to borrowing not covered at all by it; a heightening of speculative activity in asset markets; and a reduction in margins of safety for financial institutions. Further rises in interest rates, perhaps due to policy tightening, may lead on to financial crisis, with runs on banks. Such heightened credit risk as accompanies financial fragility may clearly also lead to liquidity collapses in securities markets, if it generates one-way selling of the securities concerned.

Theories of crisis focusing on **uncertainty**,¹⁹ which were developed from those of financial fragility, define it as pertaining to future developments which are so infrequent and extreme as not to be susceptible to being reduced to objective probabilities²⁰ (e.g. major changes in policy regime, wars). In the presence of such uncertainty, adverse surprises may trigger shifts in confidence, affecting markets and institutions more than appears warranted by their intrinsic significance: hence leading to potential for a liquidity crisis. The response to the potential for such uncertain events, for example by those deciding on liquidity cover²¹ (or pricing of loans or services) in banks, underwriters or market-makers in securities, may be to apply subjective probabilities to uncertain events²² plus a risk premium. But agents often tend to judge such probabilities by the actions of others (i.e. herding)²³ which if it leads to low liquidity cover, undercapitalisation and underpricing of risk can lead to

¹⁷ Key references are Minsky (1982) and Kindleberger (1978).

¹⁸ Such as financial liberalisation.

¹⁹ Shaffer (1986).

²⁰ Or alternatively and more loosely, to which expectations can only be applied with extreme difficulty.

²¹ Note that precautionary liquidity is more expensive than holding illiquid assets, ie there is a cost.

²² Such as war on an oil price shock.

²³ Such herding is not irrational if there is a greater likelihood of a bailout when shocks threaten the entire system.

financial instability. Meanwhile, super-normal profits can only be earned by financial innovation when there is uneven information and uncertainty. But such innovation may lead to instability for banks and markets if risk is underpriced. Mayer and Kneeshaw (1988) suggest that this is particularly likely for innovations because firms will have little experience of the instruments; it is difficult to evaluate the risks, especially in terms of a macroeconomic environment different from the present one; and because in new markets firms may be particularly likely to pursue long term profit maximisation. In other words, uncertainty itself may be raised by the innovation process, particularly because the behaviour of new instruments during periods of financial stress is initially unknown.

Paradigms of **disaster myopia**²⁴ extend the theories stressing uncertainty and financial fragility outlined above, to distinguish on the one hand, systematic, recurrent risks such as recession and on the other hand financial crises - the latter being subject to much greater uncertainty as outlined above. In the case of recession it is suggested that objective probabilities are known and subjective probabilities tend to be objective, because unfavourable outcomes are frequent enough to ensure an over-optimistic intermediary in terms of liquidity cover or pricing of risk is driven from the market.²⁵ But for uncertain events which may provoke financial crises, there is no such presumption; competition may drive prudent creditors from the market as they are undercut by those disregarding the likelihood of financial crisis for reasons of ignorance or competitive advantage. As well as competition, various psychological factors underlying this pattern of "disaster myopia" may be identified, notably a tendency to calculate probabilities by ease with which past occurrences are brought to mind, which declines with time, as well as institutional factors such as short periods over which decision-makers in banks and securities houses are assessed, and asymmetry of outcomes for managers and shareholders. These tendencies, which imply declining subjective probabilities of shocks during periods of calm, may lead in banking markets to declining capital positions, and loosening of "equilibrium" price²⁶ and quantity²⁷ rationing of credit, and hence increased objective vulnerability of creditors to shocks. In securities markets they may lead to narrower bid-offer spreads, increased open positions and large underwriting exposures. For both types of institution, liquidity cover may be reduced²⁸. Subjective and objective probabilities of crises may thus during a period of calm drift further and further apart, until a shock leads to an abrupt increase in credit rationing and/or a collapse in liquidity triggering a crisis, as institutions become aware of their imprudence. The

²⁴ Guttentag and Herring (1984).

²⁵ This does however assume a suitably long time horizon

²⁶ i.e. higher risk premia

²⁷ i.e. following Stiglitz and Weiss (1981), absolute limits on borrowing resulting from information asymmetries between borrower and a (profit maximising) lender and lack of control of the borrower by the lender

²⁸ Herring (1990) argues that there has been a secular increase in liquidity risk as institutions have shifted from holding of government securities as liquidity to use of interbank lines, CDs and derivatives, which are more vulnerable to market liquidity risk, as well as to changes in the market's view of an individual institution.

reaction to such a crisis may be a prolonged overestimate of the probability of shocks, which may be equally damaging.

A view of crises based on **agency costs and asymmetric information** emphasises the role such asymmetries may play in aggravating credit rationing - either by banks or securities markets - during crises. As noted by Mishkin (1991), this may occur via a number of channels. First, if interest rates rise due to monetary tightening or merely to balance the credit market, adverse selection may increase sharply, giving rise to a substantial decline in lending. Second, heightened uncertainty, such that lenders find it harder to screen borrowers, increases adverse-selection problems. It is suggested that in each case the impact is greatest on borrowers whose credit quality is difficult to ascertain - which are likely to be low quality. Again, collateral is a means whereby asymmetric information problems may be reduced (as the lender is then confident of recovering his loan even if the borrower proves to be of low quality). But this means that a decrease in the valuation of assets (e.g. a stock market crash provoked by a change in future profit expectations), by lowering collateral values, sharply increases adverse selection for lenders. Again, this will impinge more on low-quality borrowers for which there is asymmetric information. A fourth mechanism operates via moral hazard. Given asymmetric information and incomplete contracts, borrowers have incentives to engage in activities that may be to their advantage, but which harm the lender by increasing risk of default. The agency problem is greater when borrowers have low net worth as they have less to lose from default. Net worth could decline due to stock-market crashes, as above, as well as due to an unanticipated disinflation or deflation that redistributes wealth from debtors to creditors. Such effects are plausibly greater for low-quality firms that have low net worth before such crises occur.

Last, Davis (1990, 1992) offers an **industrial analysis** which suggests that periods of financial fragility, which may culminate in financial instability, are often preceded by changes in conditions of entry by intermediaries to financial markets - banks, market makers or underwriters. As well as deregulation, such changes may be provoked by technological development or shifts on the demand side. Reduction in entry barriers may lead to heightened competition in the market concerned, whether due to actual new entry (tending to perfect competition), changes in behaviour that incumbents are obliged to adopt due to the threat of new entry, in the absence of sunk costs (heightened contestability) or competitive responses that incumbents choose to make to potential or actual entry in the presence of sunk costs (strategic competition). The last implies that new entry may entail not only falling margins but also non profit-maximising behaviour, i.e. competitive behaviour aiming to gain long-term advantage at the expense of short-run profit maximisation. Strategic competition may be particularly common in the context of a bull market and buoyant long term expectations of growth in the market (e.g. for a financial innovation). But in all three cases the importance of factors such as uncertainty, information problems (leading to inadequate screening and monitoring of risks) and moral hazard arising from the safety net may lead to overshooting of the level of competition which is sustainable in long-run competitive equilibrium.

For banks, excessive competition may be manifested in lower capitalisation, liquidity and lower prices and higher quantities in credit markets. In primary securities markets such competition is likely to lead to increased risk-taking in underwriting. In dealer markets strategic competition may lead to skimping of the hedging of inventories, heavy position-taking on own-account, narrower bid/ask spreads and larger deal sizes. Narrower spreads and larger deals can increase risk of insolvency if they go beyond a profit-maximising level determined by the amplitude of liquidity/insider trading as outlined above. And as also noted, low returns to market making may increase the risk that market makers will withdraw in response to minor shocks to the market, thus undermining liquidity. Underpricing of risk in secondary or primary markets may be motivated by desire to gain synergies in the other market. These trends may leave the financial system vulnerable to shocks such as abrupt monetary tightening, or shifts in policy regime which increase uncertainty and (possibly) asymmetric information. These may provoke collapses in liquidity in dealer markets as described above, as well as sharp increases in credit rationing.

The next section of the paper comprises accounts of five patterns of collapse of secondary debt markets in chronological order, that have had "contagious" effects on primary markets and in some cases also on other security markets. The key features which are picked up by the theory are set in bold type.

2 Liquidity risk in debt securities markets

(a) The Penn Central bankruptcy (1970) - US²⁹

Although commercial paper (CP) markets - markets for short-term tradable liabilities of highly-rated companies - are long-established in the US, a crucial event in their evolution was the **innovation of the certificate of deposit (CD)** in 1962, which led both to a rapid expansion in US money markets and in the freedom of banks to bid for deposits and loans. The CD facilitated development of liability management among banks. In the light of the expanded powers offered by CDs, banks proved **eager to expand their business more generally**, opening credit lines to other financial institutions and "**nurturing the epidemic growth** of the commercial paper (CP) market, even though their generosity in granting the securing credit lines on which the market depended came at the expense of their own loan business".³⁰ Meanwhile experiences such as the credit crunch of 1966, which threatened to lead to a cut-off of business credit (as market rates exceeded CD ceilings) prompted non-financial firms to seek both committed lines of credit with banks and alternative sources of funds such as CP. Indeed many banks formed holding companies to issue unregulated CP to circumvent CD interest rate ceilings, thus implying that CP market failure could be a source of direct risk to banks. Finally, a lowering of interest rates in 1968, to offset the fiscal tightening that

²⁹ References; Timlen (1977), Wojnilower (1980).

³⁰ Wojnilower (op cit) p286.

year, led to an **explosion of credit** "as lenders were encouraged to be more aggressive"³¹ as well as rising inflation. Interest rates began to rise as **monetary policy was tightened**, but rather than operating strongly on demand for credit, the eventual blockage came on the supply side as political pressures mounted on banks not to raise prime rate further. Lending became unprofitable and growth of loans ceased in late 1969. **Spreads on CP and bonds rose** and the stock market fell sharply.

It was in the aftermath of this "credit crunch" that Penn Central Transportation Company failed³² in June 1970 and defaulted on its \$200 mn outstanding CP. **Investors, uncertain over credit risk, turned away from CP; issuance of CP declined sharply; companies unable to rollover their CP had to turn to banks to obtain credit; while companies found borrowing in all markets more expensive.** The authorities feared a wave of corporate bankruptcies; one ground for this was that lenders would ration credit owing to shortage of funds; the other was that they would particularly ration borrowers driven from the CP market, due to inability to screen out good from bad borrowers, given they lacked a relationship. Given the prior monetary tightening, onset of a recession and a sharp fall in share prices, lenders' **concerns over adverse selection and moral hazard** were particularly acute. The **authorities' response** was suspension of interest rate ceilings on short-term CDs (to enable banks to obtain funds) and indications that the discount window was available for banks needing reserves to extend loans to companies. Large-scale business failures were avoided, though firms found their borrowing capacity sharply reduced, and the cost of credit increased.

(b) The crisis in the FRN market (1986)³³

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 early 1970s 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, 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 1981-5, 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). The **innovation of perpetual FRNs** in 1984 was particularly popular for banks, as the authorities allowed them to count as capital under certain conditions, while the tax authorities allowed interest expenses to be deducted, unlike dividends. However, given the indefinite maturity, liquidity was clearly essential for perpetuals to be priced, as they were, as money market instruments. Banks also were attempting by use of dated FRNs to reduce the degree of maturity and duration mismatch in their international lending. Banks, notably in Japan,

³¹ Wojnilower (op cit).

³² Failure followed a series of unsuccessful rescue attempts (Mishkin (1991)).

³³ References: Fisher (1988), Muehring (1987), Federal Reserve Bank of New York (1987).

also emerged as the major investors in the FRN market, given higher yields than the interbank market. There was also **rapid new entry of banks lead managing new issues and making markets in secondary issues**.

The FRN crisis began with **sharp price falls** in December 1986 in the perpetual sector, which have been blamed on factors such as; investors' **re-evaluation of the equity characteristics** of these instruments; **uncertainty** arising from fears that the supervisors would deduct any holdings of bank-issued FRNs by other banks from the latter's capital (thus making investment unattractive); **excess supply of bonds** given the size of the investor base; **mispricing of issues in relation** to risk; and **false expectations of liquidity**³⁴ 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 after incurring heavy losses, thus increasing potential losses for remaining traders**. Short selling worsened the situation. Note that credit risk was not involved; spreads on the same banks' other securities were unchanged.

A similar crisis hit the much larger dated sector a month later, yields soared and issuance became virtually impossible. Although the **difficulties of the perpetual sector helped to trigger this**, the problems of **fears of new supervisory rulings, oversupply, underwriting exposures 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. One reason for this is that alternative sources of finance such as interest rate swaps and short term paper were developing rapidly. This reduction in yields 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 also an **illusion of safety in liquidity** - it was always felt that bonds could easily be sold if adverse conditions arose. Last, it was **assumed that an investor base existed beyond the banking sector**. This was not the case³⁵, in other words the market lacked breadth, so short term speculative demand was mistaken for genuine end-buyers, and the market proved vulnerable to herding.

³⁴ Whereas in November perpetualls were traded on 10 bp spreads in \$5 mn lots, by August 1987 the spread was 50 bp and the lot size \$1 mn.

³⁵ Nonbanks were unwilling to buy FRNs at money market yields as they perceived the instruments as equity; after the crisis it was feared that Japanese banks would sell on any rise in price. But in fact the latter were encouraged to hold the FRNs and not trade, as their supervisors allowed them to hold them on their books at cost.

After the crisis more and more **market makers withdrew** and **liquidity continued to decline**. Both the perpetual and dated FRN markets were **largely moribund** for the rest of the decade, except for some development of mortgage-related issues.

(c) **The failure of the high yield (junk) bond market (1989) - US³⁶**

US corporate finance in the 1980s was marked by a rapid **growth in leverage**, much of which was associated with issuance of high yield bonds. Whereas there had always been low rated or speculative bonds on the market - often a result of loss of credit rating by firms ("fallen angels") - in the late 70s and early 1980s the investment bank Drexel Burnham Lambert set out to **create a market** for bonds that would have low credit ratings at issue. An additional stimulus was the decline in the private placement market, as life insurers sought greater liquidity (Crabbe et al (1990)). Initially, the market was largely a source of finance for small emerging companies which could not easily find credit from other lenders, while offering equity-like risks and rewards to investors seeking high yields. But the market also attracted take-over and LBO activity, often enabling corporate raiders to take over large companies from a small asset base. **Issuance grew rapidly**. Drexel undertook to make markets in the securities, aided by certain savings and loans and insurance companies having close relationships with the firm.

Initially **other US investment banks sought to distance themselves for the market, but were eventually attracted** by the high profitability of primary issuance activity. Investors, such as Savings and Loans institutions and insurance companies were keen investors, given the market offered equity returns together with guarantees and security associated with bonds. Also they were partly forbidden by regulation from investing directly in equities. Bush and Kaletsky (1990) suggest that junk bonds enabled such companies to offer higher yields to retail investors and gain market share at the expense of more prudent competitors, thus increasing the onus on them to hold junk bonds too. It is a matter of controversy whether **risk was underpriced** in the market; while the yields seemed generous enough to compensate for realised defaults, these occurred in the context of a period of prolonged economic expansion.³⁷ High leverage, the high prices paid for companies, (whose security thus depended on inflated asset values) and accounts and prospectuses based on an indefinite continuation of expansion gave grounds for caution. It can be suggested, in effect, that junk bonds **dispensed with the credit analysis³⁸ usually performed by banks, leaving investors to rely on liquidity and diversification to protect themselves**. As discussed below, the former proved an illusion in changed circumstances; the latter also (given higher defaults than anticipated) to some degree.

³⁶ See Bush and Kaletsky (1991).

³⁷ The 1990-91 slowdown has exacted a heavy toll of bonds, with default rates of 8.8% in 1990 (Moody's (1991)).

³⁸ Although in principle the lead manager should offer credit assessment, balance may have been affected by the attraction of the front end fee.

By 1989 the market had reached a value of \$200 bn and **issues were still proceeding briskly**. These included part of the financing of the \$25 bn RJR/Nabisco take-over, the largest yet. But the market was weakened by a number of factors which **increased uncertainty** arising particularly from a default at Campeau, a Canadian conglomerate that had financed purchases of US retailers by junk bonds as well as **sharply increasing supply** and **declining liquidity**. Fundamentals worsened sharply when the government's Savings and Loans bail-out bill ordered thrifts to dispose of all junk bonds, although it is not clear this was sufficient to account for all of the subsequent decline. As a consequence, **prices fell rapidly, liquidity collapsed³⁹ and new issues dried up**. In the wake of this came the **failure of Drexel Burnham Lambert, the main⁴⁰ market-maker** in February 1990, as the declining value and liquidity of its holdings of junk bonds - in effect, they turned into loans - led to a downgrade of its own debt by the rating agencies and consequent inability either to rollover its commercial paper or to obtain substitute bank finance. It is notable that the market failure occurred without a tightening of monetary policy or a recession, though the later slowdown in the US weakened the market further. No intervention was felt necessary to rescue⁴¹ Drexel - whose failure was felt to pose no systemic threat - nor the market itself. **Issuance was near zero** through 1990, though a tentative recovery was apparent by the end of 1991.

(d) The Swedish finance company and commercial paper crisis (1990)⁴²

As in many other countries, the Swedish banking sector was tightly regulated for much of the post war period, with prohibitions on entry (no new banking licences were granted from 1945 to 1983), quantitative restrictions on credit and exchange controls. Banks were obliged to hold a proportion of government bonds on their balance sheets, in the interests of cheap financing of the budget deficit; and credit was provided to the housing sector on a privileged basis. The tight regulation of banking gave rise to **growth of a non-regulated sector**, the finance houses. Although these originated in the 1920s and 30s, specialising in consumer and small company loans, in the 1970s and 80s they expended first into factoring and leasing, and then lending to small and medium size firms, circumventing controls on banks. Their number rose from 67 in 1970 to 292 in 1988, with assets of SEK 171 billion. Heavy regulation of banks also led to development of direct finance. The Swedes **introduced a commercial paper market in 1980**. Initiated by banks - the first deregulation was of CDs⁴³ - it was further stimulated by issuance of short term Treasury bills in 1982. Industrial companies, housing finance institutions and government agencies were heavy users of the market. **The market grew rapidly**. By 1990 there were 270 programmes valued at SEK 160 billion, making the market the third largest in Europe. Finance houses could not issue commercial paper, but required

³⁹ Whereas trading was \$400 mn a day before Campeau, it was \$150 mn in December

⁴⁰ It accounted for 50% of trading.

⁴¹ However, the authorities were careful to ensure an orderly rundown of its affairs.

⁴² References: Bisignano (1991), Moody's (1991b).

⁴³ Note that this entailed the spread of an innovation from abroad.

a bank to make markets in their promissory notes (company investment certificates (CIC)). However, market participants **considered CICs identical to CP, although banks were not obliged to provide backup liquidity, or make markets.** Further **deregulation** of banks (Englund (1990)) entailed, first, abolition of liquidity ratios - which were 50% in 1983 - followed by abolition of other controls, and the end of exchange controls in 1989. The deregulation of finance created a structural expansion in markets which, along with the upturn of the cycle, caused an economic boom, rapid growth of the financial sector and increasing asset prices. Banks grew particularly strongly, balance sheet size increasing from 90% of GNP in 1985 to 200% in 1989. Mergers raised banks' competitiveness. Banks regained market share of consumer credit from finance houses, whose **margins narrowed**, and whose numbers fell sharply. Many of the finance houses **turned to higher-risk lending** such as highly-leveraged commercial real estate transactions and financing of investments in shares; banks supplied the bulk of their funds via CICs.⁴⁴

When growth in asset prices faltered as monetary policy was tightened, a crisis occurred in the finance company sector at end-1990. The initial casualties were Nyckeln Holdings - which suffered severe credit losses when customers defaulted due to falling real estate prices - and Beijer Capital, its major shareholder, which was also highly leveraged. The proximate cause of Nyckeln's default, **even before credit losses became fully known, was inability to roll over its CIC programme.** After the failure, Beijer Capital's programme was cancelled by banks, and it failed. The **sizeable and unprecedented losses to creditors of these firms caused a "shock"** that spawned rumours that several finance houses were in difficulties, and the **CIC market dried up - banks refused to allow rollover.** Many finance houses, lacking liquidity backup facilities, were forced to sell assets; others sought emergency bank loans. Three others defaulted on their programmes. One underlying factor may have been **inadequate monitoring** of the finance companies' lending by the banks, which largely financed them and in a number of cases owned them. The crisis left banks nursing heavy losses which led on to the crisis in the banking sector a year later. The Swedish Bank Inspectorate reportedly lacked resources and authority to supervise the companies.

Meanwhile, the potential volatility of CP markets became even more apparent with the **collapse of the broader commercial paper market** which followed; for several months even well-managed non-financial companies, whatever their nature, found it difficult to raise CP. Whereas **spreads had been very low** prior to the crisis (10-15 bp over risk free), with **little differentiation in terms of credit risk, defaults led to a flight to quality, with wide spreads, low liquidity and all but the highest quality issuers excluded.** Some recovery in the CP market, as well as differentiation by credit quality, was apparent by July 1991, with top quality credits paying 20 bp over risk free, and finance houses able to access the market 50-150 bp spreads, if at all.

⁴⁴ A similar pattern was apparent in Japan, where much speculative financing of real estate and equity markets has been via lightly regulated "non-bank banks", albeit largely funded by banks. A crisis on the Swedish scale was avoided, however (Bank of Japan (1991)).

(e) **The collapse of the ECU bond market (1992)**

Whereas traditionally the ECU bond market had been dominated by retail investors, generally content to buy and hold the paper, the use of the market by major European governments, together with the beginning of the EMU process, made the market increasingly attractive to wholesale investors, including major institutional investors, central banks and own-account traders at securities houses and banks. Indeed, **confidence in the market**, in the light of expectations of EMU became so strong that ECU yields fell below the theoretical yield on an equivalent basket of bonds. The early 1990s also saw a **rapid growth in issuance, and new entry by underwriters**. These developments were complemented by a significant **new entry of market makers** to the sector. However, the number of market makers registered with ISMA, 44, always gave a false impression of the actual amount of activity in the market. Market sources suggest that at most there have been twelve "serious" market makers who regularly offered two way prices.

According to Euromoney (1992), the ECU sector became prey to forms of overcompetition typical of the euromarkets in earlier years (see Davis (1988)), as **new entry became excessive in relation to the business**, both in the primary and secondary markets. Rather than seeking profit, **banks were seeking long term strategic advantage**, keen to make their reputations and establish relationships in what was expected to develop into Europe's bond market. Accordingly, there is evidence of **underpricing of deals**, with the underwriter accepting low or zero profits in order to "buy" market share, and accepting large, long term underwriting positions. In the secondary market, new entry led to a **narrowing of bid/ask spreads** and an increase in maximum size of trades. Bid/ask spreads were further compressed by client access to inter dealer brokers. Securities houses would often seek to make their money from **own-account trading, without developing a client base**, taking on large and risky secondary-market positions. The market makers could be caricatured as "treating a euromarket like a government bond market" - perhaps unsurprisingly given many of the large, liquid issues were ECU government bonds. The market also suffered from other structural problems, namely that it was difficult to hedge, given the cash market liquidity was greater than that of the MATIF futures contract; and the lack of a post 10 year swap curve which would have permitted asset swapping.

The **uncertainty created by the Danish and French referenda** regarding prospects for EMU led to **heavy selling** in the market in mid-1992, both by institutions and by market players seeking to unload positions following previous excesses - and engendered a collapse of activity and **progressive withdrawal of market makers** from active trading (Financial Times (1992)). The crisis occurred in stages. The Danish "no" vote led to an initial reduction in liquidity, with sizeable losses by market makers. The second crisis occurred late in July, when a one-day suspension of the obligation to make markets was followed by a resetting of spread and size guidelines, in an attempt to encourage dealers to make markets. At the end of August, as liquidity fell further, the conditions were

further relaxed. But although in the wake of this, four remaining dealers made prices for a few hours, the initiative to restore liquidity collapsed and liquidity remained poor for some months. During this period of turmoil **bid/ask spreads widened sharply**, and ECU bond yields rose to well above their theoretical levels. Notably **at 10-years, primary issuance declined to near-zero from June onwards**. As for FRNs, the collapse had little relation to credit risk - it was rather a **sharp increase in market risk**, associated in turn with uncertainty on the future valuation of bonds, which led in turn to **liquidity risk** (i.e. difficulty in selling), as described. In effect, the problem in ECU was reported to have started with heavy selling of 20-year Italian bonds (perhaps the most vulnerable to market risk), and spread. With relatively little futures liquidity to enable hedging, and lack of a swap curve so far out, liquidity difficulties rapidly emerged.

As in earlier collapses, once there was a **shock to confidence** - i.e. an increase in uncertainty that leads players to adjust their decision processes rather than merely their current opinions - it **took a long time to rebuild**. The turnover data show that turnover remained as high in the third quarter as in the second but halved in the fourth. The Bank of England (1993) suggest that high turnover in the third quarter was due to heavy selling by market makers trying to unload unprofitable positions rather than genuine end-demand. Although there was a slight pickup in 1993, turnover did not recover the 1992 level. Uncertainty spread from secondary to primary markets, making issuance difficult. Other reasons for the protracted nature of the crisis can also be adduced. For example, the reputation of market makers was tarnished and their relationships with institutions devalued. Second, the market makers (and underwriters) themselves, having been left with inventories of bonds in the collapses, were cautious about future activity. Countervailing factors that made the market relatively resilient were the commitment of governments to the markets, via their own issues and their desire to shift or retain ECU business in their own financial centres. None of these applied in the other crises described above.

3 Assessment

It is suggested that, although the five crises outlined differ in important respects - notably the role of credit risk as opposed to market risk in initiating the events - there are sufficient parallels tentatively to justify their being described as a common syndrome.

In particular, the collapses tended to occur in markets for instruments that were themselves financial innovations (whether in terms of instrument or currency), whose properties in periods of stress had not yet been evaluated. Institutional investors rather than retail clients tended to be the main investors in the markets, whether internationally (ECU, FRNs) or domestically (US CP, Swedish CP, junk bonds). The crises tended to follow a bull market in the instrument, which entailed heavy issuance in the primary market, declines in yields and yield spreads relative to other securities, rising trading volumes and narrowing secondary market bid-ask spreads (as "liquidity trading" increased). New entry of intermediaries, and intensification of competition among existing

intermediaries, was a feature of most of the crises; contemporary accounts suggest that their activities accentuated the narrowing of spreads and reduction in prices, partly in furtherance of non-profit maximising objectives in the short term ("strategic competition" for market share). However, rapid growth in debt did not necessarily lead to higher leverage of borrowers; one may contrast junk bonds and Swedish CP, where borrowers were previously restricted in access to credit and leverage did increase, with the other cases, where creditworthy borrowers chose to substitute between markets.

In several cases, the bull market led to clear overconfidence in the market, with prices overshooting fundamental values (as in the FRN and ECU crises), large underwriting exposures and position taking, disregard of differences in instruments' characteristics (such as the Swedish CIC being seen as identical to CP, despite the fact that banks were not obliged to provide backup or make markets, and perpetual FRNs being priced as money market instruments despite indefinite maturity), and liquidity being expected to remain high despite structural problems such as a narrowness of the investor base (FRNs) or reliance on one market maker (junk bonds). These patterns indicate a collective self-deluding failure on the part of market participants to attach more than a low probability to a crisis of the type that emerged.

A "shock" to such confidence, whether caused by a default (Swedish CP, Penn Central, junk bonds) or other uncertain event (such as referenda (ECU), or actual or rumoured regulatory changes (FRNs, junk bonds)), led in each case to a major re-evaluation of the securities' value⁴⁵. The consequence was heightened uncertainty (both for investors and market makers), an increase in selling, withdrawal of market makers and widening of spreads. In each case these culminated in a collapse of liquidity and of market prices that made primary issuance virtually impossible - effectively a form of quantity rationing of credit was imposed - and which persisted for some time except for the Penn Central crisis, where the authorities intervened. (Tables 1 and 2 show the evolution of prices and quantities in the markets concerned during the crises.) Where borrowers were solely reliant on the market concerned and the authorities did not intervene (as in Sweden), there were a number of bankruptcies. But in most cases the (creditworthy) borrowers could obtain funds at a higher price elsewhere.

In several cases there was contagious failure of other related *markets* which were thought to be prey to similar problems (dated FRNs, Swedish CP), although difficulties did not spread more widely (eg into fixed-rate eurobonds or government securities). Moreover, the capital adequacy and liquidity cover of financial *intermediaries* in relation to losses incurred generally proved sufficient to

⁴⁵ Technical malfunction in trading or dealing systems may be another cause of difficulty. Herring (1990) notes that the malfunction of the computer system at the Bank of New York in November 1985 led to the bank developing an overdraft with the Fed of \$30 bn - 30 times capital - before correcting the fault. The cost of not providing such support would have been liquidity failure in the US government bond market, with enormous costs in terms of higher yields demanded by investors.

prevent their collapse in the wake of the market. Probably partly for this reason, the authorities only felt it necessary to intervene decisively in the case of Penn Central.

To summarise, the crises offer credence to the theories of liquidity insurance, which draw a direct parallel between market liquidity collapse and bank runs. Contagion between markets as well as individual failures were features of the crises. These tended to follow increases in generalised uncertainty regarding equilibrium prices rather than asymmetric information⁴⁶ between investors and market makers. The forerunners of the collapses follow quite closely the predictions of uncertainty and disaster myopia theories, for example the role of innovation, of deviations of prices and quantities from fundamentals, excessive optimism regarding liquidity given structural conditions and the role of shocks in sharply reversing confidence. Given features such as higher spreads, monetary tightening and lower asset values in the wake of the crises, the various mechanisms identified by the agency cost theory of financial crisis may often be seen as underlying such rationing. But note that only in the case of Penn Central had spreads risen *prior* to the crisis, suggesting a role for disaster myopia too. On the other hand, although debt growth preceded the events, its incidence was not always related to the cycle and credit risk in the way predicted by theories of financial fragility. The precise relation of the crises to the various features highlighted in the theories of financial instability is outlined in Table 3.

4 Implications

Whether such collapses of secondary markets are a cause for concern depends on effects on primary markets, access of borrowers to alternative sources of finance, importance of continuing liquidity to the solvency of investors, and contagious effects on other markets.

Funding difficulties of intermediaries are a potential source of instability. As noted by Bingham (1991), one reason which securities market liquidity is of greater concern than in the past is that banks are more actively engaged in securities business, including not only issuance but also trading, underwriting and providing backup facilities. Hence a securities market collapse could lead to a liquidity crisis for a bank, either directly (if it relies on the relevant market for funding, or is unable to meet commitments to provide backup facilities due to "contagious" illiquidity in its own wholesale markets) but also indirectly (if suspected losses from underwriting or market making, as clearly occurred for the FRN crisis and the ECU market collapse, lead to doubts on the part of depositors regarding its solvency). Bank failure may in turn lead to contagious runs and a systemic crisis.

Equally, failure of a major securities house could occur during a market liquidity crisis. There could be withdrawal of bank credit lines as a consequence of perceptions of exposure to the market concerned, loss of confidence in the wholesale money markets where such firms obtain much of their funding, collapse of liquidity in those markets or demands by banks for greater collateral at a

⁴⁶ Elements of this may have been present in the ECU market, where the major market-maker was seen as having better information than the others, and in the failure of Drexel.

time when its asset value is falling sharply. As noted by OECD (1991), investment banks may be particularly vulnerable because of their heavy and ever-changing demand for credit, sole reliance on wholesale sources, lack of access to a lender of last resort, and multiple credit and counterparty exposures, such that solvency may be difficult to judge. Sale of assets to cover funding needs may itself depress the value of other holdings, or be impossible due to the market liquidity crisis. Note also that *net liquidity requirements imposed on such institutions by regulators to ensure investment banks survive such crises assume a reasonable amount of market liquidity is maintained* (capital requirements are of course an additional line of defence). The collapse of Drexel noted above is a classic example of the way an investment bank may collapse. Failure could in turn lead to further defaults, given the varied and sizeable exposures of firms to each other in several markets. Such failures may extend not only to other investment banks but also to banks and the payments system. This was the fear that led the Fed to offer liquidity to the markets - in effect, to support the investment banks - in the wake of the 1987 stock market crash (Davis (1992)).

A second reason for concern is that securities markets are increasingly relied on as repositories for liquidity, with liquid securities acting as a substitute for lower-yielding cash or demand deposits and a complement to matching of liabilities by assets over the longer term. Such liquidity may be sold to provide funding, or instead used as collateral for loans. Sharp declines in liquidity may lead to cash-flow difficulties due to inability to sell, or increased difficulties obtaining credit due to the lower value of collateral. Bankruptcies and defaults may ensue.

Third, the process of securitisation has entailed a much greater reliance on securities markets by a range of institutions. Banks may rely on ability to securitise assets in order to realise liquidity as well as holding larger securities portfolios themselves. Money-market mutual funds find liquidity of money markets essential in order to maintain ability to offer fixed-price liabilities - as tends to be the case. The fear is that a departure from fixed prices would lead to an immediate "run" on the fund which would itself aggravate a market liquidity crisis by forcing the fund to seek to sell its assets. There are a wide range of non-bank financial institutions such as finance houses, whose funding (as in Sweden) relies mainly on securities markets, and whose default following securities market collapse may lead to wider difficulties in the financial sector. And, there is the increasing reliance on securities markets by non-financial companies, which may have reduced the scope of their links with banks and hence find it difficult to obtain alternative forms of credit (the fear of the Fed at the time of Penn Central).

Fourth, the difficulties outlined in this paper may arise just as readily in derivatives markets as in underlying securities markets. Such markets have grown rapidly in recent years, generating concerns, for example, over the lack of experience of the behaviour of such markets under stress, the complexity of the instruments and hence difficulty in understanding the risks, as well as the lack of transparency regarding exposures and the possible links between firms that derivatives transactions may generate. Trading has tended to concentrate in a few institutions, heightening the

risk to market liquidity from problems at one of them. Meanwhile, as noted by IMF (1993), of credit, market and liquidity risk in derivatives markets "the most difficult to counter is liquidity risk". They note that demands made on derivatives for hedging can easily make liquidity disappear. For example, market makers for OTC derivatives - who tend to be banks⁴⁷ - seeking to cover open positions find it difficult to do so in their own markets, because such tailor-made instruments lack liquidity almost by definition. On the one hand, they may try to take an opposite position in organised derivatives markets - which assumes that liquidity is there. Alternatively, they may synthesise an opposite position in cash and underlying securities by using dynamic hedging techniques. But these techniques may generate liquidity problems in the exchange or the often-thin market for the underlying securities, as they mandate sales when prices fall and vice versa, leading to risk of a collapse of the price or a breakdown of trading. Second, banks are tending to use markets in derivative products, notably forward rate agreements and swaps, to manage their own interest rate risk, instead of the traditional interbank markets. Besides exposing banks to interest rate risk, the collapse of liquidity in derivatives markets may entail heightened uncertainty over banks' exposures (given that derivative exposures are in any case off-balance sheet) and thus heighten the potential for runs. Finally, to the extent derivatives have tended to benefit the price of the underlying instrument, given heightened confidence that exposures may be hedged, a collapse in derivatives market liquidity would be likely to have deleterious consequences for the market for that instrument.

There were evidently some difficulties in derivatives markets at the time of the September 1992 ERM crisis, as certain institutions found the traditional option pricing model inappropriate in the context of the extreme shifts in currency values at the time (Cookson and Chew (1992)). This was accompanied by a collapse in liquidity in OTC markets and major losses by some institutions - albeit usually offset by gains from foreign exchange trading.

All of these difficulties may be intensified by the risk of contagion between markets, as in the FRN and Swedish CP crises, which may lead market liquidity failure to impinge much more widely than its initial source.

Conclusions

A selection of recent crises in debt securities markets reveals a number of common factors, which may be related to phenomena identified by theories of financial instability that were mainly devised to describe banking crises. Given the increasing role of securities markets for funding, liquidity management and asset sales by banks and non-banks, such events are of considerable potential concern to the authorities. This analysis poses a number of questions for policy makers.

⁴⁷ Banks are reportedly attracted to dealing not just by the direct returns to such activity but also by the ability it gives to increase the menu of interest- rate and currency risk management instruments that they can offer to their clients.

First, can these events be predicted? Issues raised in this context include whether there are a priori indicators that market prices, spreads and deal sizes are out of line, whether it would be useful to seek to assess deviations from fundamentals, to consider the risks to prices that could hold in certain eventualities (such as a shift away from EMU), or when markets are sufficiently related to make contagion likely.

Second, what is the appropriate regulatory response to market liquidity risk? Can robust market structures be devised that would prevent such collapses, and are supervisory regimes for market makers and underwriters able to cope with this type of occurrence? Bingham (1992) makes a number of suggestions in these areas. Issuance of standardised benchmark securities by governments, and avoidance of interest rate instability as a by-product of monetary policy⁴⁸ are strategies that can be helpful to liquidity. He suggests that robustness of intermediaries requires adequate capital and efficient clearing and settlement, encouragement of adequate management and control procedures, that firms be induced to monitor each other and that there be a spreading of the cost of safety net assistance across market participants. An obvious additional point is that both intermediaries and end-users of securities markets must diversify their sources of funds and of liquidity so as to protect themselves against problems in individual markets. Crisis scenarios could play an important role in such calculations. More controversially, robustness may also require some limits to competition between market-makers, possibly via designation, recognition and licensing rules (note that many of the crises were in unregulated markets with free entry, such as those for eurobonds). The point is that only if there are some economic rents associated with market maker status will firms be willing to devote sufficient capital to prevent frequent liquidity collapses. An alternative to limits on entry in this context are low levels of disclosure and ability to post indicative prices. There is of course a balance to be struck between adequacy of returns and oligopolistic abuses, with high fees, wide bid-offer spreads and risks of price manipulation.

In the case where crises nonetheless occur, in what circumstances should central banks intervene as "market makers of last resort"? Clearly, moral hazard may arise for securities markets in the same way as for banks, with imprudent underwriting and market making practices being followed on the assumption that liquidity will be maintained; non financial companies would also be more willing to increase leverage via securities markets. Hence such responses should not be automatic. In many cases the failures were better used as salutary lessons in prudence for the market. On the other hand, where failure threatens "core" markets intervention is clearly essential, although their breadth and depth is likely to itself make such failure less likely.

Finally, the instability shown poses a general issue whether it is appropriate to rely heavily on securities markets to provide finance, as the ongoing development of securitisation seems

⁴⁸ Volatile and unpredictable interest rate movements may undermine the profitability of market making, by increasing position risk as well as driving away liquidity traders.

to imply - is it a cause for concern if owing to this, banks, which should in principle have a comparative advantage in overcoming asymmetric information between borrower and lender, as well as being able to maintain credit lines, are forced to withdraw from lending to some sectors?

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Table 1: Interest rate relations in securities markets

	t - 12	t - 3	t - 2	t - 1	t	t + 1	t + 2	t + 3	t + 12
Penn Central (June 1970)	1.0	1.5	1.4	1.3	1.4	1.7	1.6	1.5	0.5
FRN market (December 1986)	0.03	0.06	0.07	0.07	0.07	0.12	0.12	0.24	0.38
Junk bonds (February 1990)	2.5	2.9	2.9	3.2	3.3	2.8	2.8	2.5	3.5
Swedish CP (October 1990)	0.23	0.15	0.12	0.17	0.22	0.22	0.42	0.27	0.26
ECU bonds (July 1992)	-0.49	-0.22	-0.25	-0.39	-0.02	0.11	0.19	0.28	-0.09

1 US CP-TB spread

2 Discounted margin on FRNs over Libor

3 US BB-AAA corporate bond spread

4 Swedish CP-TB spread.

5 ECU bond yield less theoretical yield (weighted sum of yields on constituent bonds).

Table 2: New issues in securities markets

	Preceding year	Quarter of crisis (annual rate)	Year after crisis
Penn Central (Q2 1970)	7.3	-1.2	-0.04
FRN market (Q4 1986)			
Junk bonds (Q1 1990)			
Swedish CP (Q4 1990)	24.4	27.2	-2.2
ECU bonds (Q3 1992)	30.7	0.8	9.6

Table 3: Features of market liquidity crises

	ECU bonds	FRN market	Junk bonds	Swedish CP	Penn Central
Liquidity collapse	Yes	Yes	Yes	Yes	Temporarily
Collapse in primary issuance	Yes	Yes	Yes	Yes	Temporarily
Debt accumulation	Yes	Yes	Yes	Yes	Yes
Heightened credit risk	No	No	Yes	Yes	Yes
Monetary tightening	No	No	No	Yes	Yes
Uncertainty over appropriate market prices	Yes	Yes	No	No	No
Innovation	Yes	Yes	Yes	Yes	Yes
Underpricing of risk	Yes	Yes	Yes	Yes	No
New entry of intermediaries	Yes	Yes	Yes	Yes	Yes
Intervention by the authorities	No	No	No	No	Yes