AGENCY COSTS, BALANCE SHEETS AND THE BUSINESS CYCLE

Philip Lowe and Thomas Rohling

ABSTRACT

The 1980s witnessed large increases in corporate debt and sustained asset price inflation. More recently, asset prices, particularly commercial property prices, have fallen significantly. The effect of these changes on balance sheets, and their implications for the business cycle, have generated considerable interest among academics and policy makers. In this paper, we review recent theoretical models that link the evolution of the business cycle to changes in firm equity. This link arises out of the asymmetry of information between borrowers and lenders and between managers and owners. These asymmetries lead to distortions in decision making which affect both the supply of and demand for credit, and ultimately investment and output. Deteriorations in the net worth of corporations and financial institutions are likely to lead to a reduction in both credit demand and supply and to an amplification of the business cycle.

We develop a simple model in which the information problems between risk-averse management and the firm's owners lead to investment decisions that depend upon the financial condition of the firm. We also review the Australian evidence of the importance of balance sheet strength on the availability of finance. Empirical results suggest that asset price inflation or increases in corporate equity, even after controlling for general business conditions, lead to finance becoming easier to obtain. This suggests that a collapse of asset prices, or an aggregate demand shock that reduces firms' equity, will result in decreased supply of external finance.

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1.   INTRODUCTION

> Over-indebtedness means simply that debts are out-of-line, too big relatively to other economic factors. If the debts are out-of-line relatively to only a few unimportant factors, little harm may result. The great disturbances come when the debts are decidedly out-of-line with practically everything - including assets, income, gold and liquidities....
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> Irving Fisher (1933, p.11)

The importance of balance sheets in the evolution of the macro-economy has generated significant interest over recent years. This increased interest follows a rise in both corporate leverage and real asset prices in a range of countries in the 1980s. More recently, real asset prices have fallen, and many corporations have attempted to reduce leverage. These developments have sparked concern that changes in financial structure have amplified the current business cycle. In this paper we review the mechanisms through which such an amplification might occur. In addition, we review the Australian experience with particular regard to the implications of asset price inflation for the conditions under which finance is made available.

Changes in the structure of the balance sheets of corporations and financial institutions can alter the response of the economy to aggregate demand and asset price shocks. The link between balance sheets and the business cycle has its roots in asymmetries in information between borrowers and lenders, and between owners and managers. The asymmetries lead to distortions in decision making, and these distortions impose certain costs. The size of these "agency costs" is, in general, a decreasing function of corporate collateral or equity. As a result, the distortions and costs in an economy in which firms are initially highly geared are likely to be larger than in an equivalent economy with lower debt. These larger distortions can lead to a longer and more amplified business cycle in the high debt economy.

To date, models that emphasise a link between financial structure and economic activity have focused on the relationship between corporate equity and the supply of

intermediated credit. While the models differ in their structure, the key mechanism is often the same. Specifically, an increase in leverage increases the probability that the firm will be unable to meet its contractual obligations. From the point of view of the provider of finance, this increase in the probability of default adversely effects the incentives of the firm. As a result, the interest rate charged by an intermediary is an increasing function of the leverage of the firm. In the limit, the intermediary may be completely unwilling to extend credit at any price. Higher interest rates, and equilibrium credit rationing, result in fewer investment projects being undertaken.

The models that emphasise this type of mechanism generate a link between financial structure and the evolution of the business cycle through the conditions under which external finance is supplied. Deterioration in firms' equity, through an adverse demand shock, or a fall in asset prices, will cause the loan supply curve to shift to the left. The shift can be compounded if the adverse shock causes loan defaults which reduce the capital of financial intermediaries. With lower capital, financial institutions may decide to reallocate their portfolios away from business loans towards safer assets. Only after a period of balance sheet reconstruction by financial institutions and corporations, will the loan supply curve return to more normal levels.

While there has been considerable theoretical work on the relationship between financial structure and the *supply* of finance, there has been considerably less work on the relationship between financial structure and the *demand* for finance. This is surprising given that to a large extent, recent balance sheet reconstruction reflects the desire of management to reduce leverage, not so that they can obtain funds from financial intermediaries on more favourable terms, but to reduce the probability of corporate failure. In general, managers are unable to diversify away the risk associated with losing their current job and their firm-specific capital. Thus high leverage can reduce the incentives of risk-averse management to undertake risky investment.[1] As a result, high leverage can lead to a reduction in the demand for funds from financial intermediaries. Consequently, the link between corporate financial structure and the evolution of the business cycle operates not only through the conditions under which funds are supplied, but also through the demand for funds. The combination of a reduced supply of funds at any given interest rate, and

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[1] This is in contrast to the standard Modigliani-Miller (1958) proposition that the firm's investment decisions are independent of its financial structure.

a reduced demand for funds at any given interest rate, may lead to a prolonged period of slow output growth.

In this paper, as well as reviewing some of the recent models that link credit supply to the financial structure of firms and financial intermediaries, we develop a model which focuses on demand side factors. The model relies on management incentives that differ from those of the firm's owners. Since managers are not able to hold diversified portfolios of jobs, they dislike corporate collapse more than do the owners of the firm. As a consequence, investment decisions by management are a function of the financial structure of the firm. Once equity falls below a critical level, managers may not be prepared to undertake risky, but positive net value investment, but instead may attempt to recapitalise the firm through retention of earnings.

Ideally, it would be desirable to test the implications of the various models presented in the paper. While some recent advances have been made in this regard, in general the tests have tended to focus on the micro implications of the agency cost literature. This work is briefly reviewed in the paper.

Unfortunately, to date there has been relatively little empirical work directly linking agency costs and financial structure to the evolution of the business cycle. We examine this issue using Australian evidence. In particular, we focus on the cost of external finance and the conditions under which it has been extended. Our results suggest that, controlling for expected changes in business conditions, asset price inflation leads to a rightward shift of the loan supply curve. Increases in asset prices, by increasing the perceived collateral of firms, make financial institutions willing to supply a greater volume of funds at any given interest rate. This is consistent with the agency cost models. It also suggests that a fall in asset prices will see tighter credit conditions.

The remainder of the paper is structured as follows. In Section 2, we review the various mechanisms through which financial structure may impact on the evolution of the business cycle. In Section 3, we model the interactions of management incentives, financial structure and investment. We review the empirical work on agency costs and discuss the Australian experience in Section 4. Finally, in Section 5, we summarise and conclude.

2. AGENCY COSTS, CREDIT SUPPLY AND CREDIT DEMAND: A REVIEW

In traditional economic theory, specialisation allows efficiency gains through the division of labour. With perfect information, this division of labour can be achieved by one party (the principal) hiring another party (the agent) to perform certain specialised tasks. However, a fundamental problem facing the principal is the inability to costlessly write contracts with the agent that cover every possible outcome. As a result, and in contrast to the frictionless traditional theory, contracts are incomplete and enforcement is costly. This creates a potential conflict of interest between the principal and the agent, with the agent having opportunities to engage in activities that are not in the best interests of the principal. These information and incentive problems give rise to various types of costs that reduce the gains from division of labour. For instance, the principal may be required to spend resources verifying the claims of the agent. These costs are commonly referred to as agency costs.

In the case of a contract between a borrower (the agent) and a lender (the principal), the lender often has limited information about the borrower. In the work of Stiglitz and Weiss (1981), this inability to distinguish between different types of borrowers can lead to the lender restricting credit altogether. In contrast, in Williamson (1987) the lender knows the risk characteristics of the different borrowers, but must verify the claimed outcome of the projects undertaken by borrowers. Just as in the Stiglitz and Weiss model, these verification or monitoring costs can lead to credit rationing.

However, credit rationing is only one response to the information problem. Instead of *quantity* rationing, the lender may use *prices* to solve the incentive problems inherent with asymmetric information problems. The more equity or collateral a borrower can commit to a project, the smaller the risk the lender faces, and the lower will be the premium on external funds. This interaction of collateral and interest rates can have macroeconomic implications. More generally, the interaction of agency costs and collateral has implications for how the economy responds to adverse shocks. In this Section we review some of these implications.[2] Specifically, we examine the interactions between corporate collateral and the cost

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2 See also the reviews by Gertler (1988), Hansen (1992) and Stiglitz (1992).

of external funds; between bank collateral, portfolio allocations and interest rates; and between corporate collateral and management incentives.

2.1 The Role of Corporate Balance Sheets

One of the first models to link firms' balance sheets with the macroeconomy was developed by Bernanke and Gertler (1989). In their model, the borrower (the agent) has information about the outcome of the project that is not freely available to the lender (the principal). Since the lender cannot costlessly observe the project's outcome, the borrower has an incentive to falsely declare the project a failure. By declaring the project as failed, the borrower does not repay the loan principal or interest, and if not caught, is able to retain the entire return from the project. This incentive to declare "failure", gives rise to a "costly state verification problem" first outlined in Townsend (1979).[3] The lender must decide whether to verify the bad outcome declared by the borrower or to accept the declared bad outcome as the true state of the project. The probability of the bank verifying the borrower is a function of the collateral of the firm. The costs of verification/audit are often referred to as monitoring costs, and can be viewed as a reflection of the principal-agent problem.

When writing the loan contract, the lender must decide on the interest rate to charge on the loan. In doing so, the lender must take into account the expected auditing costs, which increase when the probability of an audit increases. These costs get fed through into higher interest rates. A key factor in the probability of an audit is the amount of collateral the borrower has backing the project.

In the case of complete collateralization, the borrower can guarantee payment even if the project is a failure. The probability of the lender auditing is zero (agency costs are zero) and the interest rate charged contains no added premium. However, in the case of incomplete collateralization, the positive probability induces positive auditing costs. The greater the project's outside funding requirement, the greater are the expected auditing costs. With a low equity contribution, and limited liability, the borrower has less at risk if she falsely claims the bad outcome, and therefore must be audited with a greater probability in order to induce honest behaviour. The lower the contribution of the borrower to the project, the higher is the premium on

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[3] Other papers to examine the implications of the costs of evaluation and monitoring include Gale and Hellwig (1985) and Williamson (1987).

external funds.[4] In general, external finance is more costly than internally generated finance, the difference being a measure of agency costs.

This model predicts an income-accelerator effect on investment. A negative shock to (say) productivity might cause the entrepreneur's current period income to be negative. As a result, agency costs will be higher in subsequent periods as the entrepreneur has less collateral for the next investment project. Consequently, investment will be lower than it otherwise would have been. Although firm-specific shocks may tend to average out, systemic shocks to the economy may reduce aggregate investment.

Agency costs are counter-cyclical; increasing in recessions when firms' asset values are most likely to be depressed, and decreasing in booms. Further, shocks may have asymmetric effects through the business cycle. Sharp deteriorations in the economy are more likely than sharp improvements, since there is a limit to the reduction in agency costs in good times. When borrowers experience growth conditions for a number of periods, eventually future investment projects can be self financed and agency costs tend towards zero. Any further improvements in conditions will not lower agency costs, and there will be no further accelerator effects. However, in downturns, some firms that were once fully collateralized will now incur agency costs, exacerbating the downturn.

While the above model provides a theoretical link between corporate balance sheets and the business cycle, the empirical magnitude of the mechanism of the model is questionable. That is, in many cases monitoring (auditing) costs are insubstantial relative to the value of the loan. More recent models of agency costs have attempted to address this problem. Bernanke and Gertler (1990) develop a model where the outcome of the project is common knowledge, removing the need to audit.[5] Instead, the asymmetry of information arises from the lender not knowing the *quality* of the investment project chosen by the borrower. The entrepreneur incurs a cost in initial evaluation of a project, and then must decide whether to

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[4] The problem disappears if firms can costlessly raise equity to finance the project. However, similar information problems are also present in the equity market. Consequently, it is assumed firms are equity rationed. See Greenwald, Stiglitz and Weiss (1984) for details.

[5] Calomiris and Hubbard (1990) also model the role of collateral in mitigating adverse selection problems arising from information-intensive borrowers, but do not rely on monitoring costs.

proceed. If the project evaluated looks like a "bad" project, the entrepreneur can discard it and evaluate another, but only by incurring the evaluating cost again.

Having incurred the cost, the borrower has an incentive to pass off the bad quality project to the lender as a good project, as the evaluating costs are sunk and cannot be recouped should she decide against proceeding with the project. The lower the net worth of the borrower, the higher is the incentive to pass off "bad" projects as "good" projects. As a result, the probability that any loan is repaid is lower. This in turn leads lenders to increase interest rates. Finally, the higher interest rates reduce the willingness of entrepreneurs to evaluate and undertake projects. Again, this model predicts that the business cycle will be amplified if adverse shocks affect firms' equity.

The models described above are all single period models. If financial institutions recognise the existence of business and asset price cycles, changes in equity may have smaller effects on the price and availability of intermediated finance.

Gertler (1992) extends the single-period contract models by examining multi-period financial relationships between borrowers and lenders. Unlike the single period models, lenders now take into account the net present value of the expected "lifetime" earnings of the borrower's investment project when deciding on the cost of external funds. If the borrower declares a "bad" outcome in one period, the lender may be willing to reschedule debts if the borrower has sufficient expected "collateral" in future periods. Because the debt gets rescheduled rather than written off, there is less incentive for the borrower to falsely declare the state as failed. A positive shock to a firm's profits in the first period increases output at the end of the first period, strengthening the firm's balance sheet and reducing the incentive problem for investment in period two. Consequently, the firm faces a lower interest rate in period two. Thus, shocks to a firm's balance sheet in one period can influence production in future periods even though the shocks themselves are serially uncorrelated.

In addition, a more favourable expectation about the profitability of future projects reduces the agency cost today. Even if the bad state was declared at the end of the first period, the expectation of high future earnings allows a larger debt burden to be rolled over. Conversely, a negative expectation about future economic conditions

will increase the premium on loan interest rates today, because there is less "collateral" in future projects, and less debt will be allowed to be rescheduled.

Finally, in a continuing relationship between borrower and lender, the past performance of the borrower can influence the size of the premium on external funds. The borrower realises that the moral hazard problem of attempting to pass off bad projects as good projects increases the premium on external funds. However, by always telling the truth, the borrower gains a good reputation that allows the lender to reduce the size of the premium. Hence, agency problems may be more pronounced for new firms than for established firms.

The above models imply that a deterioration in corporate equity through say an adverse demand shock or a reduction in asset prices may cause the cost of external funds to increase. This increase will amplify the contractionary effects of the initial shock. Further contractionary effects are likely to be experienced if the reduction in corporate equity is translated into a reduction in the equity of financial institutions. It is to this issue that we now turn.

2.2   The Role of Banks' Balance Sheets

Just as a lender faces some asymmetric information when lending to a firm, a depositor faces asymmetric information when lending to a bank. Using this insight, Bernanke and Gertler (1987) develop a model that shows how factors that affect the health of the financial sector can have macroeconomic effects. The general asymmetric information problem is the same as before, but now it arises between the bank (the agent) and the depositor (the principal).

Banks are assumed to have a cost advantage in evaluating and monitoring potential projects.[6] However, the information gained from project evaluation remains private to the bank; only the bank knows the true outcome of its loan investments. The contract between the depositor and the bank cannot be a state-contingent contract because the states cannot be verified by the depositor. Therefore, debt contracts

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[6]   This is a common assumption in the literature. Diamond (1984) shows that there is a cost advantage of individual investors (depositors) delegating monitoring duties to a financial intermediary. Perfect diversification by the bank means the depositor does not need to monitor the bank.

arise as the optimal arrangement between the parties.[7] Further, it is assumed that the bank cannot obtain a sufficiently high number of differentiated projects to perfectly diversify away risk. As a result, depositors face a potential risk similar to that outlined in Diamond and Dybvig (1983). However, the bank is able to overcome the information problem by holding bank capital, which acts as a form of collateral for the depositor.[8] Greater amounts of capital allow the bank to secure more deposits, *ceteris paribus*, and allow the bank to allocate a larger proportion of its lending portfolio to risky loans.[9]

Thus, the bank's net worth and the quality of the bank's illiquid assets affect the quantity of deposits that it can attract, and hence the amount of lending it can conduct. In turn, this affects investment and output. A deterioration in the bank capital or deterioration in the value of the collateral implicit in illiquid bank assets forces a contraction in a bank's illiquid investment projects, with resources being shifted to liquid assets (in their model, storage) and safe projects. Bernanke and Gertler suggest that this is what happened in the banking crisis of the 1930s. Some projects, especially those that were information-intensive and relied on bank credit, found that they were not able to obtain funds under any conditions.

There are implications for interest rates as well. The deposit rate is sensitive to the expected return on the bank's portfolio. The higher the bank's collateral, the greater the proportion of the bank's assets that can be invested in risky illiquid assets, and the higher the deposit rate the bank can offer. In the case of a deterioration in the bank's capital, the deposit rate falls, and the bank substitutes its assets towards the safe sector.

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[7] A deposit is a loan contract between the depositor and the bank. The depositor receives a fixed payment on the deposit, regardless of the outcome of the bank's investment project. Thus, this contract is very similar to the debt contract between the bank and a borrower.

[8] The bank's capital consists of equity obtained from the bank's owners or from retained earnings.

[9] Central banks may offer explicit or implicit deposit guarantees which act to remove the risk to depositors and increase the bank's moral hazard incentives. However, even in the unlikely case that the guarantee held exactly, the bank may still wish to hold capital if the bank is risk averse. For example, Stiglitz (1992) argues that if bank's objective functions are characterised by decreasing absolute risk aversion, the size of a bank's loan portfolio is positively correlated with the bank's net worth.

2.3   The Demand for Credit: the Role of Managerial Incentives

The models discussed in Section 2.1 and 2.2 imply that a reduction in the equity of the corporations and financial institutions will lead to lenders supplying fewer loans at any given interest rate; that is, the supply curve for intermediated finance moves to the left. In practice, movements in the demand curve may be equally important. A deterioration in the equity of the firm may well affect managers' decisions concerning production and investment levels. As a result, falling internal net worth may see both the supply of, and demand for, funds decline.

The work of Jensen and Meckling (1976) represents one of the first attempts to link management incentives and firms' capital structure.[10] They argue that when there is asymmetric information between managers (agents) and owners (principals), managers have an opportunity to transfer some of the firm's resources to themselves without the knowledge of the owner. For example, managers may build plush offices and buy corporate jets. Even if the owners see the manager's actions, it is difficult for them to know if these actions are in their own best interests, since managers know more about the firm than the owners (this is the main reason for hiring a manager in the first place). If the manager owned the firm, or owned a large proportion of the firm's equity, then this incentive problem would disappear.

In Jensen and Mecking's model, managers are assumed to be approximately risk neutral. They are not concerned with possible adverse effects on their reputation should their actions ultimately bankrupt the firm. In practice, such considerations may be important. The firm's owners can diversify risk by holding shares of many companies. In contrast, the managers are likely to have sunk effort and skills in a particular firm that cannot be easily used at another firm. If the manager should lose her job, she suffers a high cost. Thus, the manager may behave in a risk-averse manner taking on projects that do not maximise the value of the firm.

Greenwald and Stiglitz (1993) develop a model in which internal equity has a role in influencing the evolution of the business cycle. The firm, through its manager, is assumed to maximise expected profits *less expected bankruptcy costs*. Output decisions must be made before the price of the output is known, and are therefore

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[10] Harris and Raviv (1991) provide a good survey of the theoretical and empirical literature on incentive problems and the determinants of capital structure.

risky. Also, expected bankruptcy costs are a decreasing function of equity. As a consequence, the lower is the equity of the firm, the lower is its output.

In this model, bankruptcy costs are added to the objective function in an attempt to capture management's dislike for bankruptcy. This type of specification does not address the question of how the type of management contract effects the manager's decision and how risk aversion by management interacts with the contract. These factors are potentially important. In practice, the type of contract that is offered to managers can have important implications for their decisions. Agrawal and Mandelker (1987) find evidence that holdings by management of common stock and stock options lead to an increase in firm risk. Using information about the variance of a firm's share price before and after an announcement of an investment, they find that managers with a relatively high proportion of shares in their compensation package select investments that result in variance increases. This supports the hypothesis that the managers' holdings of shares induce them to make investment decisions that are in the interests of the firm's owners. Along similar lines, Jensen and Murphy (1990) find that there is a small but significant positive relationship between performance schemes and firm performance.[11]

The costs incurred by a manager when her firm experiences "financial distress" are documented by Gilson (1990). He finds that, on average, less than half of the directors and managers of a firm that experiences financial distress keep their jobs. Also, the directors who have resigned from these firms are less likely to serve as directors of other companies. Jensen (1988) also suggests that a takeover, or a potential takeover, can have significant incentive effects on managerial behaviour. Evidence shows that roughly 50 per cent of a firm's top level managers are gone within three years of acquisition.

These studies of managerial compensation are generally divorced from the business cycle and the internal equity of the firm. In the model developed below, we attempt to capture this interaction between contracts, the internal equity of firms and investment.

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[11] Australian anecdotal evidence (Kavanagh and McBeth, 1988) suggests that although bonus schemes are used in the majority of companies, they have become expected, and seen as part of the manager's total remuneration package. However, many firms are now adopting performance - based criteria in addition to the bonus scheme.

3.   A MODEL OF MANAGERIAL INCENTIVES

The model focuses on the links between changes in internal equity and the demand for funds.   The model makes numerous simplifying assumptions, is partial equilibrium, and examines a very simple form of contract. Nevertheless, it captures in a simple framework a number of important ideas.

The basic intuition is straightforward. While owners of the firm are assumed to hold diversified portfolios of stocks, managers are unable to hold diversified portfolios of managerial jobs. Thus, managers will suffer more acutely than the owners of the firm if the firm collapses and the manager loses her job. This introduces the possibility that managers will pass-up *risky* investment projects with positive net present-value.

We begin by assuming that each firm is run by a single manager.[12] The role of the manager is to select the type of "investment" that the firm undertakes. At the beginning of each period the manager has two types of "investment projects" from which to select. The first type of investment is a risky project while the second type is a safe project with a known return. The risky project is assumed to have a higher expected return than the safe project and would always be undertaken by the owner. Each project is assumed to cost one unit and the firm has equity of $0 \leq e \leq 1$. If equity is less than one, the manager must borrow 1-e to undertake the project. At the end of the period, the manager collects the return from the selected project and then pays any loan and interest due to the lender.

Managers are assumed to be risk averse. They are identical to one another and have the following utility function:

$$U(w) = w^{1-g} \qquad \left(0 \leq g \leq 1 \right) \qquad (1)$$

where w is the wage paid to the manager and g is the coefficient of relative risk aversion. A higher g implies a higher degree of risk aversion. The contract between the owner and the manager specifies that the wage paid is a function of the investment decision and the outcome of the project. If the manager undertakes the

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[12] Many small firms are owned and managed by the same person. In this case, the owner may be risk averse as she is unlikely to hold a diversified portfolio of firms.

safe project, a wage of $\overline{w}$ is earned. If the risky project is undertaken, the wage depends upon the survival of the firm. If the project's outcome is sufficiently poor to reduce the equity of the firm to zero, the firm will close and the manager earns a low wage of w_f. On the other hand, if the project is sufficiently successful to allow the firm to continue operating in the following period, the manager earns a wage w_s, where w_s is greater than w_f. Note that this higher wage is paid even if the project earns a low or negative rate of return, provided that the project does not wipe out the equity of the firm.

The expected utility of the manager is as follows:

If the safe project is undertaken: $\qquad U(\cdot) = \overline{w}^{1-g}$ $\qquad\qquad$ (2)

If the risky project is undertaken: $\qquad U(\cdot) = pw_s^{1-g} + (1-p)w_f^{1-g}$ $\qquad$ (3)

where p is the probability that the manager will be paid w_s. The manager maximises expected utility. Thus, the risky project will be undertaken if:

$$pw_s^{1-g} + (1-p)w_f^{1-g} \geq \overline{w}^{1-g} \qquad\qquad (4)$$

To simplify the algebra assume that w_f is zero; that is, if the firm loses its entire equity, the manager gets no payment and loses her job. In this case, the project will be undertaken only if the following condition is satisfied:

$$\frac{w_s}{\overline{w}} \geq p^{\frac{-1}{1-g}} \qquad\qquad (5)$$

that is, the risky project will be undertaken if the wage premium paid to the manager for undertaking the risky investment is sufficiently high to compensate her for the probability that she will get paid nothing, and for risk that she is accepting by undertaking the risky project. The more risk averse the manager, the greater must be this wage premium. In the limit, if the manager is infinitely risk averse, she cannot be induced to undertake the risky project. Similarly, from equation (5), it can also be seen that the higher the probability that the project will be a complete failure, the higher must be the wage premium.

So far nothing has been said explicitly about the determination of p. However, the probability that the investment project will not reduce equity to zero is a function of the current level of equity in the firm. Given a distribution of possible project outcomes, the greater the equity of the firm, the lower the probability that the outcome will be so bad that equity is reduced to zero.

If the actual outcome of the project is given by r_a and the gross cost of debt (that is, 1 plus the interest rate) to the firm is given by r_l, then the equity of the firm will be negative after the project has been completed if the following condition holds:

$$r_a < (1-e)r_l \tag{6}$$

If the gross project return is less that the total debt plus interest due to the lender, the firm must close and the manager will be paid nothing. If initial equity is equal to zero the project will be a failure from the manager's point of view if the rate of return on the project is less than the interest rate charged. In contrast, if initial equity equals one, the project cannot be a failure from the manager's point of view.

Suppose for simplicity that the distribution of project outcomes is uniform between $\underline{z}$ and $\overline{z}$ (that is, $r_a \sim U(\underline{z}, \overline{z})$) and that $0 \geq \underline{z} < r_l$ and $\overline{z} > r_l$. In this case, the probability of success from the manager's viewpoint is given by:[13]

$$p = prob(r_a > r_l(1-e)) = \frac{\overline{z}-(1-e)r_l}{\overline{z}-\underline{z}} \quad if \quad (1-e)r_l \geq \underline{z}$$
$$= 1 \qquad\qquad otherwise \tag{7}$$

Substituting this expression for p into (5) yields an equation which links the manager's decision to the equity of the firm. That is, the project will be undertaken if:

$$\frac{\overline{z}-(1-e)r_l}{\overline{z}-\underline{z}} > \left(\frac{\overline{w}}{w_s}\right)^{1-g} \qquad if \quad (1-e)r_l \geq \underline{z}$$
$$1 > \left(\frac{\overline{w}}{w_s}\right)^{1-g} \qquad otherwise \tag{8}$$

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[13] If $(1-e)r_l < \underline{z}$ then the project will be a success even if the minimum return is earned.

Note that the second case requires that even in the worst possible outcome, the firm will not lose all its equity. In this case, provided that the wage paid for undertaking the risky project is greater than that paid for undertaking the safe project, and provided that the manager is not infinitely risk averse, the project will be undertaken.

In the alternative case, equation (8) can be re-expressed to show more explicitly the relationship between equity and investment. The risky investment will only be undertaken if equity is above some critical level e* defined as follows:

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e^* = \frac{(\bar{z} - \underline{z})\left[\dfrac{\bar{w}}{w_s}\right]^{1-g} - \bar{z} + r_l}{r_l} \tag{9}
$$

As $\bar{z}$ increases, the expected return on the risky project increases. This reduces the amount of equity required for the manager to undertake the project. An increase in the wage premium that the manager is paid for undertaking the risky project or a decrease in the risk aversion of the manager will also reduce the amount of equity required before the manager will undertake the risky project. Similarly, an increase in the variance of possible project outcomes (keeping the mean constant) would also require a higher threshold level of equity before the investment would be undertaken.

Given the above structure, how does the firm behave in response to an adverse shock? Suppose initially that e > e*. In this case, the manager undertakes the risky investment. Now, suppose that an adverse demand or productivity shock occurs after the output decision has been made and a substantial loss is incurred. As a result, the equity of the firm falls. Suppose the outcome is sufficiently bad that equity falls below e*. In the following period, even though the expected return on the project is unchanged, the manager elects not to undertake any risky investment. Instead she decides to undertake the safe investment and earn the certain gross return *r*. At the end of the second period, the equity of the firm will have increased to $e_2 = re_1$.[14] Depending upon the extent of the loss of equity in the first period, the recapitalisation of the firm through the retention of earnings from the safe project may be sufficient to ensure that $e_2 > e^*$. If this is the case, the manager will again

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[14] The numbered subscripts refer to time periods.

elect to invest in the risky project in the third period. If it is not the case, the safe investment will be undertaken again. In fact, the safe investment will continue to be undertaken until period i when $e_i > e^*$. Only after the equity of the firm has been restored, will the manager again elect to undertake the risky investment. This is despite the fact that the expected return on the risky project has not changed throughout the entire period.

4. SOME EMPIRICAL EVIDENCE

4.1 Previous Empirical Research

Although research on the linkages between firms' financial structure and investment or output is in its infancy, a number of empirical studies have attempted to determine the strength and nature of the relationship. One of the most frequently tested implications of agency cost theory is that financing patterns vary across firms according to differences in the agency costs they face. A series of tests using data for US manufacturing firms, finds that investment is sensitive to financial factors, especially for firms that *a priori* are expected to face large agency costs.

Fazzari, Hubbard and Petersen (1988)[15] divide firms into those that retain a large part of their income, and those that pay-out large dividends. Their results show investment is particularly sensitive to cash flow for the group of firms that retain most of their income. Also, the inclusion of a "collateral" variable has a significant positive effect on investment for small pay-out firms, but not for large pay-out firms. This is consistent with the importance of collateral reducing the agency cost problems for those firms that find outside funds difficult to obtain. Using the same data and methodology, Gertler and Hubbard (1988) find that these effects are asymmetric over the business cycle; changes in cash flow have a larger impact on investment in recession years. In a similar spirit to Fazzari, Hubbard and Petersen, Whited (1992) shows that financial distress variables are significant factors in explaining investment, especially for firms without a corporate bond rating.

Similarly, Oliner and Rudebusch (1989) find that young firms' cash flow has a stronger effect on investment than is the case for mature age/low agency cost firms. They also suggest that firms whose managers have relatively little equity in the firm

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[15] See Mills, Morling and Tease (1993b) for a similar study using Australian data.

face higher agency problems. However, contrary to expectations, regression results do not indicate such a relationship.

Whited (1991) examines whether a firm with poor financial health will postpone investing until it can rebuild its financial asset base. Eckstein and Sinai (1986) have labelled this process "reliquefication" and suggest that it occurs during recessions and early in recoveries. In terms of the multi-period model developed by Gertler (1992), the firm, by retaining earnings, increases its collateral and thus reduces the agency cost premium on external funds. The model developed in Section 3 suggests that demand factors are also important. As the firm becomes more financially fragile, risk averse managers become increasingly concerned about bankruptcy. Consequently, managers attempt to "reliquefy" before initiating investment projects. Results using data from a panel of manufacturing firms show that for the sub-sample of firms that rely on external funds for investment, there is a significant positive relationship between lagged financial assets and investment. Also, the accumulation of financial assets tends to last approximately 2 years before investment occurs.

Other papers have examined the role of credit market imperfections in the monetary transmission mechanism. Gertler and Gilchrist (1991) suggest that small manufacturing firms are more likely to experience financial constraints than large manufacturing firms. They find that following a tightening of monetary policy, the sales of small manufacturing firms decline at a faster pace than those of large firms. Kashyap, Stein and Wilcox (1991) suggest that changes in the mix on bank loans and commercial paper are a proxy for credit supply. During recessions, tight monetary policy causes banks to decrease loan supply. Some businesses substitute towards the commercial paper market, but this substitution is imperfect, and thus the shift towards commercial paper predicts a fall in investment. Regression results confirm this prediction. Bernanke (1990) finds that the interest rate spread between the commercial paper rate and the rate on treasury bills is a good indicator of monetary policy. Consistent with this finding, Gertler, Hubbard and Kashyap (1990) derive a model of capital market imperfections and argue that interest rate spreads can proxy agency costs. An investment equation, modified for inclusion of the interest rate spread, is estimated and shows that the spread is important in explaining investment. Finally, Bernanke and Campbell (1988), Bernanke, Campbell and Whited (1990), and Warshawsky (1991) document the large rise in corporate indebtedness in the US over the 1980s, and express concern about the potential financial distress of many corporations in the event of recession.

4.2 Some Empirical Evidence for Australia

Compared to the US, relatively little work has been undertaken in Australia on the relationship between corporate equity and the business cycle. While there is considerable anecdotal evidence supporting the notion that both supply and demand factors have contributed to the recent slow growth in credit, it is difficult to find any empirical evidence on this issue.

In an attempt to redress this imbalance, we empirically investigate factors that influence the supply of finance. We begin by reviewing changes in the balance sheets of banks and corporations, and the effect that these changes have had on the cost of funds and on corporate bankruptcies. We then address the question of whether changes in corporate equity effect the availability of finance.
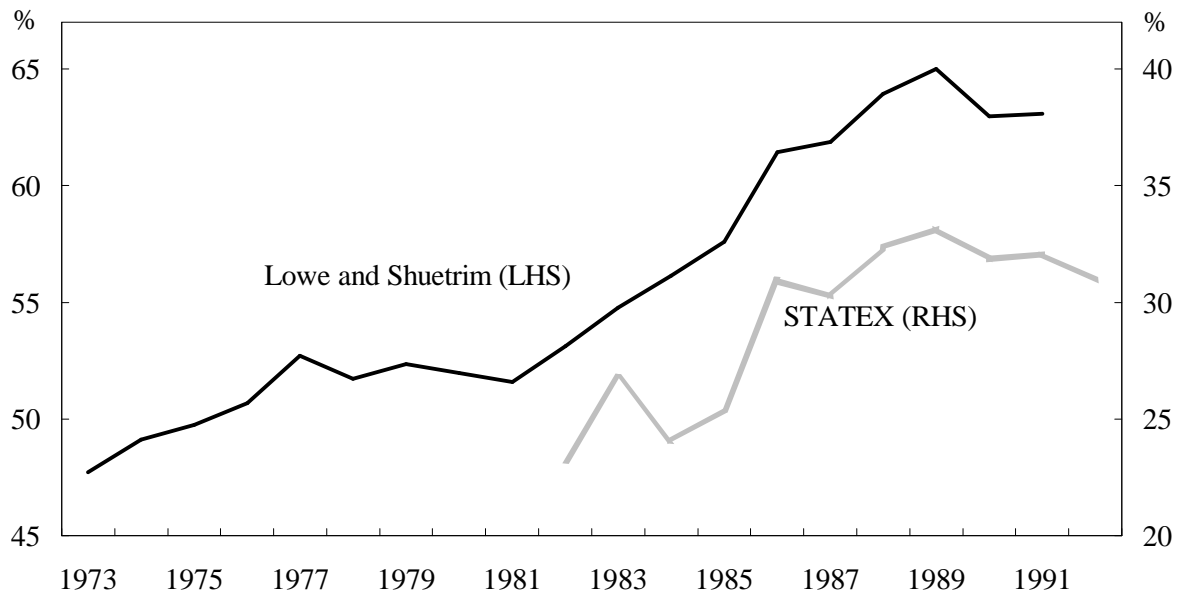
4.2.1 Debt, Balance Sheets and Asset Inflation

As in the US, Australian corporations experienced a significant increase in their debt to asset ratios over the 1980s. Graph 1 illustrates this increase in gearing using two different definitions of debt and two different data sets. The line beginning in 1973 uses data from Lowe and Shuetrim (1992), and presents the aggregate debt to asset ratio for 66 listed and unlisted companies. Here, the definition of debt is quite broad, as it includes all non-equity sources of finance. The line beginning in 1982 shows the debt-asset ratio for 80 companies calculated from the STATEX database where debt has been defined as the sum of short term securities, long‑term securities, loans and bank overdraft.[16] Both measures show significant increases in leverage over the 1980s.

There are now numerous studies that attempt to explain why corporate debt increased to this extent.[17] Lowe and Shuetrim (1992) suggest that, on the supply side, the rise in corporate indebtedness was associated with financial deregulation and a desire by banks to increase market share, and a relaxation of credit control standards. On the demand side, increasing real asset prices and a growing economy meant that firms were keen to take advantage of the increased ability of banks to lend.

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[16] Further details on these series can be found in the Data Appendix.
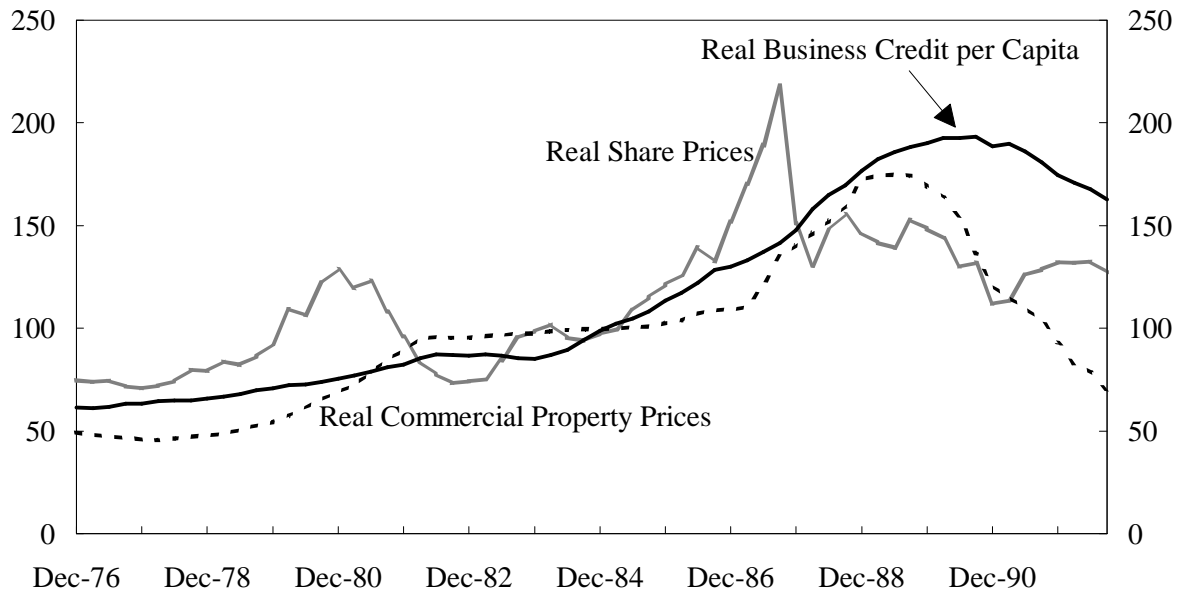
[17] See Dempster, Howe and Lekawski (1990), Stevens (1991), Macfarlane (1989, 1990) and Mills, Morling and Tease (1993a).

Graph 1: Debt to Total Assets

Since 1988/89, the debt to asset ratio appears to have fallen. In fact, Mills, Morling and Tease (1993a) find that firms have been restructuring their balance sheets to reduce their debt exposure since 1989/90. Debt raisings have been declining since 1989/90, and were negative in 1991/92.

As mentioned, the increased corporate indebtedness coincided with increasing real asset prices. In particular, the price of shares and property increased significantly. To some extent, corporations may have increased their borrowings on the basis of increased real asset values. The relationship between debt and asset prices can be seen in Graph 2. It shows the real share price index and a real property price index over the period from December 1976 to September 1992. In addition, it shows an index of business credit outstanding scaled by population.[18] All indices are based in 1984/85=100.

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[18] Deriving business credit per capita abstracts from scale effects.

Graph 2: Real Asset Prices and Business Credit

During the period from 1983 to 1989, real business credit per capita grew much faster than had previously been the case. This was associated with increases in the real price of commercial property and the real price of shares. This increase in asset values meant that in many cases the book value of equity was considerably less than the market value of equity. As a consequence, the growth of debt broadly matches the growth of equity, and thus the ratio of debt to assets, measured at market value, does not show an upward trend.[19]

In contrast, the period since 1989 has seen real business credit per capita, real share prices and real property prices fall. The decline in commercial property prices has been particularly pronounced; our real price index has fallen to the level of the early 1980s. For firms that had considerable commercial property assets, this fall in prices has represented a dramatic reduction in equity. For firms that borrowed heavily on the basis of expected asset price increases similar to those of the 1980s, this fall in asset prices has been particularly burdensome.

The increased debt to asset ratios need not make firms financially fragile if they are able to raise equity finance. However, Mayer (1990), using financial flow data for the US, Canada, France, Germany, Japan, UK, Italy and Finland, observes that in none of these countries do firms raise a substantial amount of funds from security
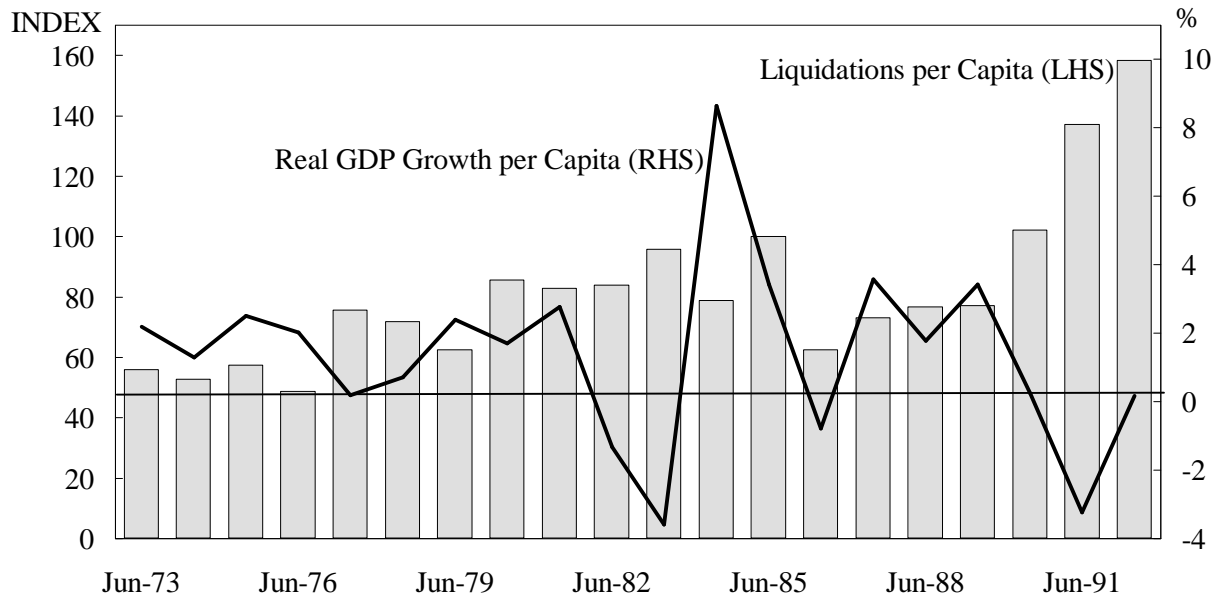
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[19] This is noted in Lowe and Shuetrim (1992) and Dempster, Howe and Lekawski (1990).

markets. Security raisings as a share of total finance range from a high of 19 per cent in Canada, to a low of 3 per cent in Germany. Retained earnings are by far the predominant source of finance for capital expenditure and bank finance is the dominant source of external finance for firms in most countries. Also, Mayer notes that small companies are more reliant on bank finance than are large companies. This is also the case in Australia. The Bureau of Industry Economics (1991) surveyed a number of small business firms and found that approximately 35 per cent of firms nominated existing or new shareholders or partners as a source of funds. The lack of equity finance could be related to the cost of issuing equity. Woo and Lange (1992) estimate that the transaction cost of an equity float for a raising of less than $500,000 is about 17.4 per cent, but for raisings in excess of $100 million is only 3.75 per cent. Equity constraints appear to be significant for many firms, and are especially important for many smaller firms.

Given these equity constraints, lower cash flows, arising from (say) an economy wide reduction in demand, reduce internal funds available to meet the debt obligations, and cause a deterioration in firm collateral. The higher the initial debt-equity ratio, the greater the probability that this deterioration will lead to bankruptcy. That this has been the case in Australia is suggested by Graph 3 that shows corporate liquidations and growth in real GDP per capita over the last two decades.[20]

Although the recessions of 1982-83 and 1990-91 appear to be of about the same degree of severity, the number of corporate liquidations in the current recession is about 80 per cent higher than the liquidations in the recession of 1982-83. Measured on a per capita basis, the number of liquidations is roughly 60 per cent higher. To some extent, the increase in the number of liquidations reflects the higher debt levels at the beginning of the 1990/91 recession compared to the 1982/83 recession.

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[20] The construction of the corporate liquidation series is discussed in the Data Appendix.

Graph 3: Real GDP Growth and Company Liquidations

This relationship between debt levels and defaults is not peculiar to Australia. Davis (1992) tests directly for the effects of debt ratios on bankruptcy in a number of countries. For the US, Canada, UK and France, he finds a positive and significant relationship between corporate debt levels and defaults. Germany shows a positive but insignificant correlation, while Japan shows a negative relationship. Also, there are strong cyclical effects on defaults for all countries except Japan.

The increased probability of financial failure has led companies to restructure their balance sheets to reduce debt levels.[21] Given the equity market is not a source of funds for many companies, this requires using cash flow and retained earnings. As a consequence, funds available for investment are reduced. Some commentators have indicated that this is a factor in limiting investment during the current cycle. Stutchbury (1992) comments that in Australia, as in the US, there has been an "expansion hesitancy" by borrowers who want to reduce their gearing, and lenders who want to minimise their bad loan portfolio. In terms of the model developed in Section 3, managers are hesitant to undertake new investment projects when the firm has high debt levels, because the risk of bankruptcy is relatively high. The fact that equity markets are a limited source of finance for many firms means that
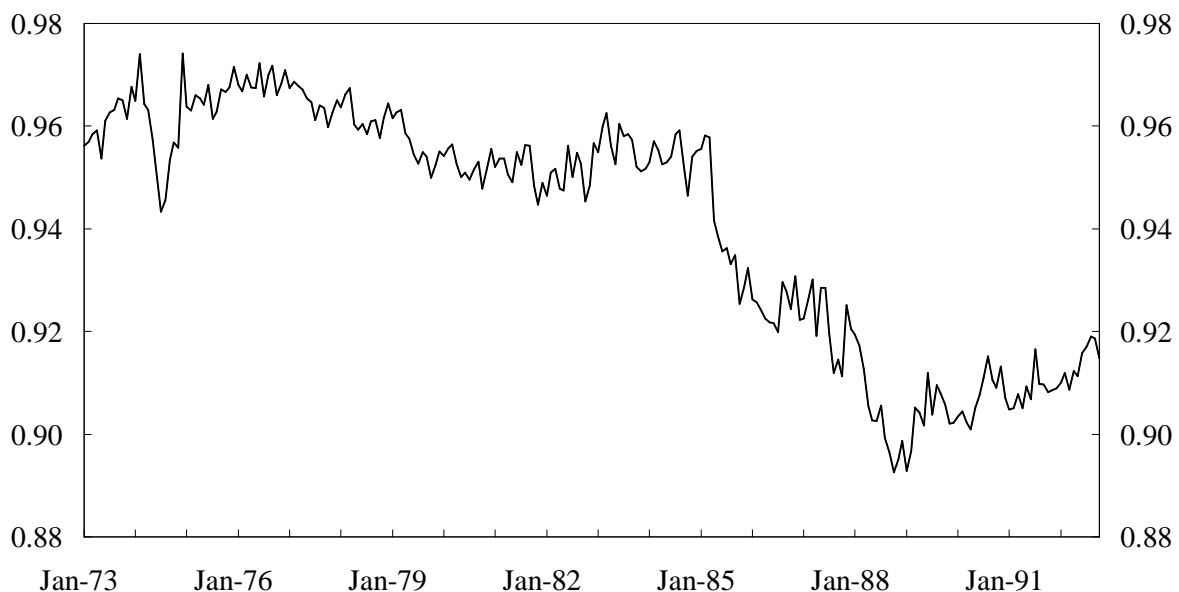
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[21] See Mills, Morling and Tease (1993a) for evidence.

managers must rely on the firm's retained earnings to rebuild their balance sheets. As discussed in Section 3, this delays investment decisions.

The counterpart of the rise in corporate liquidations during the current recession is the rise in bank bad and doubtful debts. Total non-performing loans in June 1990 were roughly $15 billion, and rose to $28.5 billion in June 1991; a rise of 90 per cent. In terms of a share of total assets, non-performing loans amounted to 2.9 per cent of assets in June 1990 and rose to a maximum of 5.9 per cent in March 1992. Since then, there has been a slight decline in non-performing loans.[22]

As outlined in Section 2.2, the banks' financial health has implications for the macroeconomy. Shocks to banks' net worth can lead to a reduction in lending and, because some firms are equity constrained, ultimately to a reduction in investment. Graph 4 presents the ratio of total debt of Australian banks (measured by total liabilities) to the banks' total domestic assets over the period January 1973 to October 1992.

Graph 4: Debt to Total Asset Ratio of Banks

Between 1973 and 1983, the ratio of debt to total assets averaged approximately 96 per cent. However, over the 1980s, when corporations were increasing their level of indebtedness, the banking sector was *decreasing* its indebtedness. As a whole,

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[22] See the January 1993 Reserve Bank Australia Bulletin for more details.

banks engaged in large capital raisings, largely to fund balance sheet expansion but also in response to the BIS risk-based standards. Levonian and Gizycki (1992) point out that part of the decline in the debt to asset ratio during the mid 1980s can also be attributed to the entry of new banks with low ratios of debt to assets.

Since 1989, there has been a slight rise in the debt to asset ratio. However, the Reserve Bank (1993) notes that if a risk - weighted measure of assets is used, along with the banks' global balance sheets, then the trend in the capital ratio since September 1989 has generally been upward. In short, there does not appear to be a bank capital shortage in Australia. In contrast, Bernanke and Lown (1991) argue that the most important factor in the reduction of loan supply in the US. during the 1990/92 recession is the shortage of bank equity capital, arising from a write down of loans.
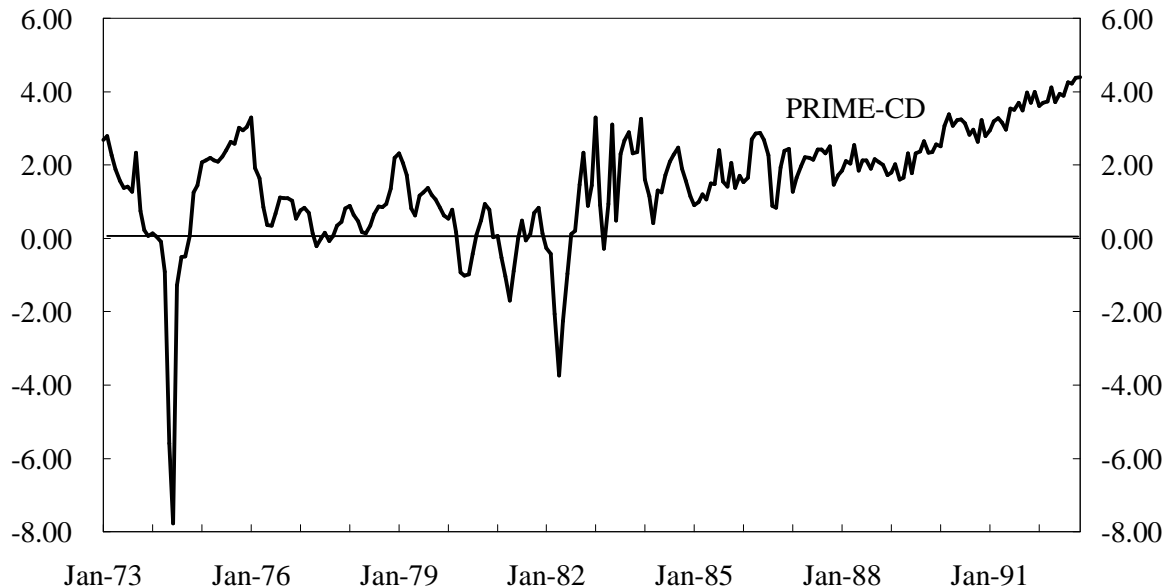
4.2.2   The Cost of Funds

The theory of asymmetric information outlined in Section 2.1 suggests that a firm's internal net worth may become a critical determinant of the terms under which it can borrow. That is, the firm's net worth, or collateral value, is important for reducing agency costs arising from incomplete information between lender and borrower. At the beginning of the current recession, debt-equity ratios were high by historical standards. While many companies have reduced gearing over recent years, improvements in firm collateral have been hampered by falling real asset prices. High debt-asset ratios, coupled with falling asset prices, are exactly the conditions under which agency costs are predicted to be the most severe. These costs should be reflected in a leftward shift of banks' supply curve of funds.

In addition, the model presented in Section 3 suggests that after a firm makes a considerable loss, management is less willing to undertake risky investment. The insights of this model can also be applied to the banking industry. Following losses, bank management may be less willing to undertake risky projects (ie., commercial lending). Instead, they may prefer to undertake safer projects (ie., housing lending) to reduce the variance of future expected returns.

One way of capturing the premium on corporate loan rates is to compare the corporate loan rate with the banks' marginal cost of funds. Following Lowe and Rohling (1992), we use the large business indicator rate on variable rate loans as a

measure of the lending rate and the certificate of deposit rate as a measure of the banks' marginal cost of funds. The interest rate margin shown in Graph 5 is the difference between these two rates.

Graph 5: The Difference Between the Prime and the CD Rate

This difference between the prime rate and the CD rate is now higher than at any time since deregulation. In January 1993, the margin was approximately 4.5 per cent, considerably higher than it was in the 1982-83 recession, when the margin reached its maximum of 3.3 per cent. This increase in margins has coincided with falling asset prices, which is consistent with models presented in Section 2. While there is little evidence to support the hypothesis that reductions in bank share capital have reduced loan supply, the occurrence of increasing margins and falling asset prices suggests some support for the view that reduced collateralization has made external funding relatively more expensive. If this hypothesis is correct, a sustained recovery, associated with some recovery in asset prices, should see the margin narrow.

Blundell-Wignall and Gizycki (1992) point out that the interest rate margin is an imperfect measure of the risk premium, as it may be affected by other factors. Among these factors is the increase in the cost of traditional deposits following deregulation. As the average cost of deposits has increased, the margin between lending rates and the wholesale deposit rate might be expected to widen if banks are
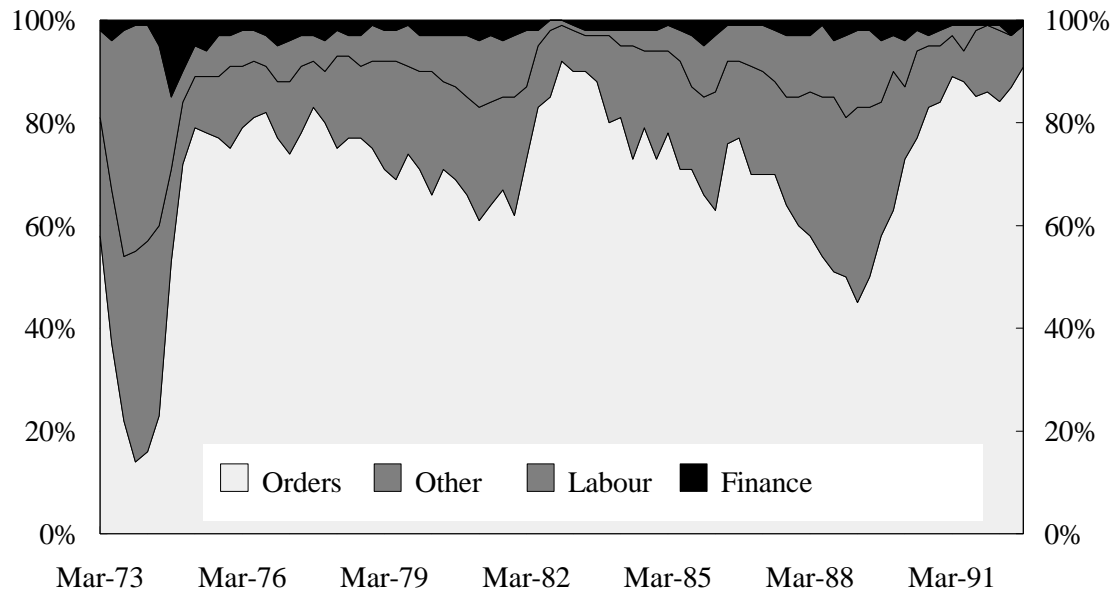
to maintain the same return on capital. In addition, changes in interest margins are affected by changes in operating costs and fee income. Thus, to gain further insight into shifts of the supply of credit curve, we now turn to alternative measures.

4.2.3 The Difficulty of Obtaining Finance

Blundell-Wignall and Gizycki (1992) examine the determinants of credit supply in the Australian economy. They estimate a simultaneous supply and demand model for Australian business credit and find that the market for credit was roughly in equilibrium since 1984. They conclude that there is no evidence of credit rationing, but do find that corporate net worth is an important factor in the supply function.

Another measure of supply can be obtained from the Australian Confederation of Commerce and Industry and Westpac Banking Corporation (ACCI-Westpac) survey of manufacturers. The quarterly survey asks respondents two pertinent questions related to credit supply. The first is "What single factor is most limiting your ability to increase production?". The second question asks, "Do you find it is now harder, easier, or the same as it was three months ago to get finance?" Although these questions do not measure credit supply directly, they provide some information about conditions under which firms feel credit is being made available. The response to the first question is shown in Graph 6. It shows the percentage of firms that report that finance is the single most important factor limiting current production. It also shows the percentage that answer labour, orders and "other".

The "availability of finance" is dominated by other factors as the principal factor constraining current production. Generally, orders are the most important single constraint on current production. The maximum share of firms that report that finance is the major limiting factor is only 15 per cent. This was during the "credit crunch" period of 1974. On average, over the 1980s, only 2.2 per cent of firms said that finance was the major factor limiting production.
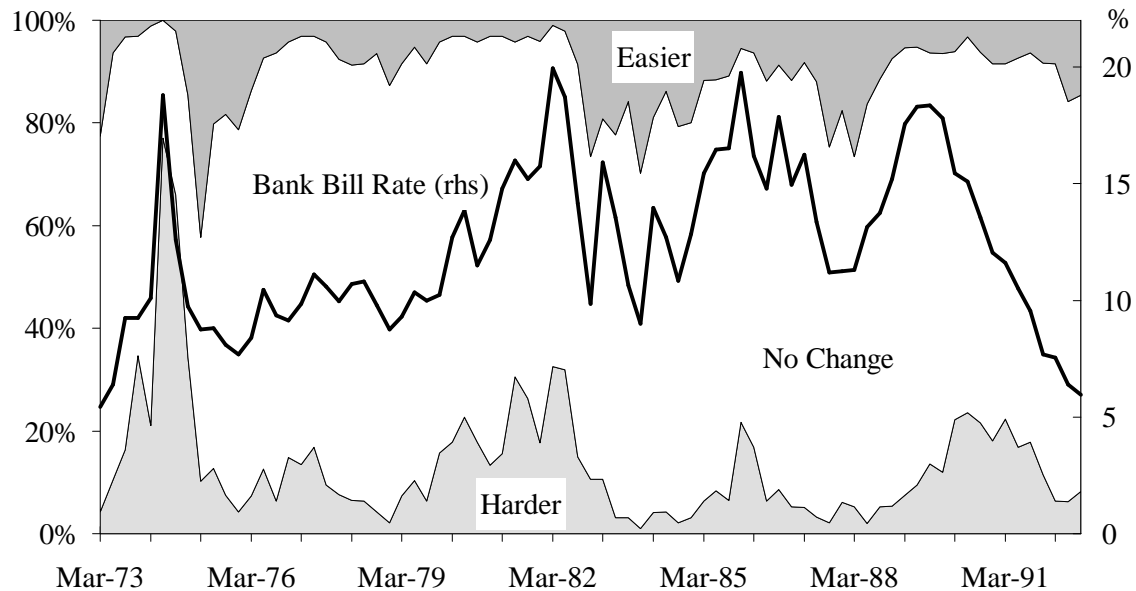
Graph 6: Single Factor Limiting Production

However, any supply constraints might be expected to impact more severely on investment than working capital used to finance current production. The response to the second question is more general, and may reflect the availability of credit for a number of purposes. Before examining this question, it is important to note that the survey has a number of limitations. First, the respondents are only manufacturing firms, and thus capture only part of total investment. Second, there is no way of measuring the *degree* of difficulty of obtaining finance: the question only asks whether it is easier or more difficult, not how much easier or more difficult. Third, since large firms receive the same weight as small firms, the response to this question can potentially be dominated by a large number of small firms. However, even with these shortcomings, the question does address potential supply side constraints on obtaining finance.

The share of managers that responded that finance was easier to obtain than it was three months ago, as well as the share that reported "no change" and "harder" is shown in Graph 7, along with the 90 day bank bill rate.

In the majority of quarters, most firms reported no change in their ability to obtain finance. However, there were periods when a significant number of managers found finance more difficult to obtain. For example, during the credit squeeze of 1974, the share of managers that found credit harder to obtain rose to 74 per cent while no managers found credit easier to obtain. This contrasts with managers' reactions to

the first question, where only 15 per cent of respondents felt finance was the single most important factor limiting production during this period.
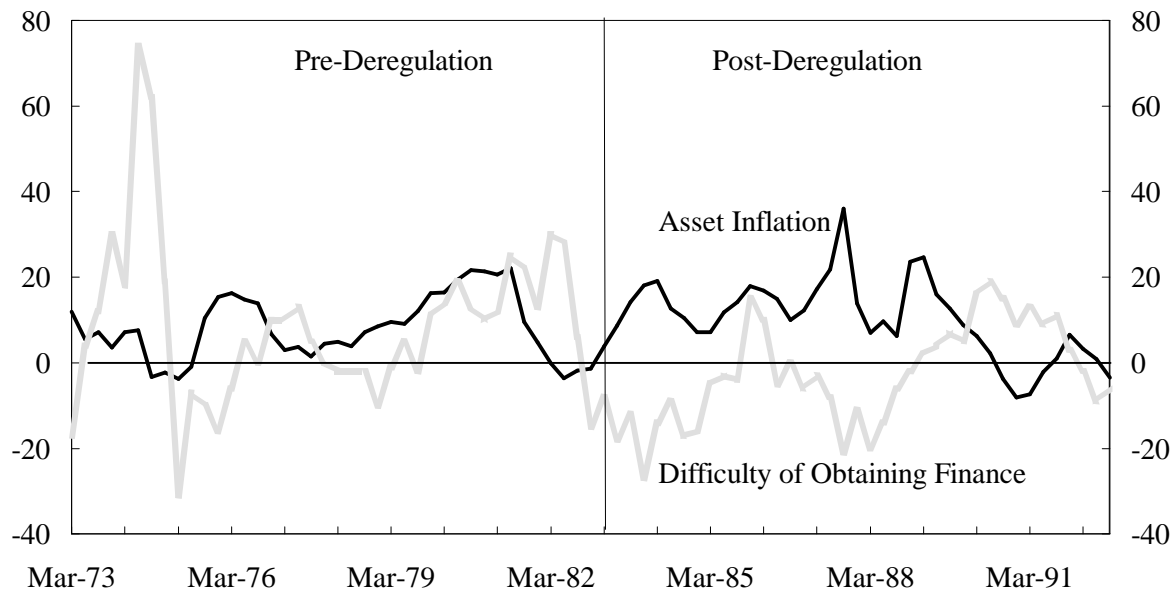
Graph 7: Difficulty of Obtaining Finance

The relationship between the perceived availability of finance and the 90 day bank bill rate is quite close through the 1980s. Periods of perceived increasing credit tightness correspond closely to periods of high interest rates. However, as noted by the Bureau of Industry Economics (1991), the relationship between interest rates and the availability of finance deteriorates towards the end of the 1980s. As interest rates were reduced, business did not report any easing of credit supply conditions. One factor that may explain this deterioration in the relationship is the increased importance of corporate net worth in credit supply decisions. The increased indebtedness of firms at the outset of the recession may have led to an inward shift of the supply curve as the economy began to slow and asset prices fell.

Macfarlane (1990) notes that banks were willing suppliers of credit during the years when asset prices were rising, as this was proving profitable for both borrowers and lenders. Conversely, in periods when asset prices are falling, the willingness of lenders to supply funds may be reduced. In order to gauge the importance of asset prices on credit supply, we utilise the aggregate asset price index constructed by Blundell-Wignall, Lowe and Tarditi (1992). The index is a weighted average of three asset price indices; the share market index, the housing price index and commercial property price index. Further details can be found in the Data

Appendix. Annual percentage changes in the index are graphed along with the ACCI/Westpac survey "net balance" measure of changes in the availability of credit. The net balance is the difference between the share of respondents that report credit is harder to obtain and the share that reports that credit is easier to obtain.

The relationship between the availability of finance and asset prices might be expected to have changed following financial deregulation. Before deregulation, it is likely that credit constraints were induced by regulations rather than considerations of corporate net worth. Financial deregulation occurred gradually over a number of years, and there is no natural break between the regulated period and the deregulated period. We arbitrarily choose the first quarter of 1983 to denote the change in regime. Graph 8 shows the relationship between asset price inflation and the difficulty in obtaining finance.[23]

Graph 8: The Difficulty of Obtaining Finance and Asset Price Inflation

Prior to financial deregulation, the relationship between the difficulty of obtaining finance and asset inflation was positive for the most part; that is, stronger asset growth was associated with tighter credit conditions. At first glance this seems to be counter-intuitive, as agency cost theory suggests strong asset growth should be associated with easier credit. One explanation is that asset price inflation often

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[23] A positive value indicates finance is more difficult to obtain, negative values indicate finance is easier to obtain.
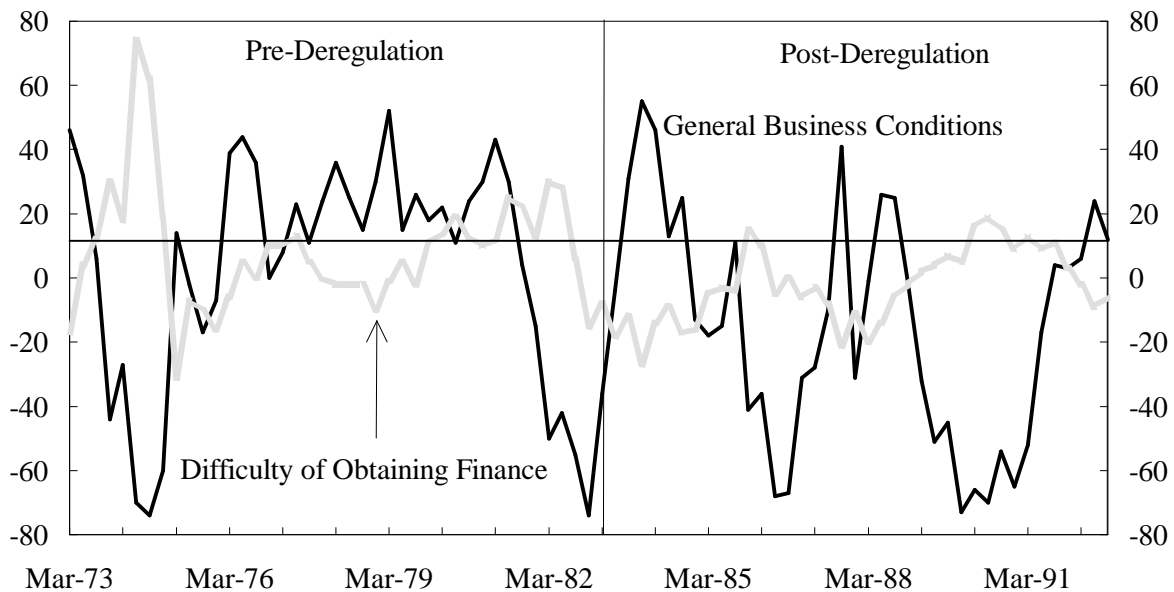
occurs in periods of economic expansion. Prior to deregulation, when the economy was growing strongly, the demand for credit rose. However, because of disequilibrium credit rationing, credit became more difficult to obtain. Regulations during this time put quantitative restrictions on banks' lending. Explicit ceilings on the growth of trading bank credit were imposed as were controls on interest rates that could be paid and received. In this environment, banks became "passive allocators of the funds which depositors put with them" (Grenville 1990). When asset prices increased, the queue of borrowers simply lengthened.

A strikingly different relationship is evident after deregulation. Asset price inflation now appears to be negatively correlated with the difficulty of obtaining funds. As agency theory predicts, periods of strong asset growth are associated with easier credit conditions, as financial institutions perceive investment projects to be backed by a higher value of actual and expected collateral.

The above suggests that interest rates and asset price inflation influence managers' perceptions of the difficulty of obtaining finance. However, agency cost theory predicts another potential influence on the supply of credit. As described in Section 2.2, Gertler (1992) points out that in a multi-period setting, the availability of finance is also determined by expected general business conditions. This is because expected business conditions affect the expected ability of the firm to service its debt. If conditions are expected to be good, agency costs will be lower than otherwise, and banks will be willing to extend finance on more favourable terms. The ACCI-Westpac survey attempts to measure the expected economic outlook with the question, "Do you consider that the general business situation in Australia will improve, remain the same, or deteriorate during the next six months?"

Graph 9 shows the relationship between the availability of finance and expected general business conditions, also measured as the net balance (the proportion of respondents that believe conditions will improve less that proportion that believe they will deteriorate).

Graph 9: The Difficulty of Obtaining Finance and
Expected General Business Conditions

In the period before deregulation, the relationship was for the most part positive; the one notable exception was the 1974 credit crunch. As for the relationship of asset inflation and the availability of finance, this positive relationship suggests that credit rationing became more severe as economic conditions improved. In the period since deregulation, the relationship changes; the difficulty of obtaining finance is now negatively related to expected general business conditions. It seems clear that when the economy is expected to improve, finance is perceived to be easier to obtain. This provides some support for the theoretical prediction of the multi-period contract model of agency costs developed by Gertler (1992).

4.2.4   Estimation Results

The above graphs suggest that interest rates, asset price inflation and general business conditions each have an impact on the difficulty of obtaining finance. However, as these three variables are likely to be correlated, it is not possible to determine their individual independent effects from the graphs. Perhaps the important factor determining both the availability of finance and asset price inflation is expected business conditions, since an expected improvement in business conditions might make finance easier to obtain and increase asset prices. In an attempt to isolate the independent effect of each of the variables, we use regression techniques. Specifically, we regress the difficulty of obtaining finance on the prime

interest rate, asset price inflation and expected general business conditions. This allows us to determine whether an increase in asset prices, independent of a change in expected business conditions, has an impact on the availability of obtaining finance.

The ACCI-Westpac survey is conducted over a three week period ending in the middle of the last month of the quarter. For example, the survey for the June quarter is conducted over the last week in May and the first two weeks of June. Given this timing, it is not possible to include, as a regressor, asset price inflation through the end of June, as this variable may be endogenous. It is possible that easier credit conditions over the months of April and May may themselves result in an increase in asset prices. To remove any possibility of endogeneity, we use the rate of asset price inflation lagged one quarter.

To gauge the robustness of the effect of collateral on the availability of finance, we also examine whether corporate net worth affects firms' perception of the availability of finance. Our proxy for net worth is the ratio of the market capitalisation of listed equities on the Australian Stock Exchange to business credit. *A priori*, agency theory predicts that the higher the firm's equity to debt ratio, the easier the availability of credit. The regression using this variable is estimated over a smaller sample since business credit is available only from December 1976. This variable is also lagged one quarter. The regressions are also conducted separately using the nominal and real prime rate. The regression results for the pre-deregulation period are reported in Table 1 and those for the deregulated period in Table 2.

The results of the regressions in Table 1 confirm a number of observations that were suggested in the previous section. First, in all four regressions, the "collateral" variable (asset inflation or the equity to debt ratio) is positively and significantly related to the difficulty in obtaining finance. As suggested by Graph 8, prior to deregulation, increases in asset prices were associated with an increase in the perceived difficulty of obtaining finance. This again suggests that disequilibrium credit rationing was taking place. As asset prices increased, or corporate net worth improved, the queue of borrowers became longer and finance became more difficult to obtain.

Second, the prime rate is positively related to the difficulty in obtaining finance in all regressions, whether measured in nominal or real terms. However, it is statistically significant only in the regression using the real prime rate and asset price inflation. Third, there is no significant relationship between the expectation of improvements in general business conditions and the difficulty of obtaining finance.

The results for the post-deregulation period are reported in Table 2.

Table 1: Pre-Deregulation
The Difficulty of Obtaining Finance

Sample	75:1-83:1	76:4-83:1	75:1-83:1	76:4-83:1
Constant	-15.47	-43.95	4.87	-33.54
	(-0.74)	(-2.77)	(2.01)	(-3.47)
Real Asset Inflation (Lagged)	1.11	...	0.90	...
	(4.01)		(3.04)	
Equity / Debt Ratio (Lagged)	...	32.95	...	36.87
		(3.44)		(4.13)
Prime Rate	1.84	1.32	...	...
	(1.20)	(0.99)		
Real Prime Rate	...	...	1.36	0.76
			(2.09)	(0.59)
General Business Conditions (6 months)	-0.07	-0.02	-0.08	-0.07
	(-0.49)	(-0.14)	(-0.70)	(-0.70)
$\overline{R}^2$	0.44	0.36	0.50	0.35
Number of Observations	33	26	33	26

Note: t statistics are reported in parentheses below coefficient estimates. The standard errors have been calculated using the Newey-West estimator using 3 lags.

Table 2: Post-Deregulation
The Difficulty of Obtaining Finance

Sample	83:2-92:3				84:2-92:3			
Constant	-17.27	2.52	-30.03	-20.61	-33.11	13.04	-34.17	-15.07
	(-1.54)	(0.16)	(-9.22)	(-2.64)	(-3.03)	(0.92)	(-5.57)	(-0.76)
Real Asset Inflation (Lagged)	-0.48	...	-0.45	...	-0.70	...	-0.44	...
	(-3.21)		(-4.01)		(-4.37)		(-2.63)	
Equity / Debt Ratio (Lagged)	...	-10.40	...	-6.45	...	-20.14	...	-7.49
		(-2.37)		(-1.80)		(-4.33)		(-1.18)
Prime Rate	0.85	0.29	...	...	2.36	1.73	...	...
	(1.19)	(0.39)			(4.23)	(2.93)		
Real Prime Rate	...	...	3.08	2.74	...	...	4.20	3.75
			(7.25)	(4.50)			(7.76)	(3.48)
General Business Conditions (6 months)	-0.19	-0.21	-0.09	-0.10	...	...	...	...
	(-4.14)	(-4.08)	(-3.09)	(-2.67)				
Forecast of Non-farm GDP (5 years)	...	...	...	...	-1.05	-5.69	-1.68	-4.12
					(-0.52)	(-2.61)	(-0.84)	(-1.81)
$\overline{R}^2$	0.59	0.55	0.79	0.72	0.47	0.49	0.70	0.62
Number of Observations	38	38	38	38	34	34	34	34

Note: t statistics are reported in parentheses below coefficient estimates. The standard errors have been calculated using the Newey-West estimator using 3 lags.

The first four columns of Table 2 report the results estimated over the post-deregulation period using the same model specifications as for the pre-deregulation period. In all four regressions, the difficulty of obtaining finance is negatively and significantly related to the various measures of corporate net worth.[24] This implies that increases in asset prices, or increases in equity, generate perceptions that credit is easier to obtain. Note that this is the case even when we control for expectations concerning business conditions. It suggests that if asset prices increase for reasons not associated with the business cycle, finance becomes easier to obtain.   This provides some support for the models that link collateral to the conditions under which finance is made available.

As in the period before deregulation, the coefficients on the nominal and real prime rates are positive, indicating that as interest rates rise, business perceives that finance is more difficult to obtain.   However, the coefficient is not statistically significantly different from zero in the regressions using the nominal prime rate, but is significant in the regressions using the real prime rate.

In contrast to the pre-deregulation period, the coefficient on the expectation of improvements in general business conditions is negative and statistically different from zero. As business conditions improve, firms find that finance is easier to obtain.

One potential problem with using the ACCI-Westpac "expected general business conditions" variable in the above regression equations, is that the forecasts relate only to the next 6 months. If managers believe that the economy is going to improve in the medium term, this may not be reflected in the forecasts for the next two quarters but may be reflected in asset prices; in particular share prices. In an attempt to control for longer-run expectations, we use the quarterly SYNTEC five year forecast of non-farm GDP. Since the five year forecasts are only available from June 1984, the sample period is restricted to 1984:2 to 1992:3. The regression results are reported in the last four columns of Table 2.

Overall, the fit of the regressions deteriorates somewhat when the 6 month forecasts are replaced by the 5 year forecasts. For example, in the regression that uses asset inflation as the collateral variable and the nominal prime rate, the $\overline{R}^2$ falls from 0.59

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[24] The coefficient on the equity to debt ratio in the regression using the real prime rate is significant only at the 7 per cent level.

to 0.47. This suggests that expected business conditions over the next six months have a more important role in influencing credit supply conditions than expected longer-run business conditions. Despite this, all variables retain their signs shown in the regressions using the 6 month forecasts. The nominal prime rate, while insignificant in the previous regressions, becomes significantly different from zero when the five year forecasts are used as the measure of expected general business conditions. Nevertheless, the fit of the equations using the real prime rate is considerably better than those using the nominal prime rate.

The "collateral" variable is negatively related to the difficulty of obtaining finance in all four regression equations using the 5 year forecasts, although the equity to debt ratio is insignificantly different from zero in the equation that includes the real prime rate. Even after controlling for improvements in general business conditions over the next five years, the difficulty of obtaining finance is negatively related to the net worth of firms. An increase in asset inflation or an increase in the equity to debt ratio, leads managers to report a decline in the difficulty of obtaining finance one quarter later. As in the previous regressions using the 6 month forecast, this result provides some support for the agency cost models that link collateral to the conditions under which finance is made available.

The coefficient on the five year forecast of economic conditions is negative in all three regressions, suggesting that as longer-run economic conditions are expected to improve, managers report finance is less difficult to obtain. However, this coefficient is only statistically significant in the regressions using the equity to debt ratio as the "collateral variable".

5.   CONCLUSIONS

Interest and theory concerning the effect of balance sheets on firm behaviour and economic activity appear to have come full circle. Explanations about the severity of 1930s Great Depression stressed the importance of high debt levels in causing corporate failures. This was followed by the revolution in corporate finance theory in the 1950s and 1960s that suggested that financial structure was irrelevant for investment, firm value and firm decision making. More recently, developments in the theory of incomplete information have again brought financial structure forward as an important consideration in determining the length and depth of the business

cycle. Along with significant changes in the financial structure of corporations, the more recent theoretical implications of corporate balance sheets for the business cycle have attracted the attention of policy makers.

In this paper we have reviewed the principal models and mechanisms through which the structure of balance sheets can affect the cycle. Three broad mechanisms were identified. The first of these relies on the fact that the costs imposed by asymmetric information between borrowers and lenders increase as the collateral of the firm falls. Changes in these costs get translated into changes in the cost of external finance. As a result, a deterioration in firm equity leads to a higher cost of intermediated finance. The second mechanism focuses on bank balance sheets. An adverse demand shock that causes an increase in loan defaults is likely to reduce the collateral of financial intermediaries. This loss of collateral may cause portfolio re-allocations by the intermediaries and, as a result, fewer funds are made available at any given interest rate.

The third mechanism focuses on management incentives. We argue that adverse shocks that reduce the collateral of a firm may induce the management of the firm to act in a more risk averse manner. Risk aversion manifests itself in management passing up projects that it would have undertaken had the firm had greater collateral. The model developed in the paper predicts that after an adverse shock, management may wish to undergo a period of "reliquefication", not only to reduce the premium on intermediated external funds, but to reduce the probability of subsequent bankruptcy and loss of their job.

In practice, empirical researchers have had difficulties in demonstrating definitive links between the nature of the business cycle and balance sheets. They have had considerably more success in showing that the structure of a firm's balance sheet can affect its decisions. Nevertheless, these micro-results, coupled with significant increases in leverage, followed by falling asset prices, has increased concern about the implications for the cycle of the corporate sector's financial health.

In the second half of the paper, we attempted to examine some of these concerns for Australia. Over the 1980s corporate indebtedness increased significantly. This was followed by some deflation of asset prices. As Mills, Morling and Tease (1993b) document, these developments have been followed by a fairly widespread attempt by the corporate sector to recapitalise. While we present no direct evidence in

support of the view that this recapitalisation (or reliquefication) is an attempt to reduce the cost of external funds and reduce bankruptcy probabilities, it is certainly consistent with the predictions of the literature discussed in the paper.

The paper does, however, present direct evidence concerning the relationship among the perceived difficulty of obtaining finance, asset price inflation and corporate indebtedness. Our results show that even after controlling for expected general business conditions, both asset price inflation and an increase in corporate equity lead to firms perceiving that finance is easier to obtain. This supports the view that increases in collateral play an important role in the availability of finance. A collapse of asset prices, or an aggregate demand shock that reduces firm equity, will result in tighter credit conditions independent of the deterioration in the general business outlook. A potentially important caveat to these econometric results is a lack of degrees of freedom. While from a purely statistical point of view there are sufficient degrees of freedom, the data only covers one real business cycle. Certainly, over that cycle the evidence suggests that there was a link between corporate collateral and the conditions under which finance was extended. It is, however, difficult to assess the role that this link will play in future business cycles.

Nevertheless, the results point to a potential problem. Asset price inflation sometimes occurs for reasons unrelated to fundamentals. The collateral generated through this inflation may be used by firms to obtain additional funding. Inevitably, a correction in asset prices occurs, and this correction may well be associated with an adverse macroeconomic shock. When the correction occurs, the "false" collateral disappears and firms are left with considerably higher debts and experience an increase in financial fragility. The result is a business cycle with a considerably greater amplitude than would have been the case had the corporate sector not increased its leverage.

Finally, while there is little evidence of equilibrium credit rationing, there is some evidence that the supply and demand for funds are a function of the financial structure of both the corporate and financial sectors. It is probable that the increase in leverage of the 1980s, and the more recent asset price falls, have caused a leftward shift in both the supply and demand curves for intermediated external funding.

DATA APPENDIX

The ratio of corporate debt to total assets is obtained from two sources: the first source is from Lowe and Shuetrim (1992), who use Company Review Service (CRS) data, and the second source is from the Australian Stock Exchange (STATEX) database. Both series are measured at book value. Lowe and Shuetrim sample a constant group of 66 public and proprietary companies operating in Australia from 1973 to 1990, when the collection was discontinued. The STATEX database samples a constant group of 80 public companies from 1982.

The asset price index is from Blundell-Wignall, Lowe and Tarditi (1992). Three separate asset price indices (based in 1984-85) are used to construct the aggregate asset price index. The commercial property price index is constructed from internal sources using Sydney CBD prices. The housing price index is from the Real Estate Institute of Australia, and the All Ordinaries share price index is taken from Table F.5, RBA *Bulletin*. The aggregate index gives shares a 29 per cent weight, housing a 59 per cent weight and commercial property a 12 per cent weight. The asset price index excluding housing gives shares a 70.7 per cent weight and commercial property a 29.3 per cent weight. This is based on the proportions to the total less housing.

The consumer price index, indexed 1984/85=100, is adjusted for the inclusion of Medicare and Medibank.

Individual state corporate liquidation figures are obtained from the Corporate Affairs commission to 1988. Thereafter, they are obtained from the Corporate Relations Unit. The state liquidation figures are divided by state population, and then indexed to 1985=100. A combined series is obtained by progressively including other state figures when they became available, and combined by weighting each state by its share of the population as of July 1985. NSW liquidations are available from 1967, SA and WA are available from 1973, Victoria from 1981. Other states and territories are not available.

Bank debt, defined as total liabilities, and bank assets are from Table B.1 RBA *Bulletin,* from 1975 to 1992. Prior to 1975, trading bank and savings bank total assets are the sum of the individual components, RBA *Bulletin*, various issues.

Total deposits proxy total liabilities, and both trading bank and saving bank series are then scaled up to 1975 figures.

The prime rate is the minimum of the range of large business indicator rates, Table F.3, RBA *Bulletin*. Prior to December 1978, the predominant rate is used. The 90 day bank bill rate is from Table F.1, RBA *Bulletin*. Monthly averages of both rates are used.

Responses to the survey questions are from the Australian Confederation of Commerce and Industry and Westpac Banking Corporation Survey of Industrial Trends, various issues.

Market capitalisation of listed equities is from the RBA Bulletin, Table F.5. Business credit is from the RBA *Bulletin*, Table D.3, and is available from December quarter 1976. Business credit has been adjusted for breaks in the series, and quarterly figures are obtained by averaging the monthly figures.

The annual averages of the five year forecasts of non-farm GDP are obtained from SYNTEC "Five Year Forecasts", published by SYNTEC Economic Services, various issues.

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