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FINANCIAL DISTRESS AND THE BUSINESS CYCLE

JAVIER SUAREZ
CEMFI and CEPR
OREN SUSSMAN
Ben-Gurion University of the Negev and MCER[1]

In this paper we argue that firms' financial distress should play a greater role in the macroeconomic analysis of the business cycle. We provide a non-technical account of a general equilibrium model that exhibits financially-driven equilibrium cycles. We show that the empirical evidence is widely supportive of the key hypothesis and implications of our approach. We use the model in order to evaluate the effects of several policy measures. It turns out that deepening the market for second-hand capital goods, subsidizing the interest payments of companies which start up when financial conditions are tight, and bailing out some companies in default can indeed 'stabilize' the economy. By way of generalization, we may say that the policy reaction to a financially driven bust should be accommodating.

I. INTRODUCTION

In spite of many important differences, Keynesian and 'real' business-cycle theories (i.e. most of modern macroeconomics) have one feature in common. They view the business cycle as a propagated response to a 'shock' that hits the economy from the outside. Confronted with this uniformity of opinion, it is somewhat surprising to discover that some of the greatest thinkers of the past held remarkably different views on the matter.

Bagehot (1873), in a chapter called 'Why Lombard Street is Often Very Dull, and Sometimes Extremely Excited', draws the distinction between two sorts of 'panics'. Some are caused by a 'sudden event which creates a great demand for actual cash'. Others cannot be attributed to 'irregular external accidents, but likewise to regular internal change'. It is the 'recurrence of these periodical seasons of delicacy which has given rise to the notion that panics come according to a fixed rule, [and] that every ten years or so we must have one of them'.

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After noting that 'common books of political economy' tend to ignore the phenomenon, Bagehot develops his own theory of 'endogenous' cycles. It starts when a 'surplus of loanable capital which lies in the hands of bankers [but] is not employed by them in any original way' is lent out, creates an expansion of real activity, and raises interest rates and commodity prices. This expansion ends when, 'at the last instant of prosperity, the whole structure is delicate'. Two factors stand behind this delicacy. The first is 'great mistakes' committed during the period of rising prices as traders 'altogether overestimated the demand for the article they deal in'. The second is that the good times of 'high prices almost always engender much fraud'. Interestingly, the whole phenomenon is related to the emergence of modern financial capitalism and the incidence of intermediation; it was hardly visible before the end of the seventeenth century.

Schumpeter's (1996) theory of cycles is quite similar to that of Bagehot. He also believed that the most important source of cyclicality is internal, as a boom 'creates out of itself an *objective situation* [which] leads *easily* to a crisis, *necessarily* to a depression' (italics at source, p. 236). The special feature of Schumpeter's theory is that business cycles and economic development are interrelated via entrepreneurial innovation and decay.[2] 'Profits in a boom [and] losses in depression . . . are essential elements of the mechanism of economic development . . . [and] the complete destruction of those existences which are irretrievably associated with the hopelessly unadapted' (p. 253). (Schumpeter was thus sceptical of anti-cyclical policy.) He was therefore interested in analysing the differential effect of a recession on old and new business. 'An old business has the buffer quasi-rent. . . . It is embedded in protecting relationships, often effectively supported by banking connections of many years' standing. . . . Therefore, it holds out much longer than a new enterprise, which is strictly and suspiciously scrutinised . . . and which only needs to give a sign of embarrassment to be considered as a bad debtor' (p. 241).

Likewise, Fisher (1933) starts his famous paper with the distinction between factors 'imposed on the economic mechanism from outside . . . [such as] sun spots or transits of Venus' and those that are 'self-generating, operating analogously to a pendulum' (p. 338). In most cases, these self-generating cycles tend to die out; but not always, like 'a ship which, under ordinary conditions is always near a stable equilibrium, but which, after being tipped beyond a certain angle, has no longer this tendency to return to equilibrium' (p. 339). His debt deflation theory has such a mechanism. Following 'debt liquidation' and 'distress selling', prices fall so that 'the more debtors pay the more they owe' (p. 344) leading to a situation similar to the capsizing of a ship.

Such explanations of the business cycle were abandoned in the second half of the twentieth century.[3] It is beyond the scope of the present paper to explain why. However, in Suarez and Sussman (1997, 1999) we develop dynamic rational-expectations models that share much in common with the above-cited work of the old masters.[4] Business cycles are created endogenously, driven by moral-hazard relations between firms and their providers of finance. The institutional environment in which these relations are formed may affect the intensity of the fluctuations; structural change in financial markets will have an effect on the business cycle. In the second of the above papers, firm liquidation and fire sales of assets under financial distress play a central role. Also, the severity of the moral-hazard problem changes over the cycle and is intimately tied to market prices. In this paper we explain these results in a non-technical way, elaborate on some of them, demonstrate the validity of some of the empirical predictions, and point out the major policy implications.

We share a common thrust with some other contemporary work. Bernanke *et al.* (1998) provide a comprehensive survey of the literature on the financial 'amplification effect'. The idea is that financial frictions amplify the effect of external shocks. In that respect, our work can be interpreted as a

[2] Hence, 'the intensity of development [in America] presumably makes the fluctuations more strongly marked than in Europe'.

[3] Patinkin's (1989) exhaustive survey of the macroeconomic wisdom of the 1960s does not bother to mention any of the above texts.

[4] The rationality of expectations implies that Bagehot's 'mistakes' play no role in our theory. However, moral hazard plays a similar role to 'fraud' in his theory.

demonstration that the amplification effect can be unbounded: even as the magnitude of the shocks tends to zero, economic activity still fluctuates. Morris and Shin (1999) develop 'endogenous uncertainty' models and apply them to bank and creditors' runs. The fluctuations generated by their models are random, unlike ours, which are deterministic. Nevertheless, both their theory of risk and our theory of cycles emphasize that business instability is endogenously determined. Allen and Gale (1998) develop a model where asset prices may depart from their fundamental value due to moral hazard in financial markets, giving rise to 'bubbles'. Our models may be given a similar interpretation, with the bubbles emerging in the booms and bursting in the busts, deterministically.

The rest of the paper is organized as follows. In section II we give a brief and non-technical description of the model of reference. In section III we discuss its time-series implications. The discussion is split into two sub-sections: the first deals with the variability across the boom and the bust, while the second uses the model in order to explain some of the 'breaks' actually observed in time-series data. Section IV discusses the main policy implications of the analysis and section V concludes.

II. THE MODEL: BRIEFLY

In Suarez and Sussman (1999), we construct an equilibrium where cycles are driven by defaults and 'distressed' asset sales (i.e. the sale of assets during episodes of financial distress). Our economy goes on for ever, but the firms' life-span is of, at most, three 'periods' because both the owner-manager of each firm and its equipment do not live longer. Starting up (say) at period t, the manager buys equipment at a relative price of q_t. If all goes well, the firm will be productive for the next two periods. As already implied, depreciation rates are high: the equipment is fully depreciated by $t+2$, while at $t+1$ its second-hand price is just a small fraction of the price of new equipment, q_{t+1}. Hence, firms do their best to avoid early liquidation.

At the equipment prices that prevail in equilibrium, all firms are profitable. However, some firms will suffer a 'liquidity shock' that affects the *timing*, but *not* the *discounted value*, of their cash flow.[5] The liquidity-short firms fail to generate any cash at $t+1$, but capitalize an equivalent amount at the next production period (i.e. $t+2$). It follows that in a frictionless world, all firms, liquidity-short or not, would be economically viable. In such a world firms would avoid early liquidation and there would be no transactions in the second-hand market for equipment. Since the demand for new equipment is stable (at a level that is determined by the new cohorts of owner-managers), the economy will converge, immediately, to a stationary equilibrium.

The case of imperfect financial markets is obviously more interesting. Suppose that owner-managers are born penniless and have to raise funds from some wealthy financiers. Suppose, also, that cash-flow is not 'verifiable' in court. Then, if a *liquid* manager defaults on his debt, arguing that the firm did not generate any cash, the financier has no way to prove that he is a liar. That raises an enforcement problem. To resolve it, a prudent financier will retain a legal right to liquidate the firm upon default. It turns out that the mere *threat* of liquidation is sufficient to resolve the enforcement problem, because a *liquid* firm will rather pay its debt than risk early liquidation. This remedy, however, comes with a cost: if the firm is *illiquid*, it has no choice but to default, in which case the financier may still exercise his rights (and pocket the revenue from selling the equipment). Remember, however, that illiquid firms are still profitable from a net-present-value point of view. Hence, liquidation rights are a sort of a necessary evil which is required in order impose discipline on firms.[6]

To mitigate this necessary evil, the threat of liquidation should be used with moderation. Financial contracts should control the ease with which the liquidation-right is exercised: sufficient to provide an incentive to repay, but not too harsh, so as to avoid unnecessary liquidations. One can imagine that the liquidation right can be easily exercised when fi-

[5] Liquidity shocks are random at firm level, but the fraction of firms hit by the shock every period is fixed, so the individual shocks do not generate a macroeconomic shock.

[6] Our analysis of the contract problem relies on the work of Bolton and Scharfstein (1996) and Hart and Moore (1998).

nance is supplied under a debt contract, when the lending is collateralized, and when the debenture is concentrated in the hands of a single lender, such as a bank. The liquidation right is more difficult to exercise otherwise. We quantify the likelihood that the financier will succeed in exercising his rights by the variable β_t. From now on, we say that finance is 'tight' if the financier's liquidation rights can be easily exercised (i.e. β is high), and 'relaxed' otherwise.

Note that β is indexed by time and may vary according to market conditions. Indeed, the manager and the financier will be wise to adjust the contract to the price at which the equipment is bought, q_t, and to the price at which the firm is anticipated to be liquidated (in case of default), q_{t+1}. The higher is q_t, the more the firm has to borrow when starting up and the more tempting it is to default on the repayments, so finance has to be tightened up. The threat of liquidation will have to be reinforced so as to induce the liquid firms to pay, but this will come at the cost of liquidating more of the liquidity-short firms, whose only choice is to default. Conversely, the higher is q_{t+1}, the more effective is the threat of liquidation, so that finance can be supplied under more relaxed conditions.[7]

It turns out that these elements are sufficient to support an endogenous, alternating boom–bust equilibrium. Starting with a boom, q_t is high and financial contracts are tightened up. That will increase the incidence of distressed asset sales next period, decrease the demand for new equipment, and will lead the economy to an output slump and recession, accompanied by depressed equipment prices.[8] But a lower q_{t+1} will benefit contemporary start-ups because they will purchase equipment at lower prices and will be able to raise finance more comfortably. That means that there will be fewer liquidations and the economy will boom again at $t + 2$.

Our model's equilibrium cycles are deterministic, perfectly foreseen, and create a pattern that exactly replicates itself over time: one period is a boom, the next is a bust, and so on, with the same levels of output, equipment prices, etc. in each boom–bust cycle.[9] Needless to say, this is not how real-world time series look. This problem could be fixed, however, by adding small shocks or by complicating the dynamic structure of the model, aiming at some theory of higher order or 'chaotic' fluctuations. For the while, we prefer to focus on a model which is simple, but can generate a rich set of predictions and some interesting policy implications, and highlights what seems to be an important hypothesis: that the business cycle is generated endogenously from financial frictions.

III. TIME-SERIES IMPLICATIONS

In Suarez and Sussman (1999) we run simulations, substituting in realistic values for the model's parameters. We thereby predict how certain variables (output, equipment prices, etc.) fluctuate across the boom and the bust. We also use the model in order to predict how structural changes in financial markets would create 'breaks' in the time series. In this section we survey the empirical literature and argue that the evidence is consistent with the model's predictions.

Admittedly, the empirical evidence in favour of our model is not as abundant as we would have liked, simply because of the relative scarcity of empirical work on second-hand markets and the cyclical patterns of corporate finance. Comprehensive time series on the number of firms suffering financial distress, the amount of distressed asset sales, the volume of trade in the second-hand market, let alone a price index for that market, simply do not exist. We have tried to assemble whatever scattered evidence exists. The good news, of course, is that there is still land to claim within this area.

(i) Variability Over the Boom and the Bust

Table 1 contains our benchmark simulation (see the Appendix for details about how the numbers are generated). The first two lines just establish what

[7] Technically, $\beta_t = \beta(q_t; q_{t+1})$ with $\beta_1 > 0$ and $\beta_2 < 0$.

[8] The first- and second-hand markets are linked via the assumption that second-hand equipment can be restored to new by a certain investment. A second-hand machine is thus equivalent to a fraction of new machine.

[9] In the simulations below we set the calendar duration of each period to 5 years.

Table 1
The Benchmark Simulation

	Bust	Boom	Amplitude
Output	2.65	2.85	7.5
Gross investment	0.37	0.45	21.6
Liquidation (%)	4.5	3.7	–0.8
Price of equipment	0.42	0.50	18.7
β(%)	61.3	75.6	14.3
Interest-rate spread (%)	4.9	5.3	0.4

Note: This table presents a benchmark for the other simulations in the paper. For more details about the model's parameter values and the definitions of variables, see the Appendix.

the boom and the bust are in terms of output and investment. The parametrization of the model ensures that the amplitude of output across the boom and the bust, 7.5 per cent, is within a reasonable order of magnitude.

One of the main implications of our model is that liquidation rates are higher in the bust than in the boom. The third row in Table 1 provides the (yearly) percentage of firms which are liquidated. Note that this variable is a combination of the incidence of liquidity shortages (which is constant over the cycle, by assumption) and β_t, the probability that the financier will exercise his liquidation rights after default (which varies along the cycle according to the tightness of financial contracts).

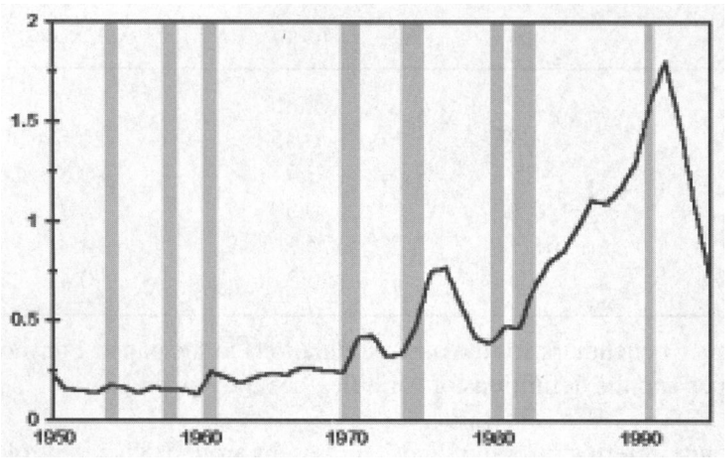
Unfortunately, even this simple prediction of our model is hard to verify. Dun & Bradstreet provide a comprehensive time series on business failures in the USA. Between 1951 and 1978, the yearly failure rate of US firms ranged between 0.3 and 0.7 per cent (see Altman, 1983), which is way below the numbers in Table 1. Note, however, that these figures are just the 'tip of the iceberg', as distressed sales of assets are far more common than fully fledged business failures—see Gilson *et al.* (1990). A more comprehensive measure of financial distress comes from banking data, because banks may report losses even if the business did not formally fail (i.e. was partially liquidated). Figure 1 shows that since the early 1980s the write-offs of US banks represent around 1 per cent of their total lending. However, Franks and Torous (1989) report that banks recover about 86 per cent of their exposure in distressed firms, implying that behind every dollar of write-offs there are several dollars of distressed asset sales. So the numbers reported in Table 1 do not seem that absurdly high. As for the incidence of failure across the boom and the bust, the data in Altman (1989), Platt and Platt (1994), and our Figure 1 seems in line with our predictions.[10]

The next row in Table 1 presents the model's prediction about equipment prices, q_t. Here, the evidence is somewhat more available. One of the first systematic studies of the second-hand market is due to Pulvino (1998). He collected data on all transactions in second-hand narrow-body aircraft that took place in the United States around the early 1980s.[11] Running a 'hedonic price' regression, he filtered out the aircraft-specific components (such as age, model, state of engine, etc.) to construct a comprehensive price index for second-hand transactions. This index shows a strong pro-cyclical pattern: as the industry entered recession in 1981, prices fell sharply. The boom–bust amplitude was between 40 and 60 per cent in real terms. Pulvino is also able to identify which transactions had a financially distressed seller. He estimates that such transactions went at a discount of 13 per cent relative to the market price at that point in the cycle, which suggests the existence of a causal relationship from distressed sales to price movements along the cycle.

[10] A similar picture comes from work in progress by Julian Franks and Oren Sussman based on non-listed UK companies in financial distress.

[11] His work was motivated by the theoretical predictions of Shleifer and Vishny (1992).

Figure 1
Financial Distress



Note: This figure represents the evolution of financial distress in the USA during the post-war period. We use the percentage ratio of banks' gross charge-offs to their gross loans and lease as reported in the Historical Statistics of the Federal Deposit Insurance Corporation (FDIC). The shading indicates NBER recessions.

Some extra evidence is provided by the cyclical behaviour of real-estate prices. Higgins and Osler (1997) analyse the recession that swept across the OECD countries in the late 1980s and early 1990s. They report a boom-to-bust real-price amplitude in commercial property prices of between 40 and 60 per cent. Englund's findings for Sweden, in his article in this issue, are even more dramatic: the price of prime-location real-estate in Stockholm increased nine-fold along an expansion period that lasted 10 years, and halved when the 'bubble' burst (see his Figure 5).

Another important implication of our model is that the higher rates of liquidation during the bust are a result of contractual rights obtained during the boom. Having to finance investment in highly priced capital goods, and anticipating that these prices will fall in the bust to come, financiers recognize that boom start-ups have a stronger temptation to breach their contract. So they tighten the terms of finance and intensify the threat of liquidation in order to ensure performance.[12] It would have been desirable to find some evidence of this 'tightening up' effect. As noted above, we would expect to find that the financial arrangements started at the boom are better collateralized and have their liquidation rights less dispersed among the financiers so as to allow quick action in case of distress. Unfortunately, we are not aware of any empirical study that throws light on this issue.

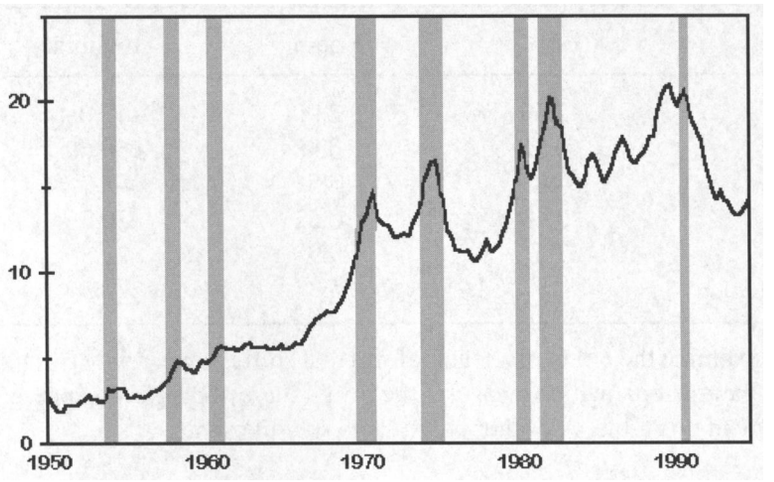
Arguably, debt finance is better suited than equity for the purposes of imposing an effective threat of liquidation in case of default (especially if banks are not allowed to hold equity). If this is the case, we would expect that the corporate sector becomes more highly levered towards the end of the expansion period. Again, surprisingly little work has been done on that effect. In Figure 2 we plot the evolution of leverage, as measured via the corporate sector's income flow. The cyclical pattern of the series is clear cut and shows that higher leverage indeed precedes the arrival of recessions. For similar evidence, see Gertler and Lown's article in this issue (Figure 4).[13]

A more straightforward feature of our model is that financiers foresee the changing price of capital goods along the cycle and adjust the terms of the financial contract accordingly. Consistent with the last row in Table 1, Gertler and Lown (this issue)

[12] Note that in spite of the fact that finance is 'tightened', the volume of finance expands during the boom because of the higher prices of capital goods.

[13] Credit expansion is quite a common feature of 'bubble' periods. See Mishkin (1996) for some dramatic evidence from Mexico.

Figure 2
Leverage



Note: This figure represents the evolution of leverage in the US non-financial corporate business sector during the post-war period. We use the percentage ratio of interest payments to pre-tax capital income as reported by the National Income and Product Accounts (NIPA). The shading indicates NBER recessions.

provide evidence of the cyclical behaviour of the terms of finance. They show that the junk–AAA spreads provide a good leading indicator of output fluctuations, anticipating recessions about one and a half years in advance (see their Figure 2). They also find that this relation has strengthened in the period after 1985. We elaborate on this and similar 'breaks' in some relevant time series in the next sub-section.

(ii) 'Breaks' in the Series

One of the most interesting implications of our model is that structural, legal, regulatory, or institutional change in financial markets may alter the pattern of business fluctuations. Indeed, the last 30 years of US history are full of such changes. A quick look at Figures 1 and 2 reveals clear 'breaks' in the time series of leverage and bad debt around the early 1980s; the breaks in both series are likely to be related. Our model suggests a mechanism through which the changes that affect financial structure may alter the pattern of the business cycle. In this sub-section we explore this possibility.

We start with a change in corporate bankruptcy law. By and large, bankruptcy law determines the allocation of power between the firm and its financiers in case of default. In some countries, such as the UK, it tends to concentrate power in the hands of the secured lenders. In others, such as the USA, the historical trend has consisted of distributing power away from the secured lenders and in favour of the company and its unsecured lenders. A clear step in that direction was the Bankruptcy Reform Act of 1978.[14] Reforms like this are frequently intended to help businesses to survive during the hard times of recession and distress.

In our model, this structural change has an effect on business fluctuations, for it will affect the incidence of liquidation, equipment prices, required external finance, and, ultimately, the whole dynamic equilibrium described above. We model the structural change as follows. The enforcement mechanism used by financiers is based on a 'threat' of liquidation which is imposed taking into account the possibility of renegotiation between the firm and the financiers, prior to liquidation. Our model contains a parameter that describes the bargaining power of each party in these renegotiations. Hence, we model a reform of the type that took place in US bankruptcy law in 1978 as a change that increases the bargaining power of the firm *vis-à-vis* its financiers. Table 2 presents the results.

[14] See Franks and Sussman (1999) for the historical background, and Scott and Smith (1986) for a comprehensive description of the reform.

Table 2
The Effect of Corporate Bankruptcy Reform

	Bust	Boom	Amplitude
Output	2.59	2.90	12.0
Gross investment	0.35	0.48	35.6
Liquidation (%)	4.8	3.5	–1.3
Price of equipment	0.40	0.52	30.7
β(%)	57.6	79.9	22.3
Interest-rate spread (%)	4.8	5.3	0.5

Note: In this table we examine the effect of a legal reform that shifts power away from the financier to the firm. Technically, the parameter λ, which measures the firm's share of bargaining power is increased from 0.5 in Table 1, to 0.501 in this table. All other parameters stay the same.

Surprisingly enough, our model predicts that the reform will increase, rather than decrease, business fluctuations. The reason is that once the financier understands that his bargaining position was curtailed, he also realizes that the effectiveness of his liquidation rights, in enforcing repayment, was diminished. To restore the viability of lending, financiers will demand more liquidation rights. That will lead to more liquidations during the bust, accompanied by lower equipment prices. Lower equipment prices during the bust will favour contemporary start-ups and will reflect, among other things, in lower boom liquidation rates.

The empirical evidence in Leeth and Scott (1989) supports our prediction on lenders' reaction to the change in bankruptcy law. They examine the incidence of debt collateralization in a sample of small business loans, some of which were contracted before the date when the new law became effective (but after it was enacted) and some afterwards. The authors find that 61 per cent of the loans contracted after the new law became effective were collateralized, and estimate that this number would have been smaller by 11 percentage points in the absence of the reform. This suggests that lenders increased collateralization in anticipation of the weaker *ex-post* bargaining power granted to them by the new law.

This result opens an avenue for further research. For the 1970s and 1980s were a period of many structural changes, especially in the regulation of banking—cf. Gilbert (1986), or Berger *et al.* (1995). The changes in structure generated changes in conduct: US firms became more highly levered (see Worthington (1993) and our Figure 2) and junk-bond markets flourished (see Gertler and Lown, this issue). Others have suggested before that such changes might have important macroeconomic implications. For example, Sharpe (1994) presents some convincing evidence that high-levered firms respond more strongly to industry shocks than low-leverage firms. Our model provides a simple framework in which the general-equilibrium effects of such developments can be analysed.

IV. POLICY IMPLICATIONS

In this section we examine the policy implications of our model. We assume that the government's objective is to smooth output fluctuations. We do not provide any rationale for the desirability of such a policy goal. In other words, we do not discuss whether smoothing output can promote a more efficient allocation of resources. This question is handled more directly in Suarez and Sussman (1997), where a related endogenous-cycles model is analysed. Since moral-hazard problems generate inefficiency, especially during the bust, one may anticipate that by smoothing the cycle long-term output may be increased. This is, indeed, the case. However, it is also the case that such a policy benefits some agents while making others worse off. In our case, smoothing the cycle may not be in the interest of bust start-ups, who buy capital goods at low prices, and face possible liquidation into a high-price

Table 3
The Effect of Deepening the Second-hand Market

	Bust	Boom	Amplitude
Output	2.67	2.82	5.6
Gross investment	0.38	0.44	15.9
Liquidation (%)	4.4	3.8	–0.6
Price of equipment	0.43	0.49	13.8
β(%)	63.0	73.8	10.8
Interest-rate spread (%)	5.0	5.2	0.2

Note: In this table we examine the effect of deepening the second-hand market. That is done by increasing the price-elasticity of the supply schedule of capital goods. Technically the elasticity parameter θ is increased from 0.1392 in Table 1, to 0.1393 in this table. All other parameters stay the same.

market. In many cases, higher total resources may be reallocated so as to make everyone better off. Unfortunately, such reallocation may not be possible in the presence of financial imperfections.

The reason is the following. When capital markets are perfect, production decisions are taken on the basis of net-present-value considerations, regardless of how wealthy or liquid decision-makers are. Obviously this is not true in our model, where projects may be liquidated just because of a temporary shortage of liquidity. The government may prevent some of these liquidations by subsidizing firms, reducing their need to be financed externally. However, the government cannot tax these firms later on, so as to cancel the wealth effect of the subsidy. Recall that the origin of the problems between firms and their financiers is that no payments can be enforced towards the end of the firm's life. Indeed, the same enforcement problems exist with taxation. Just as the courts cannot enforce repayments of private loans, they cannot enforce government taxes. Hence, the government may avoid early liquidation by subsidies, but if it tries to tax these firms later on, it is on no better grounds to get paid than private lenders.

(i) Some Policy Steps

For the rest of this section, we maintain the working hypothesis that the government aims at smoothing the business cycle. The first policy we consider is a deepening of the second-hand market. Since our model operates via distressed sales of assets, a policy that relaxes the price-effect of such sales may prove stabilizing. Suppose the government can achieve such an effect by decreasing transaction costs or by treating second-hand trade more favourably, taxation wise. Suppose, also, that such a policy can be incorporated into our model by increasing the price-elasticity of new equipment. The effect on the business cycle is reported in Table 3. It is shown that during the bust when the demand for new equipment falls, prices do not fall that much (compared with Table 1); equally, during the boom, when the demand for new equipment increases, prices do not rise that much. Crucially, the effect on output is stabilizing: boom–bust amplitude falls from 7.5 per cent in the benchmark case to 5.6 per cent in the current case.

Alternatively, consider a policy of subsidizing the purchase of equipment by boom start-ups. Note that this policy is equivalent to lowering the lending rate during the boom (in reality by the end of the expansion period and towards the bust). The reason why the subsidy should be granted to boom start-ups is that they operate under tighter financial conditions. The subsidy will decrease their reliance on external finance and allow the enforcement of more relaxed financial contracts (i.e. lower β contracts). As Table 4 shows, more relaxed financial contracts during the boom imply a lower liquidation rate during the bust, so that equipment prices do not fall that much. Crucially, the effect on output is stabilizing as well.

Lastly, consider a bail-out policy. Suppose the government pays the debt of a small fraction of firms in default during a bust period. Interestingly, the effect of such policy is not clear in advance. On the one

Table 4
The Effect of Subsidizing Start-ups in the Boom

	Bust	Boom	Amplitude
Output	2.66	2.83	6.4
Gross investment	0.38	0.45	18.2
Liquidation (%)	4.5	3.7	–0.7
Price of equipment	0.43	0.49	15.8
β (%)	62.3	74.5	12.2
Interest-rate spread (%)	4.9	5.2	0.3

Note: In this table we examine the effect of a subsidy on the purchase of equipment by boom start-ups (i.e. those that operate under tighter financial conditions). Technically, we assume that a fraction s of their investment is paid by the government. The value of s is increased from its implicit value of zero in Table 1 to 0.0004 in this table. All other parameters stay the same.

hand, some companies in distress will avoid liquidation. On the other hand, non-distressed firms will have an incentive to declare default so as to qualify for the subsidy. If that effect of the policy is foreseen in advance, lenders will tighten up financial contracts (i.e. increase β) for boom start-ups.[15] Our results show that the former effect dominates the latter, so the net liquidation rate during the bust falls (compare Table 5 with Table 1).

(ii) Should Policy Accommodate?

We showed above that the economy may be stabilized by allowing the supply of new equipment to respond more elastically to fluctuations in demand, by relaxing the price of funds during periods of high demand, and by bailing out some companies during recession.[16] In terms of the old-fashioned macro literature *à la* Poole (1970), the three policies described above can be summarized in one word: *accommodation*.

This result is somewhat in contrast to the current trend in central banking: either lean against the wind or simply ignore the wind. It is important to stress, however, that the general conclusion here is not 'always accommodate' but rather 'accommodate to financial fluctuations'. Other economic illnesses, most notably inflation, are not analysed within the current framework. Most likely, the optimal response to some of these other problems is to lean against the wind.

Hence, historical experience and recent academic research seem to imply that policy-makers should no longer neglect the macroeconomic effects of financial distress. Instead of ignoring the wind, policy-makers will have to ask 'what sort of a wind' and then use discretion to decide whether to accommodate or lean against it. The behaviour of central banks since the outbreak of the East Asian financial crisis suggests that this sort of policy has already been put in action.

(iii) A Note on Liberalization

The reader may have noticed that the changes in parameter values used to generate the wide set of results described above were remarkably small. This reflects a general property of models with non-linear dynamics: tiny changes in structure may cause the system to respond violently. Moreover, the effects are very difficult to predict, since extrapolations easily become very inaccurate.

This feature of the model captures nicely an observation that is often made: that many financial disasters have followed episodes of financial liberalization or some other structural change. In many cases, the size and scope of the structural change was

[15] Remember that we analyse the effect of the policy several cycles after its inception, when everyone is fully aware of its implications.

[16] A similar view is expressed by Allen and Gale in their article in this issue. Note that our analysis imposes stronger restrictions on the policy-makers, since we allow players to 'learn' (anticipate) the effect of the policy. Yet, the stabilizing effect is delivered.

Table 5
The Effect of Bail-outs in the Bust

	Bust	Boom	Amplitude
Output	2.66	2.83	6.4
Gross investment	0.38	0.45	18.3
Liquidation (%)	4.5	3.7	–0.7
Price of equipment	0.43	0.49	15.9
β (%)	62.2	74.5	12.3
Interest-rate spread (%)	4.9	5.2	0.3

Note: In this table we examine the effect of a policy consisting of bailing out some of the firms that go bankrupt during bust periods. Technically, we assume that the government repays the debt of a fraction b of the firms in default that would otherwise be liquidated. The value of b is increased from its implicit value of zero in Table 1 to 0.001 in this table. All other parameters stay the same.

modest: see the articles by Englund and by Allen and Gale in this issue. *Ex-post* analysis of these processes often leaves the impression that the severity of the consequences was impossible to predict. Accordingly, policy-makers might be right in feeling that structural changes are always hazardous.

V. CONCLUSIONS

There is an old tradition in macroeconomics that considers business cycles as an endogenously generated and financially driven phenomenon. This tradition was almost ignored for about 50 years. We believe that this oblivion was unfortunate. Of course, the question of whether the world is random or deterministic is more metaphysical than scientific. Yet, recent models of endogenous financial business cycles are both intuitive and handy. They generate a rich set of plausible empirical predictions and some sensible policy implications. More importantly for researchers, they are interesting and have just started to be explored. We hope macroeconomists will find them useful and will carry their development further.

APPENDIX

The tables that summarize our simulation results describe the behaviour of some key macroeconomic variables along a stationary two-period cycle generated by our model under specific values of its parameters. One should think of a model period as covering about 5 calendar years. The parameters used in the simulations fall within ranges consistent with the existing empirical evidence on depreciation rates, default rates, capital–output ratios, and the price elasticity of the supply of capital goods in developed economies. In the benchmark simulation (Table 1), they are chosen to produce oscillations in output with an amplitude of 7.5 per cent (percentage increase from the bust to the boom), which is about the amplitude of the Hodrick–Prescott cyclical component of US GDP. For further details, see Suarez and Sussman (1999).

The variables that appear in the tables are defined as follows.

Amplitude: for variables in levels, it is the percentage increase from the bust to the boom; for variables in percentage points, it is the difference between the value at the boom and the value at the bust.

Output includes the production of firms that are not discontinued and the value added in the production of equipment (equipment production – consumption good used as an input); equipment production is valued in terms of the consumption good using current relative prices.

Gross investment is equipment production valued in terms of the consumption good using current relative prices.

Liquidation measures the (annualized) probability with which a firm ends up liquidated as a consequence of financial distress.

Price of equipment is the price of equipment in terms of the consumption good.

β is the probability of liquidation of firms that default as set in the contracts signed during the period of reference.

Interest-rate spread: since in all simulations the riskless interest rate is assumed to be zero, the spread is computed as the (annualized) interest rate implied by the repayment that entrepreneurs promise to their financiers in exchange for the funds initially borrowed from them.

REFERENCES

Allen, F., and Gale, D. (1998), 'Bubbles and Crisis', *The Economic Journal*, forthcoming.

Altman, E. I. (1983), 'Why Business Fail', *Journal of Business Strategy*, **3**(4), 15–21.

— (1989), 'The "Junk Bond" Default Rate Debate', Leonard N. Stern School of Business Working Paper 539, New York.

Bagehot, W. (1873), *Lombard Street: A Description of the Money Market*, available at http://socserv2.socsci.mcmaster.ca/~econ/ugcm/3113

Berger, A. N., Kashyap, A. K., and Scalise, J. M. (1995), 'The Transformation of the US Banking Industry: What a Long, Strange Trip It's Been', *Brookings Papers on Economic Activity*, **0**(2), 55–201.

Bernanke, B., Gertler, M., and Gilchrist, S. (1998), 'The Financial Accelerator in a Quantitative Business-Cycle Framework', NBER Working Paper 5455, forthcoming in J. Taylor and M. Woodford (eds), *The Handbook of Macroeconomics*.

Bolton, P., and Scharfstein, D. (1996), 'Optimal Debt Structure and the Number of Creditors', *Journal of Political Economy*, **104**, 1–25.

Fisher, I. (1933), 'The Debt-Deflation Theory of Great Depressions', *Econometrica*, **1**, 337–57.

Franks, J. R., and Sussman, O. (1999), 'Financial Innovations and Corporate Insolvency', mimeo, London Business School.

— Torous, W. (1989), 'An Empirical Investigation of US Firms in Reorganization', *Journal of Finance*, **44**(3), 747–69.

Gilbert, A. R. (1986), 'Requiem for Regulation Q: What It Did and Why It Passed Away', *Federal Reserve Bank of St Louis*, **68**(2), 22–38.

Gilson, S. C., John, K., and Lang, L. H. P. (1990), 'Troubled Debt Restructurings: An Empirical Study of Private Reorganization of Firms in Default', *Journal of Financial Economics*, **27**(2), 315–53.

Hart, O., and Moore, J. H. (1998), 'Default and Renegotiation: A Dynamic Model of Debt', *Quarterly Journal of Economics*, **113**, 1–41.

Higgins, M., and Osler, C. (1997), 'Asset Market Hangovers and Economic Growth: The OECD during 1984–93', *Oxford Review of Economic Policy*, **13**(3), 110–34.

Mishkin, F. S. (1996), 'Understanding Financial Crisis: A Developing Country Perspective', NBER Working Paper 5600.

Morris, S., and Shin, H. S. (1999), 'Coordination Risk and the Price of Debt', http://www.nuff.ox.ac.uk /users/Shin/working.htm

Leeth, J. D., and Scott, J. A. (1989), 'The Incidence of Secured Debt: Evidence from the Small Business Community', *Journal of Financial and Quantitative Analysis*, **24**(3), 379–94

Patinkin, D. (1989), *Money, Interest, and Prices: An Integration of Monetary and Value Theory*, Cambridge, MA and London, MIT Press.

Platt, H. D., and Platt, M. B. (1994), 'Business Cycle Effects on State Corporate Failure Rates', *Journal of Economics and Business*, **46**, 113–27.

Poole, W. (1970), 'Optimal Choice for Monetary Policy Instruments in a Simple Stochastic Macro Model', *Quarterly Journal of Economics*, **84**, 197–216.

Pulvino, T. C. (1998), 'Do Asset Fire Sales Exist? An Empirical Investigation of Commercial Aircraft Transactions', *Journal of Finance*, **53**, 939–78.

Schumpeter, J. A. (1996), *The Theory of Economic Development*, New Brunswick, Transaction. (First published in 1911, first translation into English in 1934.)

Scott, J. A., and Smith, T. C. (1986), 'The Effect of Bankruptcy Reform Act of 1978 on Small Business Loan Pricing', *Journal of Financial Economics*, **16**, 119–40.

Sharpe, S. (1994), 'Financial Market Imperfection, Firm Leverage, and the Cyclicality of Employment', *American Economic Review*, **84**, 1060–74.

Shleifer, A., and Vishny, R. (1992), 'Liquidation Values and Debt Capacity: A Market Equilibrium Approach', *Journal of Finance*, **47**, 1343–65.

Suarez, J., and Sussman, O. (1997), 'Endogenous Cycles in a Stiglitz–Weiss Economy', *Journal of Economic Theory*, **76**, 47–71.

— —(1999), 'A Stylized Model of Financially Driven Business Cycles', mimeo, CEMFI, Madrid.

Worthington, P. R. (1993), 'Recent Trends in Corporate Leverage', *Federal Reserve Bank of Chicago Economic Perspectives*, **17**(3), 24–31.