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Corporate debt and financial balance sheet adjustment: a comparison of the United States, the United Kingdom, France and Germany

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Abstract

The level of UK corporate debt directly affects financial stability in the United Kingdom because a significant amount of the exposure of the UK financial system is to UK corporates. Our paper provides a comparison of the determinants of corporate debt in the United States, the United Kingdom, France and Germany. The comparison serves to benchmark our findings about the determinants of UK corporate debt. In addition, the UK financial sector is significantly exposed to the corporate sectors in the United States, Germany and France. The model assesses the contribution of investment, acquisitions, cash flows and market-to-book values to the determination of debt, and also the tendency of debt to revert to its optimum level. Debt was found to be positively related to the financing needs of the firm, and the optimum level of debt to be negatively related to the market-to-book ratio. This casts some light on the procyclicality of debt. It suggests the growth of debt in a boom is explained by the increase in financing needs; and this more than offsets the fall in the optimum level of debt associated with the rising market-to-book value. In addition, we found that it may be expected that, in a boom, German and US debt will rise above the optimum level by more than in the United Kingdom and France – responding to the higher levels of investment and acquisitions. And in a slowdown, when adjusting back down to the optimum, German and US debt tends to be paid down more slowly.

Key words: Capital structure, corporate debt, balance sheet, gearing, panel data.

JEL classification: C23, G32.

Summary

Two types of variables may help to explain corporate debt: those suggested by the 'trade-off' theory – the balance between the benefits of obtaining debt capital, such as the tax deductibility of interest payments on debt capital, and the costs of having too much debt, such as the likelihood of financial distress – and those suggested by the 'pecking order' theory – the preference for internal finance, such as retained profit, over debt capital and external equity financing. The 'trade-off' variables are those that determine the optimal level of debt – when the marginal benefit of obtaining debt capital equals to its marginal cost, variables such as the ratio of the market value to the book value (market-to-book ratio or value) of the firm. The pecking order variables are those that determine the immediate external financing needs of the firm. These variables include investment, acquisitions and cash flows.

This paper provides a comparison of the determinants of corporate debt in the United States, the United Kingdom, France and Germany. It uses a model which assesses the contribution of investment, acquisitions, cash flows and market-to-book values to the determination of debt, and also the tendency of debt to revert to its appropriate or optimum level. We obtain data from COMPUSTAT (Global) – a database of company accounts. While there is considerable previous work on the determinants of corporate debt, cross-country comparisons are relatively scarce. And few use the latest modelling techniques that are available.

The analysis in this paper takes a panel data approach – a method of examining data jointly for separate individuals and for a specific subject. We use autoregressive distributed lag equations – these equations take into account past behaviour of the regressed variable. First we estimated the equations for the total data set – the data set which included companies from all the countries. Debt was found to have a positive effect on the financing needs of the firm while the optimum level of debt had a negative effect on the market-to-book ratio. This casts some light on the procyclicality of debt. It suggests the growth of debt in a boom is explained by the increase in financing needs; and this more than offsets the fall in the optimum level of debt associated with the rising market-to-book value. The equations describing equity issuance reveal that financing needs are partly met by equity issuance, and thus are inconsistent with a pure version of the pecking order theory – which proposes that immediate financing needs are met only by debt issuance. Finally, debt has a significant negative coefficient in the investment equation, indicating that at higher levels of debt, external finance becomes more difficult to obtain.

Second, equations were estimated for the individual countries, and the following three facts emerged. First, German investment appears to be the most dependent upon external finance – both debt and equity – and French investment the least dependent. Second, the sensitivity of debt to investment and acquisitions is greatest in Germany and the United States. Third, Germany and the United States tend to be slower to pay down their debt. So, in a boom, German and US debt might tend to rise above the optimum level by more than in the United Kingdom and France, responding to the higher

levels of investment and acquisitions. And in a slowdown, when adjusting back down to the optimum, German and US debt tends to be paid down more slowly.

There are a number of different ways in which debt may be affected by the market-to-book ratio. For example, one version of the trade-off theory posits an effect due to the relationship between default risk and debt; another version an effect due to the relationship between ‘growth opportunities’ and debt. To isolate the effect on default risk on debt, we supplement our US data set with time series of Standard and Poor’s credit ratings. A new version of the model for debt is then estimated, replacing the market-to-book ratio with credit ratings. We find that ratings downgrades do tend to reduce debt, although the strength of this relationship (the coefficient) is significant only at the 10% level.

1 Introduction

The level of UK corporate debt directly affects financial stability in the United Kingdom because a significant amount of the exposure of the UK financial system is to UK corporates. If UK corporate debt is rising, thereby increasing the exposure of the UK financial system, it is important to understand what is driving the growth. After all, debt growth is not necessarily bad news from the point of view of financial stability. For example, suppose that debt rises as a consequence of a fall in perceived default probabilities. This might be regarded as good news; the rise in debt simply indicates a more robust corporate sector. A comparison to the determinants of debt in other countries helps to benchmark any conclusions that are drawn about the determinants of UK corporate debt. For example, suppose it is found that the determinants of UK corporate debt are such that debt will tend to grow in a boom. Comparisons with other major industrial countries allow us then to draw conclusions about whether that debt growth can be expected to be relatively rapid and if so why. Moreover, the UK financial sector is significantly exposed to the corporate sectors in the United States, Germany and France.

The past decade has seen much econometric testing of two of the main rival theories of debt: the ‘trade-off’ theory and the ‘pecking order’ theory. Two important recent empirical papers on debt, Shyam-Sunder and Myers (1999) and Fama and French (2002), estimate a model that embeds both theories. The conclusion which emerges is that the two theories each contribute significantly to the explanation of observed debt levels. Thus the ‘combination pecking order/trade-off’ model – the model estimated in these two papers – is the equation which we estimate in our paper.

The ‘combination’ model of debt is dynamic. This gives rise to estimation problems when applied to panel data with firm-specific effects. We use the generalised methods of moments estimator (GMM-SYS) – presented in Arellano and Bover (1995) and Blundell and Bond (1998) – to solve these problems. Debt equations are estimated for the United States, the United Kingdom, France and Germany. In contrast, Shyam-Sunder and Myers (1999) and Fama and French (2002) only estimate the model for the United States and do not use GMM-SYS.

The combination model allows us to compare, across the four countries, the movement of corporate debt over the cycle – in particular, the procyclicality of debt ratios. It quantifies the extent to which the movement in debt is driven by immediate financing needs and the extent to which it is driven by adjustment towards an optimum debt ratio. For example, in a boom, the higher growth in investment and acquisitions tends to give rise to greater financing needs. The combination model provides an answer to questions such as the following. In a boom, which countries will see their debt ratios growing faster in response to the growth in investment and acquisitions? In a slowdown, which countries reduce their debt more rapidly back down towards the optimum?

While there is a considerable empirical literature on the determinants of corporate debt, cross-country comparisons are relatively scarce. Perhaps the best known recent paper on this topic is that of Rajan and Zingales (1995), which estimates debt equations for the G7 countries. However they estimate a static trade-off model, which does not provide the insights of the 'combination pecking order/trade-off model' on the movement of debt over time. Antoniou, Guney and Paudyal (2002) estimate debt equations for the UK, France and Germany. In common with our paper, they estimate a dynamic model using GMM-SYS. However, their model is simply a dynamic trade-off model, and thus, crucially, does not include pecking order variables that determine immediate financing needs – in particular, expenditure on investment and acquisitions. Nevertheless, their results are a useful point of comparison – particularly given that they use a different data set with longer time series.(1) Moreover, we also estimate equations for equity issuance and investment. (The equity issuance equation is estimated both using GMM-SYS and also using a limited dependent variable panel data model.) We find (as do Benito and Young (2002), in their paper on the balance sheet adjustment of UK firms) that richer insights into the role of debt arise from estimating equations of other balance sheet variables.

The following three facts emerge from our cross-country comparison. First, German investment appears to be the most dependent upon external finance – both debt and equity – while French investment is the least dependent. We argue that this may reflect different tax incentives in the two countries. Second, the sensitivity of debt to investment and acquisitions is greatest in Germany and the United States respectively. Third, German and US companies tend to be slower to pay down their debt: this is manifested both by the coefficients on the lagged debt term in the debt equations, and also by the responsiveness of debt to cash flows. Given these findings, it might be expected that the movement of debt over the cycle is different in Germany and the United States than in France and the United Kingdom. It might be expected that in a boom, *ceteris paribus*, German and US debt tends to rise above the optimum level by more than in the United Kingdom and France – responding to the higher levels of investment and acquisitions. And in a slowdown, when adjusting back down to the optimum, German and US debt tends to be paid down more slowly.

Section 2 of the paper describes the 'combination model' of debt, and Section 3 specifies how it is empirically implemented using the GMM-SYS estimator. Section 4 presents the specifications of the equity issuance and investment equations, and also discusses the econometric techniques used to estimate them. Section 5 describes the data. The full set of results is provided in Appendix II, and Section 6 discusses the most important results. Finally, in Section 7, a variation of the debt equation is estimated for the United States – which includes a credit rating variable. This allows us to assess more directly the effect on debt of the perceived probability of default. Section 8 concludes.

2 The 'trade-off' versus the 'pecking order' theories of debt

The term 'trade-off theory' refers not so much to a specific theory as a set of theories that take the following form. A trade-off theory specifies a cost of taking on debt, and also a benefit. This

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(1) We use COMPUSTAT (Global) while Antoniou *et al* used Datastream data which has a longer time series for European firms.

determines an optimal level of debt – where the marginal cost of debt is equal to the marginal benefit. For example, a well-known version of the trade-off theory specifies as a cost of debt the expected costs of bankruptcy. *Ceteris paribus*, as debt increases, the probability of bankruptcy rises, increasing the expected costs of bankruptcy. And the benefits of debt, according to this version of the theory, are the tax advantages – arising from the fact that interest payments are tax-deductible. The optimal level of debt is where the marginal bankruptcy costs are equal to the marginal tax benefits.

The pecking order theory, in contrast, does not put forward an optimal debt level. It provides, instead, a theory of *changes* in debt. The pecking order model is set out in Myers and Majluf (1984). At its core is asymmetric information: managers are assumed to know more about firm quality than outsiders, and to act in the interest of old shareholders. Outsiders will then regard a decision not to issue equity as a signal that the quality of the firm is high. Thus a decision to issue equity signals that the quality of the firm is low. This reduces the price that outsiders are prepared to pay for equity. In the pure version of the pecking order theory, equity is never issued – because of the negative signal provided by the decision to issue. Thus the gap between the firm's expenditure and free cash must be financed by debt. Let us refer to this gap as 'the financing gap'. So, in summary, the prediction of the pecking order theory is that the change in debt is equal to the financing gap.

Shyam-Sunder and Myers (1999) and Fama and French (2002) are, arguably, two of the most important papers that test the trade-off against the pecking order theory. However they only test the theories for US companies. The starting point for both papers is that the two theories can be embedded in a model of the following form:

$$D_{it} - D_{i,t-1} = \alpha G_{it} + \beta (D_{it}^* - D_{i,t-1}) \qquad \textbf{(1)}$$

where D_{it} is the debt for firm *i* at time *t*, G_{it} the financing gap and D_{it}* is the optimal debt level implied by the trade-off theory. The pecking order theory, in its pure form, predicts that the change in debt equals the financing gap: that is, it predicts that $a = 1$ and $b = 0$. What is predicted by the trade-off theory? Suppose first that costs of adjusting towards the optimum are negligible. Then the trade-off theory predicts that the change in debt is simply equal to the difference between the actual debt level and the optimal debt level implied by the theory. That is, it predicts that $a = 0$ and $b = 1$. If adjustment costs are significant, however, the prediction is that the change in debt will be some fraction of the difference between actual and optimal debt levels. So the prediction is that $a = 0$ and $0 < b < 1$, where the coefficient *b* can be interpreted as the speed of adjustment.

Equation **(1)** is not specified in terms of observables and there are various ways of estimating it. Shyam-Sunder and Myers (1999) and Fama and French (2002) use rather different methods – which are discussed further below – but it is worth mentioning their broad conclusions now. Each paper finds significant coefficients on the financing gap variables and significant reversion towards the optimum. The conclusion would seem to be, then, that both the trade-off theory and the pecking order theory contribute towards the explanation of observed debt levels.[(2)] Thus in our paper, we use the combined trade-off/pecking order model expressed by equation **(1)**.

3 Empirical implementation of the combined trade-off/pecking order model of debt

The empirical implementation of equation **(1)** requires measures of the financing gap and the optimal level of debt. The main components of the financing gap are directly observable from firm financial statements: cash flow C_{it} ; investment expenditure I_{it} ; and acquisitions A_{it} . The more challenging question is how to obtain a measure of the optimal level of debt.

Shyam-Sunder and Myers (1999) use as a measure of the optimal debt the average of debt ratios over the period of the sample – that is, the target debt level is assumed to be a constant.[(3)] There is an obvious problem with this, however. Given that the financing gap tends to be procyclical, coefficients will be biased if optimal debt moves systematically with the cycle. For example, suppose that optimal debt is procyclical. Then the coefficients will be biased in favour of the pecking order theory: in a boom, the entire increase in debt will be attributed to the rise in the financing gap, when in fact, *ex hypothesis*, part of the increase is explained by the procyclicality of optimal debt.

Fama and French (2002) obtain a measure of optimal debt from a separate equation, before estimating equation **(1)**. That is, they use a two-step procedure:[(4)] first, debt is regressed on the variables suggested by various trade-off theories; second, the fitted values from this equation are used in equation **(1)** as a measure of the optimal debt. This is not subject to the criticism that might be directed at Shyam-Sunder and Myers (1999).

Our approach is more similar to that of Fama and French (2002) than Shyam-Sunder and Myers (1999). However, instead of estimating a separate equation for optimal debt, we include directly in equation **(1)** a variable suggested by trade-off theories – as proxy for optimal debt.[(5)]

What are the variables suggested by the trade-off theories? Many have been proposed. Perhaps the main ones are the market-to-book value of the firm, firm size, tax rates and sector dummies. But

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(2) Fama and French (2002) certainly draw this conclusion, arguing that each theory has difficulty with some of the data. Shyam-Sunder and Myers (1999), despite finding that debt reverts towards the optimum, present two reasons for thinking that, nonetheless, the pecking order theory is more important. First, they estimate two additional versions of equation **(1)**: a version where the financing gap term is left out – that is, the pure trade-off equation; and a version where the reversion term is left out – that is, a pure pecking order equation. They find that the pure pecking order equation has a much higher R^2 than the pure trade-off equation. Second, they argue that the apparent mean reversion might be spurious, resulting from serial correlation in the financial deficits.
(3) As an alternative proxy they use rolling averages, but do not report the results.
(4) Fama and French (2002) use a partial adjustment model, which is a restricted form of a simple autoregressive distributed lag model (ARDL). ARDL models are a workhorse in the academic literature. See for example Hendry (1995).
(5) This places the model in an equilibrium error correction (ECM) context. The dynamic model includes an error correction term. Engle and Granger (1987) and Hendry (1995) discuss this framework.

given the estimation technique that we use, many of these variables are unsuitable. We present arguments below for using GMM-SYS to estimate the debt equation. But this only captures *time-varying* effects of variables. Time-invariant effects are not captured. Thus we are precluded from including time-invariant variables, such as sector dummies. Marginal corporate tax rates have also been relatively constant over the period of estimation in the United Kingdom, United States, France and Germany. Firm size does, however vary over time, which might suggest including a proxy such as the log of real sales. However the variation across time is small relative to the cross-sectional variation; and, moreover, the time-varying component is strongly procyclical, and thus closely correlated with other variables in the equation.

We use the firm's market-to-book value M_{it} as proxy for the optimal level of debt. There are a variety of different trade-off theories that imply relations between debt and M_{it}. We shall briefly summarise three of them. The first is prominent in market anecdote and the media, but not at all in the academic literature. A rare mention appears in Welch (2002). Economic theory, he asserts, entails that:[6]

> 'firms which experience positive shocks to their enterprise values should take on higher … debt/equity ratios: ceteris paribus, firms being worth more are less likely to go bankrupt and thus have lower expected bankruptcy costs'.

It may be helpful to flesh out this thought. Suppose a firm is choosing its optimal debt by equating the increase in expected bankruptcy costs – the expected marginal cost of debt – with, say, the increased tax advantage – the expected marginal benefit. An increase in M_{it}, is, *ceteris paribus*, associated with a fall in default probabilities, inducing a reduction in the expected marginal cost of debt. The fall in the marginal cost of debt ensures that the optimal level of debt rises.

Why does this account of the effect of M_{it} on debt rarely appear in the academic literature? The reason is that it proposes a *positive* relation between M_{it} and debt. One of the most robust empirical findings about the determinants of corporate debt is that it is negatively related to M_{it}.[7] Thus the most popular theories in the academic literature are those that put forward a negative relation.

Myers (1977) and Jensen (1986) both emphasise that it is high-growth firms that tend to have a high M_{it}. Each then presents a model which predicts that high-growth firms will tend to have lower debt. Myers (1977) stresses that a firm with more growth opportunities has a greater need for financial flexibility; a loss of financial flexibility may force it to forgo a future investment opportunity. The model then predicts that high growth, high M_{it} firms will tend to keep their debt low. Jensen (1986), on the other hand, points out that an important function of debt is that interest payments decrease the quantity of free cash; this, in turn, reduces the tendency of management to deviate from profit maximisation by, for example, expenditure on perquisites. But this function of debt will be of greater benefit to low-growth firms, because they have less expenditure on investment and thus more free cash. The model then predicts that low growth, low M_{it}, firms will tend to have higher debt

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[6] Welch (2002, page 2). In the article based on the working paper, Welch (2004), he no longer makes this claim.
[7] See, for example, Fama and French (2002), Barclay, Smith and Watts (1995), Antoniou, Guney and Paudyal (2002), Rajan and Zingales (1995).

levels. Both of these two 'growth opportunities' versions of the trade-off theory, therefore, predict a negative relation between M_{it} and optimal debt.

Equation **(1)** can be arranged thus:

$$D_{it} = \alpha G_{it} + \beta D_{it}* + (1-\beta)D_{i,t-1} \quad \textbf{(2)}$$

M_{it} is to be used as a proxy for the optimal level of debt D_{it}*. And the financing gap G_{it} is proxied for by its main observable components: cash flow C_{it}; investment expenditure I_{it} ; and acquisitions A_{it}. Lags of these variables are also to be included. The model then is (where η_i is a firm-specific unobserved fixed effect):

$$D_{it} = \alpha_0 + \alpha_1 D_{i,t-1} + \alpha_2 I_{it} + \alpha_3 I_{i,t-1} + \alpha_4 A_{it} + \alpha_5 A_{i,t-1} + \alpha_6 C_{it} + \alpha_7 C_{i,t-1} + \alpha_8 M_{it} + \alpha_9 M_{i,t-1} + \eta_i + \varepsilon_{it} \quad \textbf{(3)}^{(8)}$$

In summary: the pecking order theory predicts a positive effect of investment and acquisitions on debt, and a negative effect of cash flows on debt. As for the literature on the optimal level of debt: most theories predict a negative relation between market-to-book value, and optimal debt (and thus actual debt); but Welch (2002), however, demonstrates that theory is ambiguous. The sign depends on whether the 'growth opportunities effect', identified by Myers (1977) and Jensen (1986), is stronger than the 'default probabilities effect' identified by Welch (2002).

3.1 Estimating the debt equation

The panel data methodology would be better understood if the model in equation **(3)** is represented schematically as:

$$y_{it} = b_0 + b_1 y_{i,t-1} + b_2' x_{it} + b_3' x_{i,t-1} + \eta_i + \varepsilon_{it} \quad \textbf{(4)}$$

where y_{it} and x_{it} are the dependent and independent variables, ε_{it} is the disturbance term, assumed to have a zero mean, a finite variance, and to be serially uncorrelated, and η_i is a firm-specific unobserved fixed effect. The presence of the firm-specific effect ensures that OLS estimates of the coefficients in equation **(4)** are inconsistent. The firm-specific effect can be eliminated by taking differences:

$$y_{it} - y_{i,t-1} = b_1(y_{i,t-1} - y_{i,t-2}) + b_2'(x_{it} - x_{i,t-1}) + b_3'(x_{i,t-1} - x_{i,t-2}) + (\varepsilon_{it} - \varepsilon_{i,t-1}) \quad \textbf{(5)}$$

But then the differenced error term will be correlated with the differenced lagged endogenous term – because $\varepsilon_{i,t-1}$ is a component of $y_{i,t-1}$. One response to this problem is to use, as instruments, levels

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(8) The link between equation **(3)** and equation **(1)** follows naturally. For example α_1 in equation **(3)** should lie between zero and one due to the coefficient on the lagged debt term in equation **(2)**.

variables of more than one lag. Arellano and Bond (1991) use generalised methods of moments (GMM) to derive the asymptotically efficient instrumental variables estimator. Lagged levels may be weak instruments for differences, however. In this case, there are large efficiency gains from obtaining the moment conditions not only from levels instruments for differences but also from differenced instruments for levels. Arellano and Bover (1995) and Blundell and Bond (1998) present such a GMM estimator, GMM-SYS, which is the estimator that we use in this paper. The GMM-SYS estimator combines the GMM levels estimator and the GMM differenced estimator (see Doornik, Arellano and Bond (2002)).

Shyam-Sunder and Myers (1999) and Fama and French (2002) do not use GMM-SYS. Two papers that do use GMM-SYS to estimate debt equations are Benito and Young (2002) and Antoniou, Guney and Paudyal (2002). Benito and Young (2002) estimate for UK firms equations for equity issuance, investment, dividends and debt. Their focus is on the first three equations, however. They use a simple debt equation – regressing debt just on its lag – in order to obtain evidence on the speed of adjustment. Antoniou, Guney and Paudyal (2003) estimate debt equations for the United Kingdom, France and Germany. In contrast to our paper, however, they do not estimate a combined pecking order/trade-off model, but simply a model of the reversion of debt to an optimum. Thus, crucially, they omit variables for investment, acquisitions and cash flow.(9) Moreover, they do not estimate equations for equity issuance and investment.

4 Equity issuance and investment equations

The focus of this paper is on the determinants of debt. Debt is one of a number of sources of funds; other sources of funds are equity issuance and cash flows. Sources of funds must equal, through an identity, the uses of funds. For example, uses of funds include investment and acquisitions. We follow Benito and Young (2002), therefore, in modelling not only debt but also equity issuance and investment. The identity between sources and uses ensures that equity issuance and investment decisions cast light upon the decision to take on debt.

4.1 Equity issuance

The model for equity issuance is similar to that for debt, with all variables previously defined.

$$E_{it} = \delta_0 + \delta_1 D_{i,t-1} + \delta_2 I_{it} + \delta_3 A_{it} + \delta_4 C_{it} + \delta_5 M_{it} + \eta_i + \varepsilon_{it} \qquad \textbf{(6)}$$

This is because the theory used to interpret the debt equation is the same as that used to interpret the equity issuance equation. What implications does the pecking order theory have for equity issuance? If the pure version of the pecking order is correct, the financing gap has no impact on equity issuance. Consider a weaker version, according to which investors prefer to use cash rather than debt

(9) They do, however, include a variable closely related to cash flow – namely profits. Such a variable might be interpreted in a trade-off model as a proxy for expected future profitability – and thus the probability of bankruptcy.

or equity to finance expenditure, but equity serves to cover some fraction of the financing gap. Then the financing gap would have a positive effect on equity issuance – so I_{it} and A_{it} would have positive coefficients, and C_{it} a negative coefficient.

What are the implications of the trade-off theory for equity issuance? Suppose the trade-off theory is correct, and, in particular, Myers (1977) or Jensen (1986) is correct to posit a negative relation between optimal debt and market-to-book value. If M_{it} is high then optimal debt is low, so, *ceteris paribus*, equity issuance will be higher – so that debt may be paid down. A positive relation, then, is predicted between equity issuance and market-to-book value.(10) What is predicted about the relation between equity issuance and lagged debt? If $D_{i,t-1}$ is high then, again, *ceteris paribus*, equity issuance will be higher, in order that debt be paid down. So a positive relation is also predicted between equity issuance and lagged debt.

A crucial point of contrast between the debt and the equity equations is that the former includes a lagged endogenous variable. The theoretical reason for including it in the debt equation was explained in Section 3, and depends on the fact that debt is a stock term. As a robustness check, however we also estimate a version of the equity equation that includes the lagged endogenous variable.

$$E_{it} = \delta_0 + \delta_1 E_{i,t-1} + \delta_2 D_{i,t-1} + \delta_3 I_{it} + \delta_4 A_{it} + \delta_5 C_{it} + \delta_6 M_{it} + \eta_i + \varepsilon_{it} \qquad \textbf{(7)}$$

The two equations require, of course, very different estimation techniques. For equation **(6)**, because it lacks the lagged endogenous variable, the firm-specific effect can be eliminated by simple differencing. Thus for **(6)**, we simply estimate OLS coefficients for the difference equation. As was discussed in Section 3.1, equation **(7)** cannot be estimated in this way: the presence of the lagged endogenous term ensures that the estimator would be inconsistent. So equation **(7)** is estimated using GMM-SYS.

To capture the binary nature of the outcomes of equity issuance, we also estimate discrete-choice versions of **(6)** and **(7)** using a random-effects panel probit model. The random-effects panel probit model (see Guilkey and Murphy (1993) and Arulampalam (1999) and references therein) incorporates random-effects term for company-specific unobserved variables. The models are specified as in **(6)** and **(7)**;(11) however, the dependent variable is redefined as equity issuance equivalent to 2% or more of the book-value of tangible assets.

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(10) Any observed positive coefficient is, of course, subject to a rival interpretation: that firms issue equity 'speculatively' – when they can obtain a high price for it. See Rajan and Zingales (1995).

(11) The general structure of a random-effects is a follows: $y^*_{it} = x'_{it}\beta = \mu_i + \varepsilon_{it}$; where *x* is a $1 \times k$ vector of exogenous variables, β is a $k \times 1$ vector of coefficients, $\mu_i \sim IN(0, \sigma^2_u)$, $\varepsilon_{it} \sim IN(0, \sigma^2_\varepsilon)$, and μ_i and ε_{it} are mutually independent. y^*_{it} is an unobserved variable and the observed random variable, y_{it}, is defined as $y_{it} = 1 \text{ if } y^*_{it} > 0$ and 0 else. For our purpose, the vector of exogenous variables is the same as in **(6)** and **(7)**.

4.2 Investment

Blundell *et al* (1992) estimate for UK firms a Q-model of investment. They use the estimator developed in Arellano and Bond (1991) which we discussed in Section 3.1. They also test for the significance of cash flows, arguing that if firms have difficulty raising external finance, this variable might be expected to have a positive sign. In our equation we include not only Q and cash flows but also lagged debt (as do Benito and Young (2002), in their investment equation for UK firms). There are at least two reasons why debt might be expected to have a negative effect on investment. First, if debt is high, then there may be greater difficulties in raising external finance – as was captured in the financial accelerator model of Bernanke and Gertler (1990). Second, if debt is relatively high, then *ceteris paribus* the trade-off theory predicts that a firm will aim to pay down debt, which will reduce the cash flows available for investment expenditure.

Thus the investment equation that we estimate is:

$$I_{it} = \gamma_0 + \gamma_1 D_{i,t-1} + \gamma_2 I_{i,t-1} + \gamma_3 C_{it} + \gamma_4 C_{i,t-1} + \gamma_5 Q_{it} + \gamma_6 Q_{i,t-1} + \eta_i + \varepsilon_{it} \quad \textbf{(8)}$$

In order to remove the firm-specific effect, we again use GMM-SYS. Benito and Young (2002) also use GMM-SYS to estimate a similar investment equation for UK firms.

5 Data

We use COMPUSTAT (Global) to obtain company accounts data for non-financial companies in the United States, United Kingdom, France and Germany. This database provides annual data for the period 1993-2003. The selection of data is described in detail in Appendix I. The resulting data set includes 4,341 companies and 25,888 company-years. More than half are from the United States (Table A).

Table A: Data

	Firms	Firm-years
US	2,445	15,609
UK	818	5,550
France	516	2,318
Germany	562	2,411
Total	4,341	25,888

The debt and equity equations are both scaled by the book value of tangible assets. The book value of tangible assets can be interpreted as a proxy for the collateral of the company.[12] Given that the debt equation is modelling short-run as well as long-run determinants of debt, it is preferable to scale

[12] For an elaboration of this interpretation, see Barclay *et al* (1995, page 9).

the equation by the book value rather than the market value of assets. The reason is that, as Welch (2004) establishes, debt only responds sluggishly to market value.

The investment equation is based on the Q-model. The denominator in the Q-statistic is the replacement cost of non-current tangible assets. Thus, in the investment equation, the investment and cash-flow variables are also scaled by this denominator. It is narrower than the denominator in the debt and equity equations – because it excludes current assets, such as cash, short-term investments and inventories. The perpetual inventory method, described in Blundell *et al* (1992), is used to calculate the replacement cost from the book value (see Appendix I).(13)

Chart 1 displays the aggregate debt ratios for the four countries. At least over the time period in the data set, the debt ratios exhibit procyclicality: by 2003, the debt ratios of all four countries were falling, after increasing significantly from 1997 to 2001. The econometric techniques used in this paper are well suited to cast light on the procyclicality: the differencing ensures that only time-varying determinants of debt are reflected in the coefficients. One possible hypothesis is that the optimal level of debt is procyclical. An alternative hypothesis is that the procyclicality is a result of procyclicality in the financing gap. Chart 2 shows the procyclicality of the 'observable financing gap' – the difference between expenditure on investment and acquisitions on the one hand, and cash flows, on the other hand.

Chart 1: Ratio of aggregate debt to the book value of tangible assets

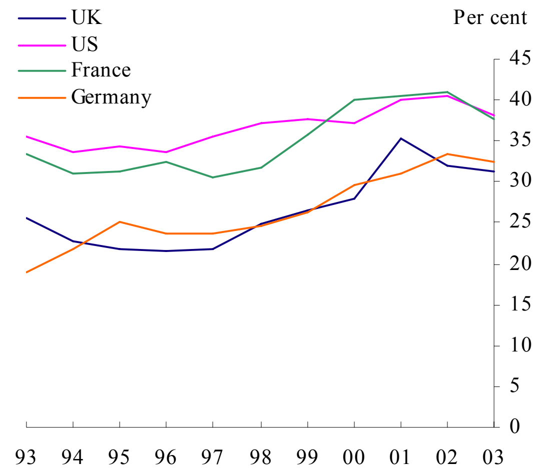
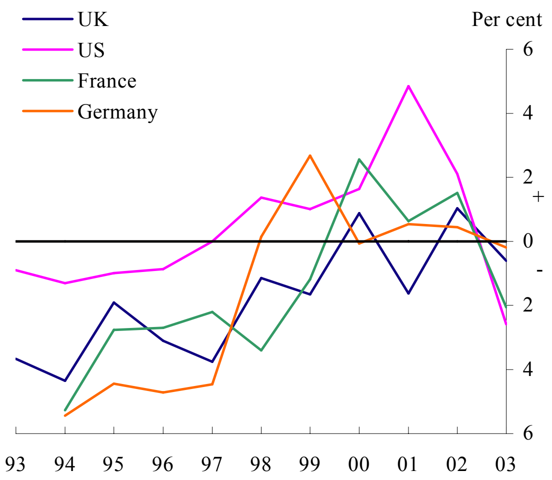


Chart 2: Ratio of the aggregate financing gap to the book value of tangible assets



(13) In general, the empirical literature on debt equations uses a broader denominator than the denominator of Q. There is a theoretical justification for using a broader class of assets in the denominator of a debt equation. In the debt equation, the relevant measure is debt relative to collateral – and collateral includes current assets.

6 Results

6.1 Diagnostics

The equations were estimated both for the individual countries, and also for the total data set – the data set that includes companies from all countries. The results are presented in Appendix II. Tables A1, A2 and A3 report the results for those equations estimated using GMM-SYS – equations for debt, equity issuance and investment. For the estimator to be consistent, it is required that there is no serial correlation in the error. Evidence for this absence is (1) negative first-order serial correlation in the differenced residuals, and (2) the absence of second-order serial correlation in differenced residuals. In all the GMM-SYS equations, we find that there is no significant second-order serial correlation in the differenced residuals. We find significant negative first-order serial correlation in the differenced residuals for all equations except the equity issuance equation for Germany. But even for this equation, the test statistic for the second-order correlation is negative with a P-value of 0.10. For the debt, investment and equity issuance equations, the French and German estimates pass the Sargan test[14] for overidentifying restrictions, while the 'all countries' and US estimates fail the test. The UK estimates fail the Sargan test only for the investment equation.

6.2 Results for the 'all countries' data set

The results for the debt equation are presented in Appendix II, Table A1. First, the results confirm that the pecking order theory contributes significantly to the explanation of debt. Two of the components of the financing gap, contemporaneous acquisitions and cash flow, have significant[15] coefficients with the expected sign. The third component, contemporaneous investment, has the expected positive sign, but is not significant.

The results also imply that the trade-off theory contributes significantly. First, the lagged market-to-book ratio is significant with a negative coefficient. As discussed in Section 3, there are competing theories about the sign of this ratio: the 'growth opportunities' theories predict a negative sign, the 'default probability' theory predicts a positive sign. The negative coefficient in our equation is in line with the empirical literature, as discussed in Section 3, providing support for the 'growth opportunity' theories.[16] Second, the coefficient on lagged debt is significant, with a coefficient between zero and one. Equations **(1)** and **(2)** suggest that this is to be interpreted as indicating an adjustment towards a target, but where the adjustment is not instantaneous. The implied rate of adjustment is 0.14.

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[14] The Sargan test is a standard specification test used to assess the validity of the number of instruments included in models estimated by instrumental variables or GMM.
[15] Unless otherwise stated, we shall use 'significant' to mean 5% significance.
[16] Should we then conclude that companies' target debt levels are not sensitive to their assessment of the probability of bankruptcy? A negative answer will be defended in Section 8.

In summary, the results in Table A1 support the following view of the determinants of debt. The pecking order variables, in particular contemporaneous cash flows and acquisitions, have a significant effect on debt, ensuring deviations from the optimum value. But companies do adjust, although not instantaneously, towards an optimum level of debt. And this optimum is, in part, determined by a negative relationship to the market-to-book ratio, in accordance with the 'growth opportunity' theories.

What can be concluded about the procyclicality of debt, discussed in Section 6? The optimum level of debt, we have found, is countercyclical – it bears a negative relation to the market-to-book ratio. This suggests that the procyclicality of debt is a result of the procyclicality of the financing gap. Thus the growth of debt in a boom is explained not by a rise in the optimum level of debt, which actually tends to fall in a boom, but rather by the rise in the financing gap.

The results for the equity issuance equations, reported in Tables A3 and A4, are consistent with the 'combination' account of debt. The coefficients on contemporaneous investment and acquisitions are significant and positive, and that on cash flows significant and negative. This implies that the financing gap is partly financed by equity issuance, and thus is inconsistent with the pure pecking order theory. In addition, as discussed in Section 5.1, the significant positive signs on lagged debt and the market-to-book ratio are predicted by the 'growth opportunities' version of the trade-off theory.

The results for the investment equation are presented in Table A2. Q and lagged Q have the positive signs predicted by theory, with lagged Q significant. Lagged debt has a significant negative coefficient, indicating that at higher levels of debt, external finance becomes more difficult to obtain. Lagged cash flows have a positive coefficient, but only have a P-value of 0.10.

6.3 Comparisons across countries

Of the four countries, Germany perhaps displays the most distinctive patterns in its balance sheet adjustment. What emerges from all the equations – the debt, the investment and the equity equations – is that investment relies heavily on external finance. It is the only country in which investment has a positive, significant, effect on debt, and in which cash flows do not have a significant effect on debt. In all four of the equity issuance equations (see Tables A.3-A.6) investment has a significant positive coefficient, and the coefficient is relatively high.(17) Perhaps most striking is the negative significant coefficient on the lagged debt term in the investment equation. Both the US and German equations have significant coefficients on their lagged debt term, but that of Germany is four times

(17) More generally, our four equity issuance equations yielded broadly similar results. The main difference was that the probit equations, reflecting the qualitative decision, tended to yield more significant results than the GMM-SYS and OLS-difference equation, reflecting the quantitative decision. For example, for UK companies, the cash-flow term was not even significant at 10% in the quantitative equations, but in the qualitative equation it was significant at the 1% level – with a negative sign, as expected. Benito and Young (2002) find the same in their probit model of equity issuance.

that of the United States.[18] The results, taken together, suggest that because of its high reliance on external finance, an increase in debt in Germany places a relatively large drag on investment.

In contrast, investment in France is not heavily dependent on external finance. This again is suggested by all of the equations. The investment terms are not significant in the debt equation. Moreover, it is the only one of the four countries for which the investment term is not significant in any of the four equity issuance equations. In the investment equation, debt has an insignificant coefficient. Moreover, while the coefficient on cash flows in the investment equation is not quite significant, it is larger than in the other four countries.

This contrast between France and Germany may partly reflect differences in the corporate tax regimes. Friderichs, Paranque and Sauve (1999) provide a helpful analysis of the incentives to retain and distribute earnings provided by the tax regimes in two countries. They conclude:[19]

> 'The underlying philosophy of the German tax system can be described by the pay out – tax back principle …: the higher rate for retained earnings should provide an incentive for firms to distribute earnings which subsequently, by using the allocational function of the capital markets, should try to reabsorb the distributed amounts via capital increases. [T]he French system clearly provides incentives for a direct retention of profits at the company level.'

Thus German firms can be expected to fund investment from capital markets, while the French are more reliant on internal funds.

For each of the countries, acquisitions have a significant positive effect on debt. The United States, however, has by far the largest coefficient. The dependency of acquisitions on debt may, in part, reflect the well-developed bond market in the United States.

The United States and Germany, then, exhibit the strongest responses of debt to acquisitions and investment, respectively. In addition, the United States and Germany also display the smallest response of debt to cash flows: in Germany, there is not a significant response of debt to cash; in the United States, the negative coefficient is significant, but much smaller in France and Germany. One way of interpreting this is that in the United States and Germany, the tendency to use cash to pay down debt is weaker.

This is consistent with what is revealed about the rate of adjustment of debt by the coefficients on the lagged debt term in the debt equation. From equations **(1)** and **(2)**, the coefficient on the lagged debt term is to be interpreted as one minus the rate of adjustment to the target debt level. For each country, the coefficient on the lagged debt term is significant. The rates of adjustment implied by the coefficients are 0.15 for the United States and Germany, 0.23 for the United Kingdom and 0.26 for France. Thus the implication is that German and US companies are slower to return to their target debt level than French and UK companies.

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[18] Like Benito and Young (2002), we find that in the UK investment equation, when the cash flow is controlled for, the debt term is not significant.

[19] Friderichs, Paranque and Sauve (1999, pages 81-82).

On the one hand, a note of caution is in order: these conclusions about adjustment to a long-run optimum come from only eleven years of annual data. On the other hand, the results match up with other results in the literature on rates of debt adjustment. Antoniou *et al* (2002) estimate a trade-off model (as discussed above, it omits the pecking order variables). They use company data from Datastream for the United Kingdom (1969-2000), France (1983-2000), and Germany (1987-2000). In all four of the dynamic debt equations that they estimate,[20] German companies are found to be slower in adjusting back to their optimum level. Moreover they find, as we did, that German debt depends less upon cash flows than in France and the United Kingdom:[21] in each of their four dynamic debt equations, for France and the United Kingdom, the coefficients on cash and lagged cash are negative and significant at the 10% level; for Germany, none of these coefficients are significant. As noted above, this may suggest that the tendency to pay down debt from cash flows is weaker in Germany.

A comparison between the findings of Benito and Young (2002) and Fama and French (2002) provide further confirmation of our conclusions about the relative speeds of adjustment. Benito and Young (2002) for the UK estimate a rate of adjustment of 0.30 to 0.35, much higher than the 0.07 to 0.17 rate of adjustment estimated by Fama and French (2002) for the United States.

In summary, the following three facts emerge from our cross-country comparison. First, German investment appears to be the most dependent upon external finance, French investment the least dependent. Second, the sensitivity of debt to investment and acquisitions is greatest in, respectively, Germany and the United States. Third, German and US companies tend to be slower to pay down their debt: this is manifested both by the coefficients on the lagged debt term in the debt equations, and also by the responsiveness of debt to cash flows. Given these findings, it might be expected that the movement of debt over the cycle is different in Germany and the United States than in France and the United Kingdom. It might be expected that in a boom, *ceteris paribus*, German and US debt tends to rise above the optimum level by more than in the United Kingdom and France – responding to the higher levels of investment and acquisitions. And in a slowdown, when adjusting back down to the optimum, German and US corporate debt tends to be paid down more slowly.

7 Debt and default probability

The results for the debt and investment equations were found to be relatively robust when estimated for different subsamples. The UK and US samples were each divided into large and small firms; and the ‘all countries’ data set was broken down into eleven industrial sectors. The equations estimated for the subsamples were broadly similar to those for the samples.

The most glaring exception, however, was the coefficient of the market-to-book ratio in the debt equation. Recall that in the ‘all countries’ equation, the coefficient was negative and significant. For

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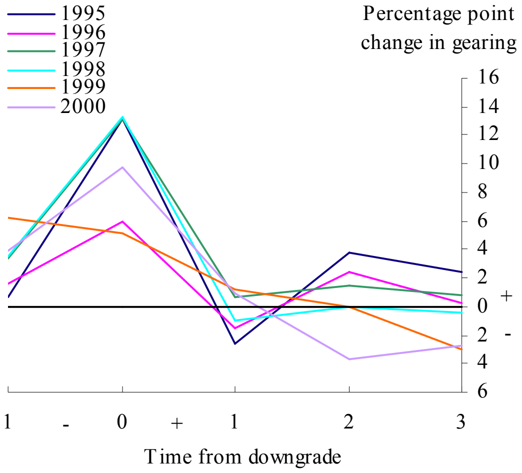
[20] See Antoniou *et al* (2002), Tables 3 and 4, pages 26-27.
[21] More precisely, Antoniou *et al* (2002), given their trade-off model, use profits rather than cash flows – but the two are, of course, closely related.

the utilities and primary goods sectors, however, the coefficient was positive and significant. This is not entirely surprising. As was explained in Section 3, theory is ambiguous as to the sign of the coefficient: the 'growth opportunities' version of the trade-off theory predicts a negative sign; while the 'default probability' version predicts a positive sign. We found that for the 'all countries' data set there was a significant negative coefficient: that is, the 'growth opportunities' effect dominated the 'default probability' effect. The sectoral results show that, for at least some sectors, the opposite is true.

There are more direct proxies for default probability than the market-to-book ratio – for example, the assessments of ratings agencies. We supplement the firm account data from COMPUSTAT (Global) with a time series of Standard and Poor's Long-Term Credit Ratings of US firms. This is used to estimate a version of equation **(3)**, where the market-to-book ratio is replaced with the lagged credit rating. The data set covers the eleven years of COMPUSTAT (Global) data. It is a balanced panel of those 150 US firms for which firm accounts data and credit ratings are available for each of the eleven years.

Chart 3 suggests that there is some relation between downgrades and debt. Each line in the chart displays the change in debt in the vicinity of downgrades. For example, the line called '1995' shows the average change in the debt ratio for the firms downgraded in 1995 – and it does so for the year before the downgrade, the year of the downgrade, and for the three years after. The chart clearly shows that debt accelerates in the year of the downgrade, and then decelerates in the years following the downgrade.

Chart 3: Downgrades and changes in debt



There are at least two possible explanations of the deceleration of debt following a downgrade. The first explanation comes from a version of the trade-off model: the downgrade is associated with a higher assessment of the probability of default which, in the presence of bankruptcy costs, causes firms to reduce their optimum level of debt. But there is a second explanation according to which the causation is in the opposite direction: the deceleration that occurs after the downgrade simply reflects the unusually high debt growth in the year of the downgrade, which, in turn, caused the downgrade.

Table A7, in Appendix II, presents the results from estimating the new version of the debt equation – where the lagged rating replaces the market-to-book ratio. It allows us to choose between the two explanations of the trends in Chart 3. This is because, when estimating the effect of the lagged rating on debt, lagged debt is controlled for. Thus the coefficient on the lagged rating cannot be interpreted as reflecting the second of the two explanations.

The variable RAT is a number between 1 and 20, where the AAA rating is assigned 1, and CC is assigned 20. The negative coefficient on RAT_{t-1} is not significant at the 5% level, with a P-value of 7%. But it does provide at least tentative evidence that an increase in the expected probability of default reduces risk.

In summary, the negative coefficient on the market-to-book ratio in the debt equation, reported in Table A1, does suggest that the ‘growth opportunity’ effect dominates the ‘default probability’ effect. But there is still reason to think that the default probabilities do affect optimal gearing. First, this is suggested by the lack of robustness of the coefficient, particularly when the sample is broken down into industrial sectors. Second, it also suggested by the negative coefficient on the lagged ratings term in the debt equation (only tentatively, however, given the coefficient is not significant at the 5% level).

8 Conclusions

While there is considerable empirical literature on the determinants of corporate debt, cross-country comparisons are relatively scarce. We estimate debt equations for the United States, United Kingdom, France and Germany, using the GMM-SYS estimator, presented in Blundell and Bond (1998), to solve the problems arising from firm-specific effects. We also estimated investment and equity issuance equations for each country, allowing a richer comparison of the role of debt in the four countries.

The debt equation for the ‘all countries’ data set suggested the following. The pecking order variables, in particular contemporaneous cash flows and acquisitions, have a significant effect on debt, ensuring deviations from the optimum value. But companies do adjust, although not instantaneously, towards an optimum level of debt. This optimum is, in part, determined by a negative relationship market-to-book ratio, in accordance with the ‘growth opportunities’ version of the trade-off theory. It follows that the optimum level of debt is countercyclical. This suggests that the procyclicality of debt is a result of the procyclicality of the financing gap. Thus the growth of debt in a boom is explained not by a rise in the optimal level of debt, but rather by the rise in the financing gap.

The following three facts emerge from our cross-country comparison. First, German investment appears to be the most dependent upon external finance, and French investment the least dependent. Second, the sensitivity of debt to investment and acquisitions is greatest in, respectively, Germany and the United States. Third, German and US companies tend to be slower to pay down their debt: this is manifested both by the coefficients on the lagged debt term in the debt equations, and also by the responsiveness of debt to cash flows. Thus it might be expected that, in a boom, German and US corporate debt tends to rise above the optimum level by more than in the United Kingdom and France, responding to the higher levels of investment and acquisitions. And in a slowdown, when adjusting back down to the optimum, German and US debt tends to be paid down more slowly.

The negative coefficient on the market-to-book ratio in the 'all countries' debt equation does suggest that the 'growth opportunity' effect dominates the 'default probability' effect. But there is still reason to think that the default probabilities do affect optimal gearing. First, this is suggested by the lack of robustness of the coefficient, particularly when the sample is broken down into industrial sectors. Second, it is suggested, albeit tentatively, by the negative coefficient on the lagged ratings term in the debt equation.

Appendix I: Data

I.1 Selection of firm-years for unbalanced panel

The following data-items (written with their codes) were downloaded from COMPUSTAT (global).

(a) The United States

Intangibles (INTAN), Current Assets (ACT), Assets-Total (AT), Income Taxes-Total (TXT), Sales/Turnover (Net) (SALE), Acquisitions (AQC), Capital Expenditure (CAPX), Debt-Total (DT), Income Before Extraordinary Items (IB), Depreciation and Amortization (DP), Purchase of Common and Preference Stock (PRSTKC), Equity Stock-Additions (SSTK), Dividends-Common/Ordinary (DVC), Interest Expense-Total (XINT), Market Value (MKVAL).

(b) Germany

Intangibles (INTAN), Current Assets (ACT), Assets-Total (AT), Sales/Turnover (Net) (SALE), Acquisitions (AQC), Capital Expenditure (CAPX), Debt-Total (DT), Income Before Extraordinary Items (IB), Depreciation and Amortization (DP), Purchase of Common and Preference Stock (PRSTKC), Equity Stock-Additions (SSTK), Cash Dividends (DV), Market Value (MKVAL).

(c) The United Kingdom

Intangibles (INTAN), Current Assets (ACT), Assets-Total (AT), Sales/Turnover (Net) (SALE), Acquisitions and Disposals (ACQDISN), Capital Expenditure (CAPX), Debt-Total (DT), Income Before Extraordinary Items (IB), Depreciation and Amortization (DP), Purchase of Common and Preference Stock (PRSTKC), Equity Stock-Additions (SSTK), Dividends-Common/Ordinary (DVC), Interest Expense-Total (XINT), Market Value (MKVAL).

(d) France

Intangibles (INTAN), Current Assets (ACT), Assets-Total (AT), Sales/Turnover (Net) (SALE), Acquisitions (AQC), Capital Expenditure (CAPX), Debt-Total (DT), Income Before Extraordinary Items (IB), Depreciation and Amortization (DP), Purchase of Common and Preference Stock (PRSTKC), Equity Stock-Additions (SSTK), Cash Dividends (DV), Market Value (MKVAL).

The data sets where then determined as follows. All firm-years with blank entries were deleted. They were also deleted if either (a) tangible assets ≤ 0 (b) total debt ≥ 2 x tangible assets (c) equity issuance ≥ 2 x tangible assets (d) the replacement cost of capital (defined below) ≤ 0 (e) investment ≥ 5 (f) for the UK, the highest 2.5% and the lowest 2.5% of Q-statistics were deleted.

I.2 Definitions of variables

(a) The denominators

The denominator in the equity issuance and debt equations is 'tangible assets'
= total assets – intangibles.

The investment equation uses in the denominator 'the replacement cost of capital'. This is calculated using the perpetual inventory formula (written in nominal terms):
K_{t+1} = (1+inflation)(1-depreciation rate)$K_t + I_{t+1}$
For any series of consecutive firm-years, the replacement cost of capital of the first in the series is just assumed to be the book value of non-current tangible assets (= total assets – intangible assets – current assets). All other items in the series are determined using the perpetual inventory formula. The depreciation rate is assumed to be 0.08 or 8%. The inflation rate is calculated (a) for the US, from the deflator for non-residential fixed investment BEA Table 1.1.4; (b) for the UK, from the business investment deflator calculated for the Bank of England model;[22] (c) for Germany, from the fixed capital investment deflator - IPD SADJ BDIPDCAPE; and (d) for France, from the investment deflator - IPD SADJ FRIPDCFME. For the purposes of this formula, investment = (net) book value of non-current tangible assets in *t* less the (net) book value of non-current tangible assets in *t*-1, plus depreciation.

(b) The variables

D_{it}: total debt/tangible assets

M_{it}: (market value + total debt)/tangible assets

I_{it}: capital expenditure/tangible assets
(but for investment equation, denominator = replacement cost of capital)

C_{it}: (income before extraordinary items + depreciation and amortization)/tangible assets
(but for investment equation, denominator = replacement cost of capital)

A_{it}: acquisitions/tangible assets

E_{it}: equity stock additions/tangible assets

Q_{it}: (market value + debt – current assets)/replacement cost of capital.

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[22] The deflator is defined in terms of variables explained in Appendix III of Harrison *et al* (2005). In particular, the deflator is defined as equal to (ikhcp + ikmcp)/(ikhkp+ ikmkp).

I.3 The balanced panel for the ratings version of the debt equation

The balanced panel was created from (a) the US unbalanced panel, the creation of which was described above and (b) time series of Standard and Poor's 'domestic long-term issuer credit rating', that was provided for us directly by Standard and Poor's. The companies selected were those for which both COMPUSTAT (Global) and credit rating data (for the variables in the revised debt equation) were available for all eleven years.

Appendix II: Results

The equations in Tables A1, A2, A3 and A7 were estimated using GMM-SYS (Arellano and Bover (1995) and Blundell and Bond (1998)). The level equations are stacked on top of the transformed equations and the estimation is carried out in two steps. Results are reported from the second step. P-values are based on robust standard errors. 'Sargan' is the Sargan statistic for equation identification. m_1 and m_2 are test-statistics for, respectively, first and second-order serial correlation in the first-differenced residuals: if the error term is not serially correlated, then there should be negative first-order serial correlation in the first-differenced residuals, but no second-order serial correlation.

Table A1: Debt equation (GMM-SYS)

	All countries		US		UK		France		Germany	
	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P
D_{t-1}	**0.860**	**0.00**	**0.847**	**0.00**	**0.774**	**0.00**	**0.735**	**0.00**	**0.853**	**0.00**
I_t	**0.214**	**0.13**	**0.261**	**0.22**	**0.222**	**0.27**	**0.271**	**0.13**	**0.37**	**0.00**
I_{t-1}	**0.052**	**0.43**	**0.081**	**0.45**	**-0.073**	**0.45**	**-0.108**	**0.24**	**0.021**	**0.82**
A_t	**0.552**	**0.00**	**0.853**	**0.00**	**0.364**	**0.00**	**0.308**	**0.13**	**0.298**	**0.06**
A_{t-1}	**-0.025**	**0.17**	**-0.050**	**0.22**	**-0.033**	**0.07**	**0.144**	**0.03**	**0.086**	**0.00**
C_t	**-0.070**	**0.03**	**-0.085**	**0.02**	**-0.22**	**0.00**	**-0.344**	**0.00**	**-0.004**	**0.91**
C_{t-1}	**-0.006**	**0.43**	**-0.006**	**0.39**	**0.008**	**0.64**	**-0.038**	**0.00**	**-0.039**	**0.18**
M_t	**-0.001**	**0.66**	**-0.004**	**0.19**	**0.001**	**0.83**	**0.002**	**0.47**	**0.002**	**0.16**
M_{t-1}	**-0.002**	**0.00**	**-0.001**	**0.07**	**-0.003**	**0.06**	**0.002**	**0.38**	**-0.002**	**0.03**
Sargan		**0.00**		**0.01**		**0.08**		**0.98**		**0.73**
m_1	**-13.12**	**0.00**	**-9.919**	**0.00**	**-7.188**	**0.00**	**-5.649**	**0.00**	**-5.960**	**0.00**
m_2	**0.975**	**0.33**	**0.752**	**0.45**	**1.185**	**0.24**	**0.743**	**0.46**	**-0.331**	**0.74**

Table A2: Investment equation (GMM-SYS)

	All countries		US		UK		France		Germany	
	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P
I_{t-1}	**0.4097**	**0.00**	**0.4336**	**0.00**	**0.2683**	**0.01**	**0.2909**	**0.00**	**0.3297**	**0.00**
C_t	**0.0006**	**0.92**	**-0.0032**	**0.20**	**0.0112**	**0.04**	**0.0755**	**0.06**	**-0.032**	**0.03**
C_{t-1}	**0.0040**	**0.10**	**0.0046**	**0.02**	**0.0042**	**0.16**	**-0.0102**	**0.22**	**0.0404**	**0.00**
Q_t	**0.0000**	**0.09**	**0.0003**	**0.39**	**0.0001**	**0.82**	**-0.0222**	**0.16**	**0.0011**	**0.44**
Q_{t-1}	**0.0000**	**0.02**	**0.0000**	**0.01**	**0.0006**	**0.03**	**0.0137**	**0.07**	**0.0004**	**0.23**
D_{t-1}	**-0.0946**	**0.00**	**-0.0910**	**0.00**	**-0.0244**	**0.63**	**-0.1886**	**0.17**	**-0.4036**	**0.00**
Sargan		**0.00**		**0.00**		**0.01**		**0.29**		**0.06**
m_1	**-5.910**	**0.00**	**-5.274**	**0.00**	**-2.344**	**0.02**	**-3.059**	**0.00**	**-3.237**	**0.00**
m_2	**-0.207**	**0.84**	**-.569**	**0.57**	**0.047**	**0.96**	**-0.535**	**0.59**	**-0.832**	**0.41**

Table A3: Equity issuance (GMM-SYS)

	All countries		US		UK		France		Germany	
	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P
E_{t-1}	**0.0454**	**0.02**	**0.0605**	**0.13**	**0.0537**	**0.08**	**-0.0500**	**0.34**	**-0.0569**	**0.13**
D_{t-1}	**0.0385**	**0.00**	**0.0365**	**0.06**	**0.1404**	**0.00**	**0.0121**	**0.55**	**-0.0199**	**0.51**
I_t	**0.1437**	**0.00**	**0.1058**	**0.06**	**0.2069**	**0.09**	**0.0220**	**0.71**	**0.3234**	**0.00**
A_t	**0.2909**	**0.00**	**0.1903**	**0.08**	**0.1903**	**0.08**	**0.4503**	**0.01**	**-0.0664**	**0.58**
C_t	**-0.0556**	**0.05**	**-0.0528**	**0.07**	**-0.0430**	**0.51**	**0.0307**	**0.22**	**-0.0677**	**0.04**
M_t	**0.0150**	**0.00**	**0.0194**	**0.00**	**0.0077**	**0.02**	**0.0098**	**0.07**	**0.0085**	**0.00**
Sargan		**0.00**		**0.00**		**0.06**		**0.99**		**0.92**
m_1	**-9.964**	**0.00**	**-7.053**	**0.00**	**-6.600**	**0.00**	**-3.753**	**0.00**	**-1.64**	**0.10**
m_2	**1.555**	**0.12**	**1.303**	**0.19**	**0.848**	**0.20**	**0.090**	**0.93**	**-0.271**	**0.47**

Table A4: Equity issuance (OLS differences)

	All countries		US		UK		France		Germany	
	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P
D_{t-1}	**0.0554**	**0.00**	**0.0407**	**0.09**	**0.1370**	**0.00**	**0.0212**	**0.27**	**-0.0060**	**0.83**
I_t	**0.2871**	**0.00**	**0.2113**	**0.00**	**0.2826**	**0.04**	**0.0103**	**0.87**	**0.2371**	**0.00**
A_t	**0.3973**	**0.00**	**0.2082**	**0.07**	**0.3803**	**0.00**	**0.4385**	**0.01**	**-0.0748**	**0.54**
C_t	**-0.0725**	**0.02**	**-0.0689**	**0.06**	**-0.0510**	**0.43**	**0.0131**	**0.54**	**-0.0762**	**0.03**
M_t	**0.0197**	**0.00**	**0.0231**	**0.00**	**0.0076**	**0.02**	**0.0096**	**0.06**	**0.0074**	**0.00**
m_1	-10.17	**0.00**	-7.317	**0.00**	-7.252	**0.00**	-4.320	**0.00**	-1.258	**0.08**
m_2	.941	**0.35**	.782	**0.43**	0.271	**0.79**	0.417	**0.68**	0.920	**0.33**

Table A4 was estimated using OLS on the differenced equation.

Table A5: Dynamic equity issuance (Probit)

	US		UK		France		Germany	
	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P
E_{t-1}	**0.6494**	**0.00**	**0.3967**	**0.00**	**0.4082**	**0.00**	**0.5190**	**0.00**
D_{t-1}	**-0.0321**	**0.57**	**0.3829**	**0.00**	**1.0746**	**0.00**	**0.4331**	**0.06**
I_t	**0.5948**	**0.01**	**1.0655**	**0.00**	**0.0303**	**0.96**	**1.6924**	**0.00**
A_t	**0.6266**	**0.00**	**1.0038**	**0.00**	**2.2712**	**0.00**	**0.2603**	**0.46**
C_t	**-0.0772**	**0.01**	**-0.2832**	**0.00**	**-0.3038**	**-0.23**	**-0.6132**	**0.00**
M_t	**0.2079**	**0.00**	**0.0576**	**0.00**	**0.0384**	**0.02**	**0.0474**	**0.01**
Log-likelihood	**-5626.0063**		**-1922.8994**		**-626.2584**		**-550.2823**	
σ_u	**0.4887**	**(0.0331)**	**0.4194**	**(0.0582)**	**0.4392**	**(0.0997)**	**0.0009**	**-**
ρ	**0.1928**	**(0.0211)**	**0.1496**	**(0.0353)**	**0.1617**	**(0.0615)**	**0.0000**	**-**

Table A6: Static equity issuance (Probit)

	US		UK		France		Germany	
	Coeff.	P	Coeff.	P	Coeff.	P	Coeff.	P
D_{t-1}	**-0.0632**	**0.34**	**0.4089**	**0.00**	**1.1376**	**0.00**	**0.2599**	**0.34**
I_t	**1.0331**	**0.00**	**1.3150**	**0.00**	**0.1800**	**0.76**	**2.2731**	**0.00**
A_t	**0.7921**	**0.00**	**1.0709**	**0.00**	**2.6376**	**0.00**	**0.2760**	**0.46**
C_t	**-0.0781**	**0.01**	**-0.2656**	**0.01**	**-0.2990**	**0.27**	**-0.6812**	**0.00**
M_t	**0.2391**	**0.00**	**0.0612**	**0.00**	**0.0184**	**0.02**	**0.0605**	**0.00**
Log-likelihood	**-5751.5143**		**-1939.0052**		**-631.8117**		**-558.0654**	
σ_u	**0.8052**	**(0.0301)**	**0.6102**	**(0.0473)**	**0.6242**	**(0.0849)**	**0.5234**	**(0.1053)**
ρ	**0.3933**	**(0.0178)**	**0.271**	**(0.0306)**	**0.2804**	**(0.0549)**	**0.2151**	**(0.0679)**

Tables A5 and A6 are the estimated random-effects probit model for equity issuance. The models are estimated by Gaussian Maximum Likelihood. Coefficient (Coeff) estimates and corresponding P-values (P) are provided. Log-likelihood is the value of the likelihood function, σ_u is standard deviation of the panel-level variance (company-specific component) and ρ is the proportion of the total variance that is accounted for by the panel-level variance (company-specific component). The standard errors for σ_u and ρ are given in parenthesis.

Table A7: Debt equation with ratings (GMM-SYS)

	Coefficient	P
D_{t-1}	0.893	0.00
I_t	-0.124	0.47
I_{t-1}	0.341	0.03
A_t	0.652	0.00
A_{t-1}	0.013	0.72
C_t	-0.078	0.70
C_{t-1}	-0.003	0.97
RAT_{t-1}	-0.014	0.07
RAT_{t-2}	0.010	0.18
Sargan		1.00
m_1	-4.832	0.00
m_2	1.096	0.27

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