Balance sheet adjustment by UK companies

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Corporate debt levels in the United Kingdom are currently at an historically high level in relation to the market value of corporate capital. Empirical evidence discussed in this article suggests that this is unlikely to be an equilibrium position and that companies will continue to act so as to strengthen their balance sheets. Much of this adjustment is likely to occur through financial channels, such as reduced dividend payments or increased new equity issues, but it could also occur through more restrained capital investment. Illustrative simulations presented in the article suggest that adjustment tends to be gradual and that it may take several years for balance sheets to return to equilibrium.

Introduction

The balance sheet position of non-financial companies goes through phases of strength and weakness. At present, the amount of corporate debt is at an historically high level in relation to the market value of the capital that ultimately provides the means by which the debt will be serviced. Past patterns would suggest that high gearing levels will not persist without companies acting to bring down their indebtedness. But the speed and means of any such adjustment could have important implications for financial and monetary stability.

From a financial stability perspective, the current high levels of debt, if allowed to persist, might leave companies vulnerable to shocks that could affect their ability to service their debts in the future and so risk their continued existence. But, at the other extreme, if the repayment of debt required a further sharp cut-back in corporate spending, that would affect the outlook for the economy as a whole, including the inflation target. Assessing the likelihood of these and other possible outcomes requires an understanding of what lies behind the build-up of corporate debt and how companies typically adjust their balance sheets.

This article addresses these issues by asking what determines the level of gearing that companies appear to aim for over time and whether this is likely to have changed recently. This provides some guidance as to whether gearing is currently excessive and in need of adjustment. It then discusses some recent evidence on how companies adjust their balance sheets in practice and assesses the likely path of adjustment. The overall conclusion is that balance sheet adjustment is likely to be gradual and achieved mainly by companies retaining more profits than by further sharp cut-backs in capital spending.

Equilibrium gearing and the need for adjustment

The amount borrowed by companies reflects their financing decisions over a number of years.(1) While they may have limited scope to make changes from year to year, in the long run companies have considerable discretion over their borrowing. Most companies that wished to reduce their indebtedness could do so over a period of years by retaining more profits at the cost of dividend distribution and by issuing new equity from time to time. Once debt began to fall, interest payments would also be reduced, making further debt reductions easier to achieve for a given level of profits. But debt may be more difficult to reduce for companies whose interest payments are large in relation to their profits and if market conditions make it difficult to raise equity finance. Failure to adjust debt quickly then makes the process of adjustment more difficult as extra interest payments add to the burden. Once insolvency is threatened, the cost of debt to the company is more than the simple interest charge and would include the

(1) Unless otherwise stated, we assume that company decisions are made by the management on behalf of the shareholders. In practice, decisions about how much debt to hold are usually taken by management subject to the approval of shareholders, who have the power to remove management if they are not happy with its choices.

direct costs of re-organisation in the event of insolvency as well as the indirect costs that arise when companies get into financial difficulty (Barclay *et al* (1995), Myers (2001)).

What are the attractions of debt that tempt companies to borrow to the extent that they risk financial distress? For some companies, it may be that debt appears cheaper than equity in that the interest rate on debt is usually less than the cost of equity finance. They might try to exploit this difference by substituting debt for equity. But the famous Modigliani-Miller theorem (Modigliani and Miller (1958)) shows that this strategy will not generally be successful. Substituting debt for equity in this way makes the remaining equity even riskier and the resulting higher cost of equity finance offsets exactly any benefit of having more debt. In essence, a company is valued on the basis of the income stream it generates and there is no obvious reason why it should be valued differently when it repackages that income stream into separate debt and equity streams unless this changes the value of the income stream itself.

The importance of the Modigliani-Miller theorem, as Miller himself emphasised, is that 'showing what does not matter helps to draw attention to what does'. The academic literature draws attention to four main factors that make debt an attractive method of business finance.(1) First, debt is encouraged by differences in the rate at which income is taxed at the corporate and shareholder level, partly due to the tax deductibility of corporate interest payments (Auerbach (2002)). This is discussed further below. Second, asymmetries in information between the managers of companies and outside investors also tend to encourage debt issuance. Such information asymmetries are more acute for equity investors whose returns depend on the performance of the company than for debt providers whose returns are usually clearly specified in advance. The possibility that managers might take advantage of their better knowledge about the true state of their business when selling equity might cause investors to wonder whether it is as valuable as is claimed. This leads investors to undervalue new equity issues, enhancing the attractiveness of debt relative to equity finance (Myers and Majluf (1984)). Third, in the absence of debt companies would generate larger amounts of cash that could be disposed of at the discretion of managers. Shareholders might worry that managers would use this to consume 'perks' rather than to benefit shareholders. As such, one of the advantages of debt is that it limits the free cash flow available to managers (Jensen and Meckling (1976)). Fourth, debt is preferred by entrepreneurs who do not wish their control rights to be diluted, as would be the case with equity issues (Hart (2001)).

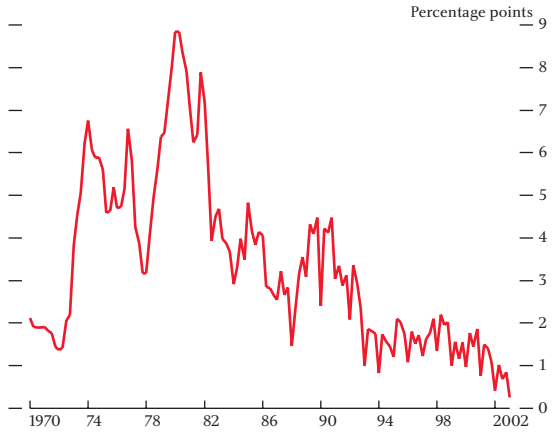
If there were only benefits to holding debt and no costs relative to equity this would imply all firms hold 100% debt and no equity. However, increasing debt also raises the expected costs of financial distress. These depend on both the probability that a firm will suffer distress, and the magnitude of the costs should the firm suffer distress. Under the so-called 'trade-off' model of gearing, firms are assumed to trade off the advantages of debt against the expected costs of financial distress (Barclay *et al* (1995), Myers (2001)). As firms borrow more, the benefits of debt increase, but the expected costs of distress also rise as the probability of bankruptcy rises. The 'trade-off' model implies that there will be an equilibrium level of debt where any further increase in indebtedness will raise the expected costs of distress by more than the additional benefit of that extra borrowing. Not all theories in the literature are consistent with the concept of an equilibrium level of debt. For example, the 'pecking order' theory of Myers and Majluf (1984) asserts that borrowing is always preferred to new equity issues because all other costs and benefits of holding debt are second order in relation to the effects of asymmetric information on the terms and conditions of equity finance. Therefore, 'changes in debt ratios are driven by the need for external funds, not by any attempt to reach an optimal capital structure' (Shyam-Sunder and Myers (1999)).

These different theories all throw some light on the factors that lie behind the balance sheet choices of companies, but it is not clear how they can be combined into a single model that offers an empirical explanation of changes in gearing over time. Indeed, Myers (2001) has suggested that 'there is no universal theory of the debt-equity choice, and no reason to expect one'. It is even less likely then that a complete empirical model of gearing could be constructed. Partly this reflects the difficulty in quantifying the effects of factors like asymmetric information and the need to discipline managers. Despite much progress theoretically, Rajan and Zingales (1995) claim that 'very little is known about the empirical relevance of the different theories'.

(1) A recent survey of this literature is Myers (2001).

Our approach is to develop an empirical model of corporate debt choices based on what is readily quantifiable. We make use of the 'trade-off' theory of gearing described above in which firms trade off the tax benefits of debt against the expected costs of financial distress to determine their equilibrium level of gearing. Quantifying the tax benefits is not straightforward. Our estimate is an update of the measure derived by Young (1996); and is shown in Chart 1.(1) This measure of the tax advantage of holding debt depends on corporate and personal tax rates and is weighted by the proportion of equity held by individuals and pension funds, taking into account the different tax treatment of these two groups. It shows the overall financial benefit to shareholders of an additional unit of corporate debt, taking into account the other financial opportunities open to shareholders. A positive value for the tax gains to gearing implies that it is more efficient for the firm to borrow than for the shareholders to borrow and supply equity capital to the firm.

Chart 1
Tax gains to corporate gearing



The intuition behind our measure of the tax advantage of debt is as follows. The tax deductibility of interest payments implies that by borrowing more a firm will increase its interest payments and reduce its tax liability. A firm can use the proceeds of its additional borrowing to pay out a higher dividend in the current period at the expense of a lower dividend in the next period. Shareholders can then invest the additional proceeds of the higher initial dividend and earn a return on their investment. The benefits to shareholders may be eroded once personal taxes are taken into account; this depends on the relative tax rates on dividend income and capital gains. The rate of capital gains tax is important because the value of equity will fall when more debt is issued, leading to a reduction in shareholders' capital gains tax liability. Thus, corporate borrowing to fund higher dividend payments would not be welcomed by investors with high marginal rates of income tax; they would prefer to accumulate money within the company and be taxed at a lower capital gains rate. By contrast, tax-exempt investors such as pension funds would always tend to benefit from the tax saving of corporate borrowing. This suggests that, other things being equal, the tax gains to corporate gearing will be higher the lower is the personal tax rate relative to the capital gains tax rate. They will also be higher, the higher is the corporation tax rate, since then there will tend to be more company tax payments against which interest can be deducted.

Our measure shows that on tax grounds there have been positive benefits to corporate borrowing throughout the period from 1970. The size of the gain has varied substantially over time as corporate and personal tax rates have changed. There were significant increases in the tax benefits of gearing over the 1970s as corporation tax rates rose. There was then a fall throughout the 1980s as corporation tax rates fell. Since the mid-1990s the estimated tax gains to gearing have been at an historically low level.

Equilibrium gearing

We now develop an empirical model of gearing that follows and updates the approach of Young (1996). A dynamic model of corporate net debt is estimated as a function of the market value of the assets of the corporate sector and the tax gains to corporate gearing. The model is limited to the extent that it focuses solely on the tax benefits of gearing; other less quantifiable factors that are likely to be important in the gearing decision, such as the costs of financial distress, are assumed not to vary over time. The wide historical variation in corporate and personal tax rates over time in the United Kingdom makes it possible to assess whether changes in the tax benefits to corporate debt have

(1) The expression measuring the tax gains to gearing is:

$$GAINL_t = \sum_m w_{mt}\left(\frac{(1-\tau_t^m)}{(1-g_t^m)}r_t - (1-\tau_t)r_t - \frac{g_t^m}{(1-g_t^m)}\pi_t^* d_t\right)$$

where t indicates the time period, m denotes individuals or pension funds, r is the interest rate, w_m is the weight of investor m, τ^m is the income tax rate paid by m, g^m is the capital gains rate paid by m, τ is the corporate tax rate, π^* is expected inflation and d takes the value of one when the capital gains system is indexed and is zero otherwise. If this expression is multiplied by 400 we can interpret the tax gains to gearing in terms of the annualised interest rate at which firms can borrow (as in Chart 1).

caused companies to vary their desired level of gearing. But in practice, as noted above, those decisions will also be influenced by movements in the less quantifiable factors affecting the risks and costs of insolvency.

Our analysis defines PNFC capital gearing as net debt in relation to the market value of the corporate sector. Net debt is defined as the sum of all outstanding bank borrowing and securities other than shares minus currency and deposits. We measure debt in relation to the market valuation of the PNFC sector since the market value should be equal to the expected present value of all future cash flows from which the debt must eventually be repaid. This is likely to be a good measure of the borrowing capacity of PNFCs. Gearing can also be measured in relation to capital at replacement cost, but we focus on the market value measure since it is quicker to respond to market developments and because the capital stock is notoriously difficult to measure.

In the estimated model (see appendix), actual gearing adjusts gradually to a long-run solution that is determined by the tax gains to gearing, which are statistically significant at the 1% level. The long-run solution to the equation is interpreted as equilibrium gearing. Chart 2 compares the actual level of capital gearing at market value with the long-run equilibrium level implied by the estimated model. Chart 3 shows the difference between these two series; our measure of balance sheet disequilibrium. As might be expected, the equilibrium level of capital gearing at market value implied by our model has remained more stable than the actual level, reflecting the greater frequency of shocks to the latter. Most of the variation in equilibrium gearing occurred during the 1970s and early 1980s with the peak being reached in 1980. The long-run equilibrium level of gearing fell for most of the 1980s, as corporate tax rates were reduced from the high levels of the 1970s. There has been little variation in the 1990s.

Disequilibrium gearing

The actual level of gearing can move away from equilibrium in response to the changing circumstances that companies face, including the arrival of investment or merger and acquisition opportunities as well as changes in cash flow. Companies may allow borrowing to rise in the short term in each case with the intention of reducing it in the longer term as, for example, investment opportunities pay off. There may also be unexpected shifts in the market valuation of companies that move the actual level of gearing away from

Chart 2
Actual level and implied equilibrium of PNFC capital gearing at market value

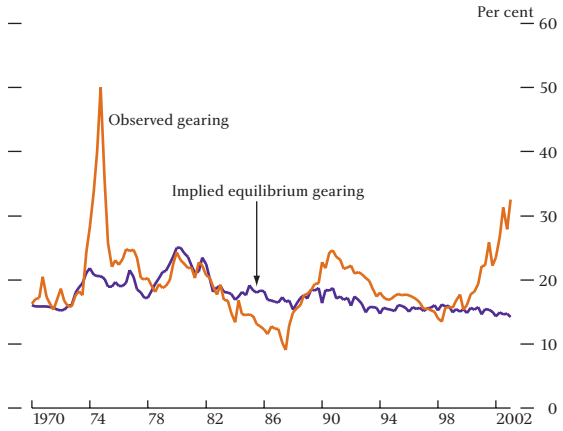


Chart 3
Difference between actual gearing and implied equilibrium gearing

equilibrium. For example, an unexpected decline in the stock market would reduce market values and increase gearing.

There have been four episodes in the past 30 years when observed gearing has diverged persistently from our estimate of equilibrium gearing. The first of these was in 1974 when severe stock market weakness reduced the market value of companies relative to their net debt and thus raised measured gearing to substantially above the equilibrium implied by our model. This disequilibrium was largely eliminated by a market recovery. The second period of disequilibrium was in the mid-1980s when corporate gearing fell below the estimated equilibrium level. This was more than reversed by a sharp increase in corporate debt in the late 1980s and early 1990s. According to these estimates, companies spent most of the 1990s gradually adjusting their balance sheets back to equilibrium. The fourth period of disequilibrium is the current one, where the increase in indebtedness

since 1998, combined with falls in the market valuation of the corporate sector since the beginning of 2000, has resulted in capital gearing at market value increasing to a level well above the equilibrium implied by our model.

Possible means of adjustment and evidence

The historical pattern of the emergence and then correction of balance sheet disequilibria suggests that companies are now likely to be considering ways of reducing their indebtedness. In some cases the urgency of the need for adjustment may be more apparent to lenders, market commentators and rating agencies than to highly indebted companies themselves. Such external pressure, for example a ratings downgrade and higher borrowing costs, may force companies to take corrective measures. In other cases, companies may adjust balance sheets pre-emptively and voluntarily before external pressures build up. There are a number of possible channels through which balance sheet adjustment may take place; these include both real and financial changes. Real adjustment can take the form of a run-down in inventories, cut-backs in capital expenditure or reductions in labour input.(1) Financial adjustment involves changes in dividend policy, increases in equity finance or a refinancing of debt.

Whether real or financial adjustment is undertaken, it is unlikely to be costless. Cut-backs in capital spending may have adverse implications for the long-run profitability of firms, if they mean that productivity-enhancing investment projects are not undertaken. As for changes in dividend policy, Lintner (1956) argued that firms seek to avoid reducing dividends wherever possible. In the presence of asymmetric information any reduction in dividends may act as a negative signal to the markets that future cash flow may be lower than expected; and consequently there could be an adverse impact on the share price of that firm.

Recent research at the Bank has investigated the impact of financial factors on company-level capital investment, dividend payments and new share issues. Benito and Young (2001) explore the reasons for an increase in the proportion of companies omitting or cutting their dividend payments in recent years.(2) They find that high gearing is one of the key factors explaining the increased propensity for companies to omit or cut their dividend. Benito and Young (2002) discover an interesting contrast in the effect of different financial indicators on firm behaviour. In particular, they find that dividend payments and the propensity to issue new shares are affected by the stock of debt relative to the value of capital, whereas capital investment is more affected by a flow measure of financial pressure, the ratio of interest payments to profits. This suggests that companies would mainly tend to adjust their balance sheets by financial means except when there is substantial pressure on their cash flow, when they also cut back their capital spending.

Similar relationships can be estimated at the aggregate level. In the appendix, we list aggregate relationships linking dividend payments, net equity finance and capital investment to balance sheet disequilibrium. We find statistically significant effects of disequilibrium gearing on dividend payments and new share issues, with a much weaker effect on capital investment, consistent with the company-level evidence. The quantitative impact of disequilibrium gearing is estimated to be substantial. The long-run response of dividends and net equity finance to an increase in the gap between actual gearing and the equilibrium level implied by our model is larger and quicker than the response of investment. The slower response of investment is consistent with the notion that real adjustment only takes place once constraints on financial variables start to bind.

Likely path of adjustment

If there is a need for adjustment, a key question is how quickly balance sheets will return to equilibrium. Even though companies may respond quickly to the disequilibrium, the process of balance sheet adjustment is likely to be protracted simply because the flows of dividends and investment are small in relation to the stock of debt. To illustrate this point, in 2003 Q1 the flow of PNFCs' dividends accounted for 4.7% of their net debt. The corresponding figure for business investment was 8%. This suggests that sustained adjustment to these flows over a period of time is required to eliminate large gaps between the actual level of gearing and the equilibrium implied by our model.

The speed of adjustment is also affected by the underlying macroeconomic and financial background. If

(1) Using company-level data, Nickell and Nicolitsas (1999) find evidence of significant effects of financial pressure on employment, wage growth and productivity.
(2) See *Bank of England Financial Stability Review*, June 2003, page 52, for a discussion of this trend.

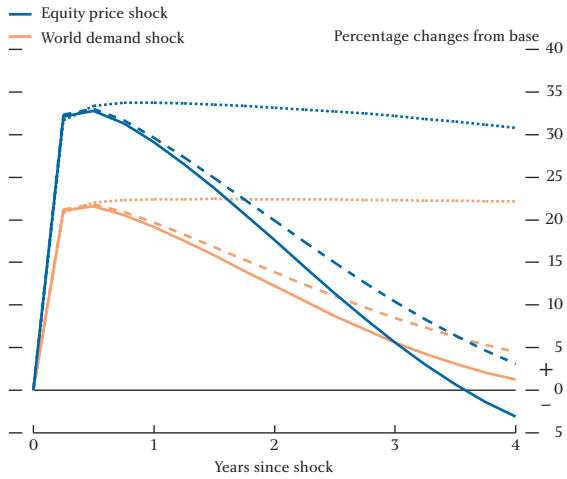
the performance of the economy were to deteriorate, this would probably be associated with a weakening in corporate profitability and so the funds companies have available for debt repayment would be reduced. Further, the level of interest rates also has an impact on the path of adjustment with lower interest rates facilitating more debt repayment given that what is saved in interest payments can be used to repay debt.

To illustrate how capital gearing might move back towards equilibrium and how the adjustment path is affected by macroeconomic conditions, we consider simulations of two shocks that move capital gearing away from its equilibrium position. In the first case the shock represents slower growth in world activity and trade, which adversely affects domestic demand (UK GDP declines by approximately 2% relative to base after three years), while in the second case there is an immediate unanticipated 35% fall in both world and UK equity prices. The shock to equity prices can be thought of as a downward revision to mistaken expectations about corporate earnings. This second simulation was used as part of the International Monetary Fund's recent Financial Sector Assessment Programme (see Hoggarth and Whitley (2003)). Interest rates are assumed to remain constant in response to the shocks.

The simulations use a medium-term macroeconometric model (MTMM, as described in Bank of England (2000)) and three versions of the corporate sector extension described in Benito, Whitley and Young (2001). The first version assumes no active balance sheet adjustment in the corporate sector. The second version replaces the dividends, net equity finance and investment equations with estimated equations that include balance sheet disequilibrium terms. The third version allows adjustment to take place via dividends and net equity finance but not investment. These new equations are documented in the appendix. The simulations are only illustrative. They indicate what might happen in response to a certain set of circumstances and not necessarily what would happen.

Chart 4 shows the response of capital gearing at market value to the shocks in the version of the model with all forms of balance sheet adjustment (solid line), with adjustment through dividends and net equity finance only (broken line) and without balance sheet adjustment

Chart 4
The response of capital gearing at market value(a)



(a) Solid line represents the response using the equations that incorporate full balance sheet adjustment; the broken line does not allow investment to adjust. The dotted line shows the response using equations without the balance sheet adjustment term.

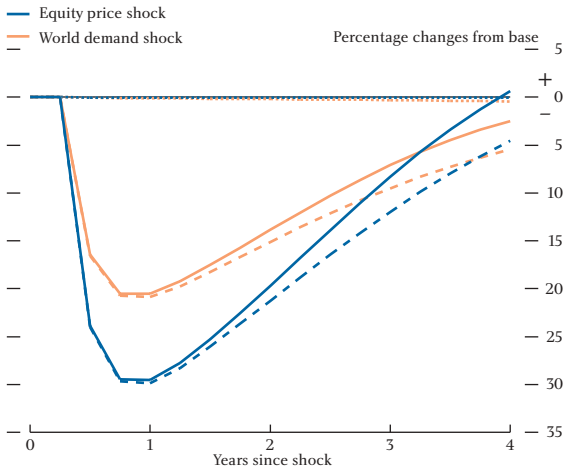
(dotted line). Both shocks lead initially to a sharp rise in gearing as lower growth and equity prices reduce corporate profitability (thereby necessitating more debt finance in the short run) and the market value of companies. In the model without balance sheet adjustment, the level of gearing shows no tendency to move back to base following the shocks. By contrast, once adjustment is allowed for, changes in dividends, investment and new issues reduce the level of borrowing relative to what it would otherwise have been so that corporate gearing returns towards its initial level.(1) If adjustment is not allowed to take place through investment, it still occurs but at a slower rate. The adjustment is relatively protracted in that it takes nearly five years for capital gearing to return to base, illustrating the kind of timescale involved in the process of adjustment.

The adjustment of capital gearing towards base is less rapid in the case of the world demand shock than in the case of the equity price shock. This is because profitability is more adversely affected by the former shock, so that less profit is available to repay debt compared with the equity price shock.(2) This illustrates how the performance of the wider economy is important in determining the timescale of adjustment.

Charts 5 and 6 show that the response of dividends and business investment to the shocks is negative, but the size of the negative effect is much larger when

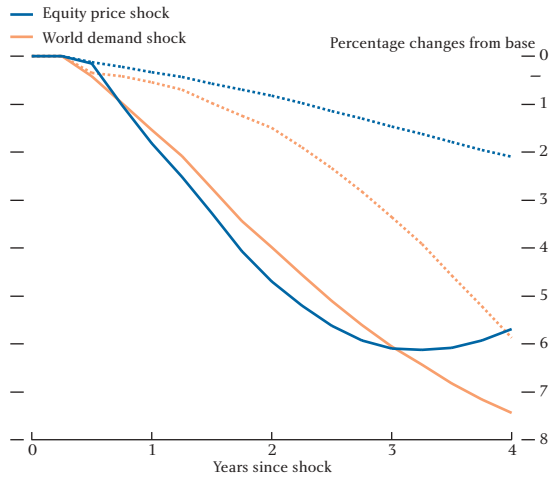
(1) Raising new equity finance may be more difficult following an equity price shock. Our equation for equity finance does have a role for equity prices which should at least partially account for this.
(2) GDP is one of the main determinants of corporate sector profitability in our macroeconometric model. The greater adverse effect on GDP in the demand shock explains why profitability is reduced by more in the former simulation.

Chart 5
Response of dividends to shocks(a)



(a) Solid line represents the response using the equations that incorporate balance sheet adjustment; the broken line does not allow investment to adjust. The dotted line shows the response using equations without the balance sheet adjustment term.

Chart 6
Response of investment to shocks(a)



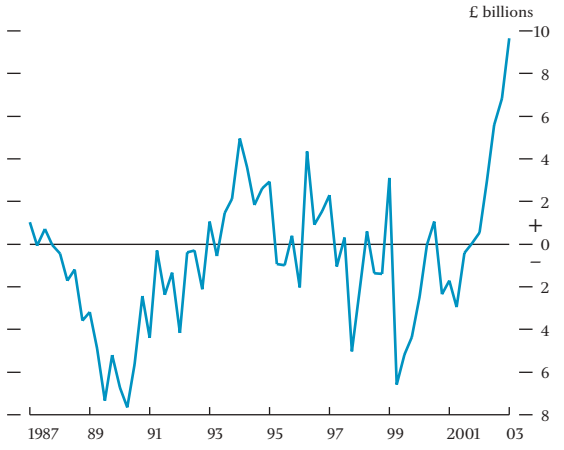
(a) Solid line represents the response using the equations that incorporate balance sheet adjustment. The dotted line shows the response using equations without the balance sheet adjustment term.

companies are also attempting to adjust their balance sheets. The response of dividends to both shocks is relatively rapid, with a peak change within a year and then a return towards base as the balance sheet disequilibrium is gradually eliminated. The dynamic response of capital investment is much slower reflecting the long lags in the estimated equation. In both percentage and absolute terms, the adjustment of dividends is larger than the adjustment to investment. The smaller and slower adjustment of investment relative to dividends reflects the likelihood that investment will only be adjusted once the financial variables such as dividends face binding constraints.(1) If no adjustment occurs through investment, the cuts in dividends are larger and slightly more equity finance is raised to compensate for this.

Conclusion

This article suggests that companies are not indifferent to the state of their balance sheets. Our estimates suggest that actual gearing is substantially above its long-run equilibrium and at an historically high level. This suggests the likelihood of substantial balance sheet adjustment over the coming few years. Of course, it is possible that our estimates of equilibrium gearing overstate the amount of adjustment which needs to take place. They reflect only the tax benefits of gearing and assume that the risks of financial distress are constant over time. It may be the case that the greater macroeconomic stability of recent years has raised the equilibrium level of gearing by reducing the probability of firms suffering financial distress. Against this, there is some evidence that adjustment is already under way in the recent weakness of company dividend payments and the robust move of private non-financial companies into financial surplus (see Chart 7).

Chart 7
PNFC sector financial balance



To the extent that our estimates of equilibrium gearing are approximately correct, the adjustment process is likely to be protracted in the absence of a substantial stock market recovery. This is borne out by the fact that the move by PNFCs into large financial surplus has been accompanied by only a modest reduction in debt levels. Nevertheless, gearing levels are bound to fall over time if a financial surplus can be sustained. In this sense, it may be that the adjustment that has been made already to expenditure and financing flows is sufficient to have initiated a gradual move of corporate gearing back to equilibrium.

(1) Approximately 40% of quoted PNFCs did not pay a dividend in 2002 which shows that constraints can bind for firms.

Appendix: equation listing

The simulations shown are based on the extension to the Bank's medium-term macroeconometric model (MTMM) described in Benito, Whitley and Young (2001). This appendix documents the changes to the model used from that reported in Benito, Whitley and Young (2001), particularly with respect to the incorporation of a balance sheet adjustment mechanism.

The simulations with balance sheet adjustment use all of the equations listed below. The simulations which do not allow adjustment to take place through investment use the main MTMM investment equation (as reported in Bank of England (2000)) in place of equation **(9)**. The simulations with no balance sheet adjustment use re-estimates of the dividends and net equity finance equations (equations **(5)** and **(8)** respectively) without the balance sheet disequilibrium variable (CGEAREX), and the MTMM business investment equation in place of equation **(9)**.

Tax gains to gearing (GAINL)

$$GAINL_t = GAINL_{t-1} \qquad \textbf{(1)}$$

Desired PNFC capital gearing at market value (DSCGEAR)

$$\ln(DSCGEAR_t) = 2.63 + 26.51\,GAINL_t \qquad \textbf{(2)}$$

where *GAINL* (equation **(1)**) is the tax gains to gearing.

Excess PNFC capital gearing at market value (CGEAREX)

$$CGEAREX_t = CGEAR_t - DSCGEAR_t \qquad \textbf{(3)}$$

where *CGEAR* is actual PNFC capital gearing at market value and *DSCGEAR* is desired PNFC capital gearing at market value.

Liquid asset holdings of PNFCs (SLIQ)

$$SLIQ_t = SLIQ_{t-1} + 3819.1 + 0.533\Delta YPNFCO_t \qquad \textbf{(4)}$$

where *YPNFCO* is gross disposable income of PNFCs.

Dividends paid by PNFCs (DIVPNFCO)

$$\ln(DIVPNFCO_t) = -4.008 + 0.292\ln(DIVPNFCO_{t-1}) + 0.894\ln(SLIQ_{t-1}) - 0.219\,DTAX_t - 0.618\,DTAX2_{t+1} + 1.412\,DTAX2_t - 0.774\,DTAX2_{t-1} - 0.028\,CGEAREX_{t-1} \qquad \textbf{(5)}$$

where *SLIQ* is liquid assets held by PNFCs (equation **(4)**), *DTAX* is a dummy variable that takes the value of one from 1997 Q3 onwards, *DTAX*2 is a dummy variable that takes the value of one from 1999 Q2 onwards, and *CGEAREX* is excess PNFC capital gearing at market value (equation **(3)**).

Net distributions of PNFCs other than dividends (ODIS)

$$ODIS_t = -0.09(GOSPNFCO_t - INTPNFCO_t) \qquad \textbf{(6)}$$

where *GOSPNFCO* is gross operating surplus of PNFCs, *INTPNFCO* is net interest payments of PNFCs.

Net distributions of PNFCs (DISPNFCO)

$$DISPNFCO_t = DIVPNFCO_t + ODIS_t \quad \textbf{(7)}$$

where *DIVPNFCO* is dividends paid by PNFCs (equation **(5)**), and *ODIS* is net distributions of PNFCs other than dividends (equation **(6)**).

Net equity finance of PNFCs (NEF)

$$NEF_t = MV_t^*(0.016 + 0.212(NEF_{t-1}/MV_{t-1}) - 0.0009GOSPNFCY_{t-1} + 0.018\Delta\ln(EQP_{t-1}) + 0.0004CGEAREX_{t-1}) \quad \textbf{(8)}$$

where *MV* is the market value of the PNFC sector, *GOSPNFCY* is gross operating surplus as percentage of GDP, *EQP* is equity prices and *CGEAREX* is excess PNFC capital gearing at market value (equation **(3)**).

Business investment (IBUS)

$$\ln(IBUS_t) = \ln(IBUS_{t-1}) - 0.002 + 0.193\Delta\ln(IBUS_{t-3}) + 0.269\Delta\ln(IBUS_{t-4}) + 1.523\Delta\ln(GDP_{t-1}) - 0.094[\ln(IBUS_{t-1}) - \ln(KNH_{t-2}) - \Delta\ln(GDP_{t-1}) + 5.263 - 7.796(\ln(BETA_{t-1}) - \Delta\ln(GDP_{t-1})) + 0.580(\ln(KNH_{t-2}) - \ln(GDP_{t-2}) + \ln(WACC_{t-1}))] - 0.0008CGEAREX_{t-2} \quad \textbf{(9)}$$

where *GDP* is GDP, *KNH* is the non-residential capital stock, *BETA* is one minus the business sector depreciation rate, *WACC* is the weighted average cost of debt and equity, and *CGEAREX* is excess PNFC capital gearing at market value (equation **(3)**).

Definition of the tax gains from gearing (GAINL)

Tax gains from gearing are defined as:

$$GAINL_t = \sum_m w_{mt}\left(\frac{(1-\tau_t^m)}{(1-g_t^m)}r_t - (1-\tau_t)r_t - \frac{g_t^m}{(1-g_t^m)}\pi_t^* d_t\right)$$

where m denotes individuals or pension funds, r is the interest rate, w_m is the weight of investor m, τ^m is the income tax rate paid by m, g^m is the capital gains rate paid by m, τ is the corporate tax rate, π^* is expected inflation and d takes the value of one when the capital gains system is indexed and is zero otherwise.

Macro variables used in calculating the tax gains from gearing

Variable	Data source
One-period nominal interest rate (r)	0.0025*(ONS code AMIH)
Price index (P)	After 1987: ONS code CHMK Before 1987: ONS codes (ABJQ + HAYE) / (ABJR + HAYO) Series spliced using ratio between the two in 1987 Q1
Expected one-period inflation rate (π^*)	$\pi^*_t = (P_{t+1}/P_t) - 1$
Equity held by m as a proportion of total holdings of individuals and pension funds (w_m)	Calculated using data from ONS Share Ownership reports and from Young (1992)

Tax rates used in calculating tax gains from gearing

Variable	Group	Data source
Corporation tax rate (τ)	–	Main rate of corporation tax
Personal income tax rate (τ^m)	Individuals	Basic rate of income tax
Personal income tax rate (τ^m)	Pension funds	Zero
Personal capital gains tax rate (g^m)	Individuals	Capital gains tax rate
Personal capital gains tax rate (g^m)	Pension funds	Zero
Indexation of capital gains tax dummy (d)	–	Is 1 from 1982 Q2 onwards

Definitions of other non-MTMM variables used

Variable	Data source
PNFC capital gearing at market value (CGEAR)	From 1990 Q1 ONS codes: $\frac{\text{NLBE + NLBI + NKZA – NKJZ}}{\text{– NYOT}}$ Spliced at 1990 Q1 with data from Young (1993)
Excess PNFC capital gearing at market value (CGEAREX)	Defined by equation **(3)**
Net distributions of PNFCs (DISPNFCO)	Defined by equation **(7)**
Dividends paid by PNFCs (DIVPNFCO)	ONS code: RVFT
Desired PNFC capital gearing at market value (DSCGEAR)	Defined by equation **(2)**
Gross operating surplus of PNFCs (GOSPNFCO)	ONS code: CAER
Gross operating surplus of PNFCs as a percentage of GDP (GOSPNFCY)	ONS codes: 100*(CAER/CGCB)
Net interest payments of PNFCs (INTPOUT)	ONS code: ROCG – ROAY
Market value of PNFCs (MV)	ONS code: – NYOT
Net equity finance of PNFCs (NEF)	ONS codes: NEVL – NESH
Net distributions of PNFCs other than dividends (ODIS)	ONS codes: CAER – RPBO – ROCG + ROAY – RVFT
Liquid asset holdings of PNFCs (SLIQ)	ONS code: NKJZ
Gross disposable income of PNFCs (YPNFCO)	ONS code: RPKZ

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