# Business cycles and leverage in UK firms: a theoretical and empirical analysis

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## Abstract

This study analyzes configuration effects of the 2008 business cycle shift, together with bank loan supply frictions, on the overall leverage, and short-term and long-term debt ratios of UK quoted companies. The panel data considers the 2001-2011 time period and our sample is based on the firms in FTSE All Share Index. We demonstrate that the recent crisis affected the leverage ratios of UK firms. Both financially constrained and unconstrained companies experience counter-cyclical book leverage patterns, which is not apparent for market leverage. The findings include a significant upward shift in the average leverage ratio of UK companies with access to public debt markets between 2007 and 2008, suggesting that these companies are substituting bank debt with non-bank public debt sources and possibly taking advantage of the historically low interest rates. This study shows empirically that capital structure varies over time and factors such as shifts in economic cycles, market timing opportunities, bank loan supply contractions, financial constraints and PDM access impact corporate financing decisions. We also develop a theoretical model that investigates into the link between cyclicality of capital structure and financial constraints.

*Keywords*: capital structure; financial constraints; UK firms; 2008 financial crisis; public debt market access; business cycles

*JEL classification*: E44, G32

## 1. Introduction

Traditionally, scholars of corporate finance examine firm-specific factors affecting a firm's choice of capital structure (e.g., Titman and Wessels, 1988). However, an emerging body of research studies the macroeconomic conditions affecting the relationship between firms' financing choices and real activity in the economy, and particularly the effect of business cycles on corporate leverage (e.g., Antoniou, Guney, and Paudyal, 2008; Korajczyk and Levy, 2003; Leary, 2009). This paper contributes to this latter stream of research by examining the effects of the latest (2008) recession on UK firms' financing choices.

According to Modigliani and Miller (1958), a firm's choice of financing is irrelevant under perfect market conditions. This argument motivated researchers to develop theories examining the effect of market imperfections, such as taxes and financial distress costs (DeAngelo and Masulis, 1980), agency conflicts (Grossman and Hart, 1982; Jensen, 1986; Jensen and Meckling, 1976), and informational asymmetries (Myers, 1984; Myers and Majluf, 1984; Ross, 1977), on a firm's choice of capital structure. Arising from these theories, empiricists focus on firm-specific factors, such as asset structure, size, profitability, growth opportunities, volatility, non-debt tax shields, and uniqueness as antecedents of financing choices. On the other hand, some scholars consider country-wide factors to examine whether firms within the same industry and country are more similar than those in different industries and countries (e.g., Booth, Demirguc-Kunt, and Maksimovic, 2001; Rajan and Zingales, 1995).

Researchers focus on how macroeconomic conditions (particularly, business cycle shifts) and supply-side factors (particularly factors limiting firms' access to public debt markets) may affect corporate financing and investment choices over time (e.g., Chen, 2010; Duchin, Ozbas, and Sensoy, 2010). Business cycle shifts represent the long-term pattern of alternating periods of economic growth (recovery) and decline (recession) characterized by changing employment, industrial productivity and interest rates. A capital market supply friction refers to the sudden tightening of conditions in the flow of capital through the banking system. This problem may be

particularly acute during a credit crunch, as witnessed in the UK during 2008. Previous studies suggest that corporate capital structure choice varies both over time and across firms and that the impact of these factors depend, to a major extent, on the degree of public debt market (PDM) access (see, e.g., Leary, 2009) and the level of financial constraints present in the company. For example, Korajczyk and Levy (2003) consider business cycle effects on the leverage levels of financially constrained (FCC) and unconstrained (FUC) firms.

Ivashina and Scharfstein (2010) show that bank lending, including US corporate loans, shrunk significantly during the 2008 financial crisis. Campello, Graham, and Harvey's (2010) new survey evidence demonstrates the severity of bypassing profitable investments by financially constrained firms in Asia, Europe and the US as a consequence of the current credit crunch.

This study extends the existing research in order to examine whether the 2008 business cycle shift, combined with contractions in the supply of bank loans, has affected the capital structure choices of UK firms during 2001-2011. The major contributions are as follows. This paper is among the first to consider the effects of the recent business cycle shift on firms, hence extending previous work. The paper considers the interaction between financially unconstrained/constrained firms and access/non-access to public debt markets. Previous research either considers FCC/FUC firms (e.g., Korajczyk and Levy, 2003) or access/non-access to PDMs (e.g., Leary, 2009). This study considers the effect of the business cycle shift on debt maturity (long-term versus short-term debt). Overall, this study contributes to the debate whether an economic downturn results in a reduction or an increase in corporate leverage, and provides macroeconomic policy implications. Furthermore, we provide a theoretical model that shed some light on the relevance of business cycles and financial constraints to firms' leverage patterns and managers' financing decisions.

The timeframe this study considers offers a strong boom versus bust situation (see Figure 1 in Appendix D). The current paper examines if there is a difference in the cyclical leverage

patterns of FCCs and FUCs in the UK. The paper also analyzes whether shifts in the business-cycle affect long- and short-term debt ratios differently. In addition, this study examines whether, as a result of the 2008 loan supply shock, the leverage ratios of firms with no access to PDMs are different from their counterparts. To the best knowledge of the authors, this is the first paper that attempts to investigate the above current issues using new data.

This study is organized as follows: Section 2 outlines the emerging literature examining the interaction between business cycles shifts, capital market supply constraints, and capital structure. This section also delves into the particular characteristics surrounding the 2008 recession period. In section 3, we develop a theoretical model that attempts to provide an understanding of the cyclical/counter-cyclical patterns of leverage of financially constrained and financially unconstrained firms. Section 4 sets out the research methods by explaining the sample selection and analysis methods, key aspects of the data segregation, and the reasons behind the choice of the dependent and explanatory variables. Section 5 explores the results produced by the mean and regression analysis and relates these finding to past literature in the area. Section 6 concludes.

## 2. Related literature

Researchers seek to learn how macroeconomic conditions in the business cycle affect corporate capital structure. Hackbarth, Miao, and Morellec (2006) argue that macroeconomic conditions are important antecedents of corporate leverage due to the trade-off between the tax benefit of debt and bankruptcy costs. Both of these factors may depend on macroeconomic conditions. The tax benefit depends on cash flow levels, which in turn may depend on whether the economy is expanding or contracting. Expected bankruptcy costs depend on the probability of default, and the size of the loss in the case of default, both of which may be affected by the current state of the economy. Thus, variations in macroeconomic conditions should induce variations in optimal leverage.

Empirical evidence supports the use of macroeconomic conditions as antecedents of leverage, and suggests that the financing mix varies both over time and across firms. More specifically, several studies (e.g., Baker and Wurgler, 2002) show that aggregate equity issues vary pro-cyclically, and tend to rise following abnormal increases in the firm's equity price. On the other hand, the effects of shifts in the business cycle on variations in aggregate debt issues depend on whether the firm is financially constrained or not (Choe, Masulis, and Nanda, 1993; Gertler and Gilchrist, 1993 and 1994). Korajczyk and Levy (2003) define FCCs as firms that do not have sufficient resources to undertake investment opportunities, and face severe agency costs when attempting to access financial markets. They show that aggregate debt issues vary pro-cyclically for FCCs and counter-cyclically for FUCs, indicating that both macroeconomic conditions and firm-specific factors drive variations in financing choices, and that these variations differ with the degree of financial market access. Kiyotaki and Moore (1997) suggest that the pro-cyclical leverage patterns of FCCs arise as they tend to borrow more when collateral values are highest, that is, following high returns in the equity market or high corporate profits.

Korajczyk and Levy (2003) provide a theoretical justification for the observed counter-cyclical leverage patterns of FUCs. They suggest that levered managers' wealth is reduced during recessions as a result of low returns in the equity market (share options) or low corporate profits (bonuses). This shift in relative wealth exacerbates the agency problem and increases optimal leverage to realign managers' incentives with those of the shareholders. Due to the positive effect of higher leverage on the earnings per share, the levered managers will enjoy a higher return and will do so up to the point where their incentives are aligned with those of external shareholders. This effect leads to counter-cyclical leverage for those firms that are not severely financially constrained.

Korajczyk and Levy (2003) state that firms tend to have more internal funds during an expansion, which, according to the pecking-order hypothesis, means that firms are less likely to increase leverage during such periods. They find that FCCs fit the pecking order theory less well

than do FUCs due to their pro-cyclical leverage pattern and also because macroeconomic conditions play a smaller role in the target leverage and issue choice for FCCs. In addition, the authors suggest that FUCs are able to time their security issues to periods when the relative pricing of the asset is favourable, as indicated by the low deviations from target leverage and the fact that macroeconomic conditions account for a high percentage of their time-series variation in issue choice.

Financial constraints and leverage patterns affect the amount of real investment and profits made by companies over the business cycle. Levy and Hennessy (2007) suggest that the decline in real investment is particularly acute for firms facing more severe agency problems (FCCs) since their stringent leverage constraint hinders their ability to substitute debt for equity. Consistent with this suggestion, Gertler and Gilchrist (1993) find that the inventory-sales ratio falls (increases) dramatically for small (large) firms following a monetary tightening. Similarly, Kashyap, Lamont, and Stein (1994) find that the inventory investment of firms without access to PDMs fell dramatically during the 1981 recession. Campello (2003) finds that mark-ups are more countercyclical, that is, they increase more in recessions, when industry debt is high.

Chittenden, Michaelas, and Poutziouris (1999) show that during recessions, UK SMEs tend to decrease (increase) their long (short)-term debt levels, with the opposite generally being true during booms. These findings are consistent with the pro-cyclical changes in leverage for (typically small) FCCs. They suggest that this trend may occur as a result of increasing working capital requirements during recessions following the piling up of stocks and delayed payments from customers. Therefore, firms would have to raise short-term debt to finance possible cash flow shortages. On the other hand, during downturns, major investments that would require long-term financing may be delayed or cancelled, lowering long-term debt ratios.

Faulkender and Petersen (2006) estimate that firms with access to PDMs have 35% more debt than firms without access and suggest that when estimating leverage one should include

both the antecedents of its preferred leverage (the demand side) and the variables that measure the constraints on a firm's ability to increase its leverage (the supply side).

Leary (2009) suggests that shifts in the availability of bank loans following capital market supply frictions impact firms' financing mix and this impact depends on whether the firm has access to PDMs. Leary (2009) uses the 1966 credit crunch in the US to show that the leverage of small, bank-dependent firms falls relative to that of large firms with PDM access, following negative loan supply shocks. This is because firms without access to PDMs will need to find alternate sources of capital to avoid capital constraints. These sources may include internal funds, external equity, trade credit, or non-bank private debt. With the exception of the last possibility, all of these substitutions would result in relatively lower leverage following a loan supply contraction. Leary (2009) points out that large firms, on the other hand, shift in the availability of bank loans are likely to affect large firms for two reasons. Firstly, banks' lending to small, risky firms may be more sensitive to credit supply than their lending to larger firms. Secondly, larger firms can more easily substitute toward nonbank public debt sources in response to changes in the cost or availability of bank debt. In addition, survey evidence by Graham and Harvey (2001) suggest that managers of firms with PDMs access routinely time debt issuances to periods where interest rates are low relative to historical rates. Barry, Mann, Mihov and Rodriguez (2008) also show that firms issue more debt, more debt relative to investment spending, and more debt compared to equity when interest rates are low relative to historical rates. Considering that a credit crunch period is often followed by a period of low interest rates, this may be another reason why public debt by larger firms may increase during such periods. Therefore, the use of public debt by firms with PDM access increases, relative to that of small firms, following a credit crunch.

Leary (2009) also suggests that firm size is an important determinant of capital structure, at least in part, because it proxies for differences in bank dependence and PDM access. In this respect, Gertler and Gilchrist (1994) show that after tight money and on the onset of recessions,

credit flows to smaller firms contract relative to credit flows to larger firms indicating that smaller borrowers bear the brunt of tight money.

*2.1. A brief analysis of the 2008 economic recession period*

The 4.4% contraction in the UK GDP in the Q1:2009, compared to the Q1:2008, is associated with a recession and has a dramatic effect on the equity values of UK companies. Indeed, during the same period the FTSE-All Share index lost value by more than 30% (see Figures 1 and 2 in Appendix D). One of the major factors contributing to the 2008 recession is the sudden tightening of conditions to obtain credit following the significant defaults in prime credit derivatives which contained sub-prime mortgages. This situation is synonymous with the loan supply contractions analyzed in Leary (2009) and Faulkender and Petersen (2006). Since the summer of 2007, banks have been seeking to restructure their balance sheets by injecting new capital, selling assets and reining back on their lending, which has a dramatic effect on the amount of lending available for creditworthy businesses in the short-run. This practice produces a marked slowdown in the growth of stock of lending to UK businesses during 2008 and 2009 (see Figures 3 and 4 in Appendix D). Global syndicated bank loans are sparse following the banks' reluctance to lend money and firms setting up new borrowing facilities during this period are facing tighter conditions and higher spreads and fees. This restriction reduces the amount of debt taken on by bank-dependent firms that have no access to PDMs.

On the contrary, unconstrained firms with access to PDMs increase their leverage levels during the recession and loan supply contraction period (Korajczyk and Levy, 2003; Leary, 2009). The rise in the UK corporate bond issues in 2009 suggests that this is the result of difficulties firms are facing in obtaining bank loans and the strong demand from investors following the considerable difference in yields between corporate paper and government bonds. One factor Graham and Harvey (2001), and Barry et al. (2008) suggests, which may be contributing to these increased bond issues, is that interest rates during 2008 and 2009 are

significantly low relative to prior years. Firms with PDM access may be timing their debt issuances to take advantage of the low interest rates.

**3. The Model**

It is not intuitively obvious why the leverage patterns of financially constrained (FC) and financially unconstrained (FU) firms would be affected differently by the business cycle. Hence, in this section, we develop a model in order to understand the cyclical/counter-cyclical nature of the leverage of FC/FU firms in relation to business cycles. Our model incorporates both moral hazard and asymmetric information. Specifically, our model is constructed as follows.

Consider an economy consisting of two firms $i \in \{A, B\}$, and a bond market. We define firm $A$ as *financially unconstrained* (*FU*), and firm B as *financially constrained* (*FC*) (we elaborate on this further below). Furthermore, the management of firm A are of high ability, and the management of firm B are of low ability (again, elaborated further below). All players in the game are risk-neutral, and the discount rate is zero.

The timeline of the game is as follows. At **date 0**, both firms have a new risky project available, requiring investment funds $I > 0$. The project is risky, in that it ultimately (at date 2) either succeeds (with probability $P$), in which case it provides date 2 income of $R > 0$, or it fails (with probability $1 - P$), in which case, it provides zero income. At date 0, both firms simultaneously decide how to finance the new project. Furthermore, at this time, firm $i$ has existing free cash flows equal to $X_i$. We consider the case where $X_A \geq I > X_B$. Therefore, firm A can choose to invest in the project using its free cash flows if it wishes (it is financially unconstrained: FU). Firm B has insufficient free-cash flow to invest in the project: it is financially constrained (FC). Alternatively, at date 0, firms can go to the bond market to raise

the required investment funds. The bond market is assumed to be competitive (that is, loan rates are set competitively). Finally, a firm can decide not to invest in the project at all.

If a firm invests in the project, then, at **date 1**, the firm's management can exert effort into the project, $e_i \in \{0,1\}$, which affects the probability of success as follows: $P_i = p_i + \gamma_i e_i$. Note that $p_i$ is the intrinsic success probability of the project, and is independent of the manager's effort level. $\gamma_i$ is the manager's ability parameter. We consider the case where $p_A > p_B$; and $\gamma_A > \gamma_B$. That is, the intrinsic success probability of firm A's project is higher than that of firm B (firm A's project is of higher quality than firm B's, even before we consider managerial input and skill). Furthermore, the management of firm A have higher ability than the management of firm B. Hence, the expected value of project $i$ is $V_i = P_i R$. Effort is costly: specifically, the cost of effort function is $ce_i$.

At **date 2**, the project succeeds or fails. If the project fails, and the manager has obtained bond finance, the manager faces financial distress costs $F$. The players receive their payoffs, and the game ends.

We wish to consider the effect of business cycles on leverage. In order to do so, we consider two separate, static, cases: booming economy, and economy in recession. We assume the following regarding success probability in the two business cycle cases. When the economy is booming, the skill parameters (for both management A and B) are low. When the economy is in recession, the skill parameter for management B remains low, but the skill parameter for management A increases: specifically, $\gamma_A(boom) < \gamma_A(recession)$: $\gamma_B(boom) = \gamma_B(recession)$.[1] The intuition here is that, when the economy is booming, intrinsic quality of projects is high, and managerial skill is of marginal insignificance (that is, it is not required, or is unable to, create, much added

[1] Throughout the analysis, we retain the assumption that $\gamma_A > \gamma_B$ (that is, manager A is more skilful than manager B), regardless of whether the economy is booming or in recession.

value). When the economy is in recession, managerial skill is now of high importance. Management A possesses such skill, but management B does not.

We will discuss below that this is a critical assumption to drive the counter-cyclical pattern of leverage for the FU firm. If management A had found it easier to create value in the boom than the recession, then we may have obtained a cyclical, rather than counter-cyclical, pattern.

Our model considers both moral hazard (since the managers exert unobservable effort levels, and hence effort-shirking may be a problem) and asymmetric information. In terms of the latter, the bond market cannot determine firm type (A or B) by observation alone. However, the two firms' simultaneous financing decisions provide signals to the market, which affects the bond market's loan rate to the firms. Hence, we are considering an asymmetric information game with Bayesian updating, as follows. Before the firms make their financing decisions, the market's prior beliefs are that each firm has equal probability of being firm A or firm B. After the market observes the financing decisions, the posterior (updated) beliefs are as follows. In the boom state of the economy, if the market observes that only one firm has issued bonds (we assume that the market cannot observe whether the other firm has used internal cash flow to invest in the project, or simply not invested in the project at all), then the market believes that firm to be the financially constrained firm B (FC), while the other firm is firm A (FU). If both firms go to the bond market, the market is unable to update is beliefs, and continues to assign equal probability to each firm being of type A or B.

In the recession state of the economy, the market's beliefs will be reversed: if only one firm issues bonds, the market believes that it is firm A (FU).

In equilibrium, we will need to show that firm A's and B's choices are consistent with market beliefs. In particular, the reversing of beliefs described above will support the FC's (FU's) cyclical (counter-cyclical) leverage compared to the business cycle.

When solving games, we need to solve by backward induction. That is, in our game, we first need to solve for each firm's optimal date 1 effort level, given the date 0 financing choices. Then we move back to date 0 to solve for the equilibrium financing choices. However, although we are solving backwards, it will first be useful to set up the framework of the date 0 financing choice (signalling) stage. We can represent the date 0 game as the following normal form game.

| A\B | Do not Invest | Issue Bonds |
|---|---|---|
| Do not Invest | 1, 2 | 3, 4 |
| Invest using free cash flow | 5, 6 | 7, 8 |
| Issue Bonds | 9, 10 | 11, 12 |

The payoffs in the normal form game are as follows:

$\prod_A = X_A,$ (1), (3)

$\prod_B = X_B.$ (2), (6), (10)

$\prod_B = P_B(R - I(1+r)) + X_B - (1-P_B)F - Ce.$ (4), (8), (12)

$\prod_A = X_A + P_A R - I - Ce,$ (5), (7)

$\prod_A = P_A(R - I(1+r)) + X_A - (1-P_A)F - Ce.$ (9), (11)

These payoffs are explained as follows. If a firm does not invest in the new project, it retains the free cash flow (for example, this could be invested in financial securities at zero NPV). See equations (1) and (3).

If firm A invests using free cash flow (see equations (5) and (7)), the manager's payoff consists of the free cash flow minus the required investment plus the expected income from the

investment minus the cost of effort. In (5) and (7), the second and third terms represent the expected NPV from the project. (Note that firm B cannot invest using free cash flow).

If a firm issues bonds to invest (see, for example, equations (4), (8) and (12) for firm B), the first term reflects the fact that the firm only repays the bondholders in the case of success, form the success income R. The third term reflects the manager's expected financial distress costs (lost reputation etc) from not being able to repay the bondholders in the case of failure.

Next, note that the loan rates are determined in the bond market, given the bondholders' beliefs about firm types. Recall that, in the case of a booming economy, we specify that if a firm unilaterally approaches the bond market, the market believes that that firm is type B (FC). Hence, in the case of (4) and (8) (only firm B approaching the bond market), or (9) (only firm A approaching the bond market), the competitive loan rate $r$ satisfies:

$$P_B I(1+r) = I. \qquad (13)$$

Substituting for (13), equations (4), (8) and (9) become

$$\prod_B = P_B R - I + X_B - (1-P_B)F - Ce. \qquad (4a), (8a)$$

$$\prod_A = P_A R - \frac{P_A}{P_B} I + X_A - (1-P_A)F - Ce. \qquad (9)$$

We note that, in 4a and 8a, the loan rate is accurately priced, as the market is correct in its belief that it is firm B issuing debt. Therefore, firm B's expected repayment is $I$. In (9), the loan rate is too high, since the market is incorrect in its belief about firm type. Therefore, firm A's expected repayment exceeds I.

If both firms approach the bond market, the market cannot update its beliefs, and assigns equal probability to each firm being of either type. Therefore, in (11) and (12), the competitive loan rate satisfies:

$$\frac{P_A + P_B}{2} I(1+r) = I. \qquad (14)$$

Therefore, (11) and (12) become

$$\prod_A = P_A R - \frac{2P_A}{P_A + P_B} I + X_A - (1 - P_A)F - Ce. \qquad (11a)$$

$$\prod_B = P_B R - \frac{2P_B}{P_A + P_B} I + X_B - (1 - P_B)F - Ce. \qquad (12a)$$

Since the market cannot update its belief, its loan rate is given by averaging the probabilities of the two types repaying. Therefore, firm B obtains cheap debt, and firm A obtains expensive debt (this reflects the adverse selection problem in loan rates first identified by Stiglitz and Weiss 1981).

Now, we are in a position to solve the game backwards. We begin by considering the date 1 effort choice, given the date 0 financing choice and date 0 loan rates. First, in the case that firm A has financed the project by free cash flow, equation (5) and (7), under the respective effort levels, become

$$\prod_A (e = 0) = X_A + p_A R - I \qquad (15)$$

$$\prod_A (e = 1) = X_A + (p_A + \gamma_A)R - I - C \qquad (16)$$

Next, consider manager A's payoffs under the loan contract:

$$\prod_A (e = 0) = p_A (R - I(1+r)) + X_A - (1 - p_A)F. \qquad (17)$$

$$\prod_A (e = 1) = (p_A + \gamma_A)(R - I(1+r)) + X_A - (1 - p_A - \gamma_A)F - C. \qquad (18)$$

Now, we assume that

$$\gamma_A R > C > \gamma_A (R - I(1+r) + F). \qquad (19)$$

Given this assumption, under free cash flow financing, manager A exerts high effort, but under bond financing, manager A exerts low effort. Therefore, we consider manager A's best responses to manager B's choice of financing as follows. If manager B does not invest, manager G compares (1), (5) and (9). We note that (5) dominates.

If manager B issues bonds, manager A compares (3), (7) and (11). We note that (7) dominates. Therefore:

**Lemma 1**: *In a booming economy, manager A's dominant strategy is to invest using internal free cash flow.*

Since manager A's dominant strategy is to use internal cash flow, in order to solve for the equilibrium, we only need to compare (6) and (8). We note that (8) > (6) iff

$$qR - I > (1-q)F. \qquad (20)$$

We assume that this is the case. The left-hand side represents the NPV of firm B's project. We assume that in boom times, this is positive. The right hand side represents the expected financial distress costs, which we assume to be low.

Therefore, we state our first main result.

**Proposition 1**: *When the economy is booming, the equilibrium financing choices for the two firms are as follows. Firm A (FU firm) finances the project with internal cash flow. Firm B (the FC firm) finances the project by issuing bonds.*

The intuition for this result is as follows. Firstly, the FU firm has nothing to be gained by issuing debt. Manager G does not need to use debt to commit to high effort level (there is no great marginal benefit from the manager exerting high effort in boom times: also financial distress costs are low, so debt cannot drive high effort). Furthermore, debt is expensive for firm A (high loan rate: adverse selection effect).

Firm B is financially constrained, and so cannot use internal free cash flow. Therefore, manager B's choice is simply between not investing or issuing bonds. As we are in a booming economy, firm B's project has a positive NPV (although this is lower than firm G's NPV). Furthermore, financial distress costs are low. Therefore, manager B (the FC-firm) issues bonds to take the project.

To complete the picture, we now consider the case where the economy is in recession. Firstly, we assume that, due to the recession, $\gamma_B$ reduces. We assume that it reduces such that

$$I > (q + \gamma_B)R.$$

Therefore, even if manager B exerts high effort level, the project has negative expected NPV. Therefore, manager B will be unable to obtain debt. Therefore, (10) > (12). Hence, we are able to focus on manager G's best response to non-investment by manager B.

We assume the following in a recession. Firstly, manager A's ability becomes more important (recall that $\gamma_A(boom) > \gamma_A(recession)$. We assume that this is sufficient to change assumption (19) as follows:

$$\gamma_A R > \gamma_A(R - I(1+r) + F) > C.$$

Now, manager G's ability, and the expected financial distress costs, are high enough that manager G now exerts high effort under debt. Effectively, in bad times, the manager is using debt as a commitment to high effort (this supports the argument of Korajczyk and Levy 2003). The expected financial distress costs under debt commit the manager to higher effort levels, which reduce the ex ante loan rate.[2]

[2] In our model, the manager only considers his expected, ex post, date 2 payoff. Debt is used as a commitment to higher effort as it reduces the ex ante loan rate. In a more complete model, we would consider payoffs in which the manager is rewarded on short-term and long-term firm value. Now, the managers' date 0 choice of financing may affect the ex ante value of equity (as equity-holders would form beliefs about managerial types) *and* (as in the current model) date 0 loan rate (as bond-holders form beliefs about managerial types). Introducing this feature would enrich the model, but, we believe, would not change the qualitative results of interest in this paper (the

Next, we demonstrate that (9) > (5), and (9) > (1). Therefore, manager A's best response to non-investment by B is to issue bonds. Hence, our next result is as follows:

**Proposition 2**: *In recession, manager B does not invest in the project. Manager G issues bonds to invest in the project.*

The intuition is that, in recession, manager B's project becomes so bad that he is unable to access the debt market, and so does not invest. Manager G now switches to debt to alleviate the agency problem, in order to commit to high effort.

Combining proposition 1 and 2, we observe that our model suggests that FC firms have pro-cyclical leverage patterns, while FU-firms have counter-cyclical leverage patterns.

Our model emphasises an interesting factor behind the counter-cyclical leverage patterns of FU firms. Our analysis suggests that such countercyclical pattern depends upon managerial effort becoming more important in an economic downturn.

Having provided theoretical support for the leverage patterns of FC and FU firms, we now turn to our empirical analysis.

## 4. Data and methods

### *4.1. Sample selection and data period*

This study employs a stratified sample of 155 companies, filtered from the FTSE All-Share Index, and from 12 different market sectors. This index contains all 619 companies listed on the London Stock Exchange (LSE) main market, which represents approximately 98% of the UK's market capitalisation. Therefore, the sample offers a broad range of firms which allows for a meaningful segregation with respect to the financial constraint levels and PDM presence. Firms which operate in the financial services sector are excluded. This paper uses annual data from Datastream for the 2001-2011 period. This period comprises a high level of GDP growth

cyclical/counter-cyclical nature of FC/FU leverage in relation to the business cycle). Hence, we leave this extension for future research. Such an extension would be inspired by the debt signalling model of Ross (1977).

between 2001 and 2007, a major fall in growth during 2008, and the occurrence of double deep recession in the following years, thus providing a good business cycle shift situation.

### *4.2. Data segregation*

#### *4.2.1. Financially constrained vs. financially unconstrained companies*

In accordance with previous studies, the sample is split into two categories: FCCs and FUCs. The literature proposes several ways for defining financial constraints. Kashyap et al. (1994) use the existence of a bond rating to differentiate FCCs from FUCs. This study adopts the approach of Korajczyk and Levy (2003) and Fazzari, Hubbard, and Petersen (1988) where a FCC is defined as one which does not have sufficient resources to undertake investment opportunities and which faces severe agency costs when accessing financial markets. Korajczyk and Levy (2003) use a high retention rate combined with the existence of investment opportunities to segregate FCCs from their counterparts. Firms with limited access to external financing may need to retain a large proportion of their earnings to consider future investment opportunities. This limitation would require them to avoid distributing any dividends or pay low dividends. This study adopts three criteria to label a firm as FCC: i) The minimum average retention ratio ([after-tax profit –dividends paid]/after-tax profit) is 75% over the period (firms with negative retention ratios are excluded); ii) The average market-to-book ratio is greater than 1 over the period; iii) The firm must be included in one of the 12 market sectors, which are aerospace and defence; electronic and electric equipment; food and beverage producers; general retailers; industrial engineering; media; real estate; healthcare and pharmaceuticals; software and computer services; support services; telecommunications; and travel and leisure). 46 companies meet these criteria and the remaining 109 firms are labelled as FUCs.

*4.2.2. Firms with and without access to PDMs*

To examine the effects of a loan supply contraction on leverage, the sample is grouped into companies with and without access to PDMs. The presence of quoted bonds on the LSE is used to determine whether the company has access to PDMs where segregation by presence of a bond rating is adopted (Kashyap, Lamont and Stein, 1994). 34 out of 155 firms are found to have bonds quoted on the LSE with the majority (62%) being FTSE-100 companies. Leary (2009), Gertler and Gilchrist (1994), and Oliner and Rudebusch (1996) use firm size to proxy for capital market access. This metric is a less direct measure that may relate with PDMs access following the higher probability of liquidity constraints in smaller firms.

*4.3. Dependent variables*

The study employs four different measures of leverage to capture the effects of business cycle changes on the different categories of liabilities. The first two measures are i) the ratio of total debt to total assets in book values (B*DR*) and ii) the ratio of the sum of book value of debt and market value of equity to total assets (*MDR*). The other two measures are the ratio of short-term debt to total assets (*SDR*) and the ratio of long-term debt to total assets (*LDR*). While BDR and MDR examine firms' total debt position, SDR and LDR allow for the examination of the business cycle influences on the maturity structure of liabilities. Chittenden et al. (1999) point out that the leverage costs of short term liabilities may differ from those of long term liabilities and that firms may have separate policies with respect to short term and long term debt thus implying that business cycle shifts may affect short term liabilities differently from long term liabilities. Unlike BDR and MDR, SDR and LDR include non-financial debt items such as trade credit. Bevan and Danbolt (2002) show that trade credit and equivalent account for more than 62% of total liabilities of large UK firms, illustrating its significance as an element of corporate financial structure. They suggest that an analysis of leverage based solely upon long-term debt provides only part of the story.

*4.4. Explanatory variables*

*4.4.1. Firm-specific factors*

The asset structure of the firm (TANGIBILITY) is measured as net fixed assets divided by total assets (Ferri and Jones, 1979). A debate exists on the link between leverage and tangibility. Rajan and Zingales (1995) suggest a direct link since the higher the tangibility, the more assets could serve as collateral, which in turn is likely to increase leverage. According to Stiglitz and Weiss (1981), lenders seek collateral to respond to both adverse selection and moral hazard risks. Conversely, Grossman and Hart (1982) argue that lenders monitor with difficulty the capital outlays of firms with a high proportion of less collateralizable assets and therefore such firms may choose a higher debt level to limit their managers' consumption of perquisites. This explanation implies a negative link.

Firm profitability (PROFIT) is measured as the ratio of earnings before interest, taxes and depreciation to total assets. Several studies (Titman and Wessels, 1988; Rajan and Zingales, 1995; Booth et al., 2001) expect a negative link between leverage and profitability as the pecking order hypothesis states that firms finance their needs in a hierarchical fashion, relying first on retained earnings before using debt and external equity. This point implies that firms with higher profits (and thus retained earnings) would have a lower leverage ratio. Following Titman and Wessels (1988); Rajan and Zingales (1995); firm size (SIZE) is measured as the natural logarithm of deflated total sales. Titman and Wessels (1988) argue that relatively larger firms tend to be more diversified and less prone to bankruptcy and thus can enjoy higher leverage ratios. Similarly, Leary (2009) suggests that size is an important factor because it proxies for debt market access. These concepts thus imply that a positive correlation between size and leverage. Rajan and Zingales (1995) suggest that firm size could be a proxy for the amount of information outside investors have, which therefore should increase their preference for equity relative to debt. This theory therefore suggests that leverage is negatively related to firm size.

Future growth opportunities (GROWTH) is measured in two ways: i) intangible assets over total assets (GROWTH1); total assets minus book value of equity plus market value of equity, scaled by total assets (GROWTH2). Ross (1977) argues that good firms tend to issue debt to distinguish themselves from bad firms, suggesting that growth options and leverage are positively related. However, Jensen's (1986) free cash flow theory suggests that firms with high growth options should have a lower leverage to be able to take on the many positive NPV investment opportunities. Therefore, in this case, firm growth should be negatively related to leverage. Following Titman and Wessels (1988), the non-debt tax shield (NDTS) is equal to depreciation expenses over total assets. The tax deductions for depreciation and investment tax credits are substitutes for the tax benefits of debt. As a result, firms with large non-debt tax shields relative to their expected cash flows should use less debt. Following this intuition, such shields are expected to be negatively related to leverage (DeAngelo and Masulis, 1980).

Finally, time-varying company risk is accounted for by calculating in each year a firm's beta (BETA) as suggested by the capital asset pricing model (CAPM) theory.[3] This factor should also reflect the market reaction of cash flow volatility of the firm.

*4.4.2. Macroeconomic factors*

Apart from the above firm-specific variables, the macroeconomic variables are intended to proxy for the time-period effects that may influence leverage. Korajczyk and Levy (2003) and Kiyotaki and Moore (1997) include such variables to take account of the degree of agency problems and optimal leverage levels, which are affected by the aggregate distribution of wealth between managers and outside shareholders. As managerial compensation is tied to corporate profits (bonuses) and equity performance (share options), the macroeconomic factors can capture this distribution effect.

[3] The period for beta is chosen as both 60 months and 36 months for robustness purposes.

Since this work focuses on the time-period effects on leverage, the study uses two macroeconomic variables. These include the GDP growth rate (GDP) over the previous year (see Figure 1) (following Gertler and Gilchrist, 1994; Kashyap, Stein and Wilcox, 1993; Leary, 2009), and the equity market return (FTAS) (see Figure 2) (following Korajczyk and Levy, 2003; Leary, 2009). The former is measured as the growth rate of real GDP over the period 2001 to 2011, and the latter is measured as the one-year growth rate of the FTSE All-Share Index. These macroeconomic factors should have an inverse effect to the 2008-time dummy variable and accordingly the sign of their coefficients should be opposite to that of the 2008 dummy variable. This means they should be positively linked to leverage for the FCCs and firms without PDM access, to indicate a pro-cyclical leverage pattern, and negatively linked to leverage in the case of the FUCs to indicate a counter-cyclical leverage pattern.

The fall in UK GDP growth and FTSE All-Share Index illustrate that the effect of the current financial crises on UK firms started to emerge in the first quarter of 2008. This occurrence implies that any effect of a business cycle shift on the firms' financing choices should begin to be reflected for the 2008 time period. To examine this, a dummy variable is constructed (DUMMY 2008), which is one in 2008 and zero in other years. This variable measures the effect of a business cycle shift on leverage ratios. A positive sign implies an increase in debt during contractions (counter-cyclical pattern) and a negative sign implies a decrease in debt during contractions (pro-cyclical pattern).

The study examines if a business cycle shift affects leverage by looking at the DUMMY 2008 coefficient. Following the literature, we also examine if DUMMY 2008 is negatively (positively) related to leverage for the FCCs (FUCs). In addition, since the effect of the credit crunch also began to emerge in 2008, DUMMY 2008 is used to test whether the credit crunch had a different effect on firms with PDM access compared to those without. Following Leary (2009), this paper therefore considers if leverage is negatively linked to the interaction dummy variable (DUMMY INTER), which is DUMMY 2008 multiplied by DUMMY PDM, which is

one for firms without PDM access and zero, otherwise. To investigate whether PDM access and the credit crunch affect firms with future growth options differently, this paper also constructs two additional interaction variables, that is, GROWTH*DUMMY PDM, and GROWTH *DUMMY 2008.

*4.5. The model*

The overall unbalanced panel data set comprises 155 companies with six-years for most companies. Following the differing relationship between leverage and business cycle shifts for FCCs and FUCs, the sample is divided into two, one consisting solely of FUCs (N=109) and another for FCCs (N=46). The following model is estimated for these data sets (*i*: firm; *t*; time).

$$DR_{it} = \alpha_0 + \alpha_1 PROFIT_{it} + \alpha_2 SIZE_{it} + \alpha_3 TANGIBILITY_{it} + \alpha_4 GROWTH_{it} + \alpha_5 NDTS_{it} + \alpha_6 BETA_{it} + \alpha_7 FTAS_t + \alpha_8 GDP_t + \alpha_9 \text{DUMMY 2008} + \varepsilon_{it} \qquad (1)$$

where the dependent variable, DR, is either BDR, MDR SDR or LDR; $\varepsilon_{it}$ is the error term. Appendix A provides all variable definitions.

To test the effects of the loanable funds supply shock on leverage, the study adopts the following model, similar to Leary (2009). The model is run on the sample of 155 firms where firm-invariant and time-invariant differences in overall means are captured by $\beta_9$ and $\beta_{10}$, respectively. The coefficient of interest is $\beta_{11}$, which measures the change in leverage due to the supply shock for the firms without access to PDMs, relative to their counterparts.

$$DR_{it} = \beta_0 + \beta_1 PROFIT_{it} + \beta_2 SIZE_{it} + \beta_3 TANGIBILITY_{it} + \beta_4 GROWTH_{it} + \beta_5 NDTS_{it} + \beta_6 NDTS_{it} + \beta_7 FTAS_t + \beta_8 GDP_t + \beta_9 \text{DUMMY 2008}_t + \beta_{10} \text{DUMMY PDM}_i + \beta_{11} \text{DUMMY INTER}_{it} + \beta_{12} \text{GROWTH} * \text{DUMMY PDM}_{it} + \beta_{13} \text{GROWTH} * \text{DUMMY 2008}_{it} + \varepsilon_{it} \quad (2)$$

## 5. Data analysis

### *5.1. Summary statistics of segregated data*

#### *5.1.1. Financially constrained vs. financially unconstrained companies*

Table 1 shows that FCCs are smaller than FUCs, and the size difference is statistically significant. This suggests a link between financial constraints and firm size, being consistent with Fazzari et al. (1988) and Korajczyk and Levy (2003). Further, FCCs have significantly lower leverage and long-term ratios whereas they have significantly higher beta values. Korajczyk and Levy (2003) state that higher beta for FCCs suggests that the relative movement in equity values is not driving the difference in leverage pattern across the two samples.

**[INSERT TABLE 1 HERE]**

Appendix B reveals that both BDR and LDR of FCCs indicate a slight downward shift towards 2008, which is more apparent in SDR. MDR is quite volatile throughout the period because of the change in market value of equity. Interestingly, signs of falling leverage ratios started to emerge in 2007. This may be because banks began to reign back on their lending since summer 2007, possibly having an effect on the amount of credit available to smaller FCCs. This downward shift in LDRs towards the financial crisis period is an indication of a pro-cyclical leverage pattern in the capital structure choice of FCCs.

The changes in debt ratios of FUCs in Appendix B show a similar but opposite trend to those in FCCs. In this case, BDR and LDR are increasing as they approach 2008, showing a counter-cyclical leverage pattern. This is controversial since it indicates that FUCs are actually increasing their leverage ratios during times which put the highest strain on their solvency levels.

According to Korajczyk and Levy (2003), FUCs increase leverage during downturns to realign managers' incentives with shareholders, considering the greater reduction in a levered manager's wealth relative to outside shareholders during such periods. It may also be due to the reduction in retained earnings during recessions which causes them to require more external financing.

An explanation that the main problem with the current economic system is its debt laden nature may reflect the controversy. To overcome the current financial crisis, firms may need to convert systematically debt to equity rather than aggressively increase leverage and hence cause fragility and hidden volatility. Bernanke and Campbell (1988) also suggest that higher leverage may magnify the sensitivity of a firm's reduction in net worth or equity values following negative shocks in the economy, which in turn increases pressure on the firm's solvency ratio (i.e., total net worth/total assets). In addition, Hackbarth et al. (2006) show that default thresholds are countercyclical leading to higher default rates in recessions. Similarly, Shleifer and Vishny (1992) infer that a firm's debt capacity depends on current economic conditions with companies typically being able to borrow more funds during booms. Shleifer and Vishny (1992) point out that when recovery rates are pro-cyclical, corporate debt capacity can be up to 40% larger in booms than in contractions.

The SDR of FUCs remains relatively stable over the period. This stability suggests that for this group SDR is unaffected by shifts in the business cycle, which makes sense considering that the largest portion of short-term liabilities consists of liabilities used for transaction purposes rather than financing purposes (Rajan and Zingales, 1995). In addition, the total debt does not make up a very high proportion of the total liabilities and ranges from 35% of total liabilities for FCCs, to 44% of total liabilities for FUCs. This difference may possibly imply the presence of constraints in accessing the PDMs.

### *5.1.2. Companies with and without access to PDMs*

When comparing firms with PDM access to the ones without, the latter have substantially lower debt ratios except SDR (see Table 1), consistent with Leary (2009). Faulkender and Petersen (2006) state that it is not surprising that firms with a debt rating have higher leverage ratios, since such firms tend to have characteristics which theory predicts would cause them to demand more debt. For instance, they show that firms whose assets are mainly tangible are more likely to have a bond rating and in turn choose to have higher leverage ratios. The fact that companies with PDM access are larger is another reason why those firms tend to have higher TDR. Hovakimian, Opler, and Titman (2001), Titman and Wessels (1988), and Ferri and Jones (1977) find leverage to be positively correlated with size as larger firms are less risky, more diversified, have lower financial distress costs and lower issue costs owing to economies of scale.

Also, firms without access to PDMs are less prone to financing their operations through short-term debt. These statistics indicate that the extent of PDM access has an effect on the type and amount of debt. The fact that firms with PDM access have a significantly lower market-to-book ratio and a higher leverage ratio is in line with Jensen's (1986) free cash flow theory, which suggests that firms with low growth opportunities should have a higher level of debt to avoid investing their free cash flow in value-reducing investment projects.

Being inconsistent with Leary (2009), Appendix B shows that the leverage of smaller firms with PDM access does not fall relative to their counterparts. Also, the main upward shift in the BDR of firms with PDM access occurs between 2007 and 2008, implying that the negative loan supply shocks together with the contraction had a positive effect on their leverage. Leary (2009) attributes two main reasons for this. Firstly, banks' lending to larger firms is less sensitive to credit supply shocks than their lending to smaller (riskier) firms. Secondly, firms with PDM access can more easily substitute towards non-bank public debt sources in response to changes in the cost or availability of bank debt. In addition, Graham and Harvey (2001) and Barry et al. (2008) suggest that firms time debt issuances when interest rates are relatively low.

The recent drastic fall in UK interest rates could possibly have played its part in prompting this reaction. However, the reduction in leverage ratios is more apparent from 2009 onwards.

This relationship of increasing leverage during negative loan supply shocks is less reflected for firms without PDM access since the upward shift seems to be a gradual one triggered off in 2006, way before any loan supply contractions began to affect firms. Surprisingly, an upward shift is registered for the 2008 period for all ratios, since studies show that, as a result of negative loan supply shocks, companies with no PDM access tend to find alternate sources of capital to debt financing, such as internal funds, external equity and trade credit, all of which results in relatively lower leverage levels (Leary, 2009). However, the contractions in the debt levels of these companies are perhaps lagged as they only began in 2010.

### *5.2. Regression analyses*

This study employs the OLS, fixed effects (FE) and random effects (RE) estimation methods to be consistent with the literature, and it also uses the censored Tobit technique as the dependent variables take values only between zero and one. As a general note, Hausman test's p-values in this study are always far lower than the conventional level of 0.05, favoring FE over RE method. Further, as implied by the correlation matrix in Appendix C and the unreported variance inflation factors (VIFs <10) for all explanatory variables, the regression results are robust to the multicollinearity problem. The estimation results are only for GROWTH 2 as the estimates are generally insensitive to the two growth definitions. Furthermore, as the interdependence of observations at firm-level can cause correlations among the residuals, using the statistical package Stata 12, we clustered the standard errors for the FE and RE regressions.

#### *5.2.1. The association of debt ratios with firm-specific and market-specific factors*

Table 2 reports the results for FUCs and FCCs by considering the influence of firm and market-specific factors on overall book and market leverage. The significantly positive

coefficient on DUMMY 2008 in Panel A is a clear indication of a counter-cyclical leverage pattern in FCCs, the first category. This result implies that the 2008 crisis actually increased FCCs' book leverage ratio, after considering various factors. However, this does not seem to be the case for the market leverage in Panel B since this dummy variable generates an insignificant coefficient. The insignificant coefficient of FTAS suggests that a change in the FTSE market index does not affect the book or market leverage ratios of FCCs. On the other hand, it appears GDP growth rate does affect the financing mix of FCCs in the UK by increasing their book leverage in Panel A but not the market leverage in Panel B. Regarding some of the control variables, book or market leverage seems not to be linked to profitability (unlike Booth et al., 2001; Myers, 1984; Titman and Wessels, 1988) while it is positively related to size and tangibility (Rajan and Zingales, 1995; Titman and Wessels, 1988).

Panel A, Table 2 suggests the presence of a counter-cyclical book leverage pattern for FUCs, the second category. The significantly positive coefficient on DUMMY 2008 implies that as a result of the 2008 crisis, the book debt ratios of FUCs actually increased; signifying a counter-cyclical leverage pattern. This result contrasts with the statistically significant and positive coefficient on FTAS, which signifies a pro-cyclical leverage pattern since a rise in market return increases book leverage. However, GDP growth seems to negatively and significantly influence book and market leverage ratios of FUCs, by which a counter-cyclical pattern is implied. Moreover, market leverage does not get affected significantly by FTAS or 2008 dummy in Panel B. Among the control variables, profitability has insignificant coefficients for book leverage, which is against the trade-off theory that predicts that profitable firms should have high leverage. However, it has significant and negative coefficients for market leverage, which confirms the pecking order theory. The negative effect of GROWTH for both leverage definitions is not in line with Ross' (1977) incentive signalling approach, which states that good

firms (with growth options) issue debt to distinguish themselves from bad firms. The NDTS coefficient does not comply with the theory either.

**[INSERT TABLE 2 HERE]**

Table 3 provides the results for FUCs and FCCs by considering the influence of firm and market-specific factors on short-term and long-term leverage. The significant coefficients on FTAS, GDP, and DUMMY 2008 in Panel A reveal that shifts in the business cycle or by macroeconomic variables for both FCCs and FUCs do influence short-term financing. This conclusion is important since following shifts in the business cycle, firms generally do not alter short-term liabilities that are generally applicable for transaction purposes but would rather engage in altering their longer-term financing liabilities. This result also illustrates the relevance of not avoiding any market frictions with respect to short-term credit availability. The regression results suggest that FCCs reduced their short-term financing in 2008, which is a pro-cyclical pattern supported also by the positive effect of GDP growth on this type of financing. However, higher stock market performance caused them to reduce their short-term leverage. For the FUCs, the story is different since they increased short-term debt financing during 2008 as the corresponding dummy variable suggests. This finding is consistent with that in Chittenden et al. (1999) who find that UK companies tend to increase their short-term debt during recessions citing increased working capital requirements and piling up of stocks as reasons for this. Moreover, the stock market movements does not seem to affect short-debt leverage of FUCs whereas improved GDP figures appear to have increased this ratio.

As for the firm-specific factors, the negative sign on GROWTH indicates that SDR for both categories decreases as a result of increased growth prospects, inconsistent with Jensen's (1986) free cash flow argument. The insignificant coefficient on PROFIT for FCCs and FUCs is not in accordance with the pecking order or trade-off theory. The direct size effect seems to matter only for the OLS results. The positive coefficient on NDTS in both groups is against the

theory. In both groups again, asset tangibility does not comply with the theory. In addition, firm risk measured by beta does not seem to affect SDR.

A different pattern emerges when LDR is the dependent variable in Panel B, Table 3. None of the macroeconomic factors (all with insignificant coefficients) seem to affect long-term borrowing of FUCs. This may suggest that long-term leverage of FUCs is immune from any changes in the economy and stock market. The positive and significant sign of DUMMY 2008 imply that economic recessions increase the long-term debt ratios of FCCs. This is not in line with Chittenden et al. (1999) who cite delays or cancellations of major investments as the reason for the downward shift in the LDRs. The findings that both higher GDP growth and stock market performance lead FUCs to borrow more long-term is a pro-cyclical pattern. On the other hand, regarding the control variables, firm size, NDTS and asset tangibility influence LDR of both groups as predicted by the theories. Firm beta impacts significantly and positively only the LDR of FUCs.

**[INSERT TABLE 3 HERE]**

*5.2.2. The effects of loan supply contractions on capital structure choice*

Table 4 shows how the book leverage (Panel A) and market leverage (Panel B) are affected by the supply contractions and other market factors using the full sample. The main factor is the coefficient on DUMMY INTER, which measures the change in leverage due to supply shocks for the firms with no access to PDMs. The statistically insignificant coefficients in both panels show that there is no particular difference in the leverage between these two types of companies resulting from the 2008 time period, which is being used as a proxy for the beginning of the credit crunch period. This insignificant coefficient may be due to a lag in the effect of the credit supply shock on the leverage ratios (see e.g., Figure 5 in the appendix), with the possibility that the effects may show up in later financial years. It is also possible that the loan supply shock affects firms that are much smaller than the ones included in the sample, considering that the sample consists only of companies quoted on LSE's main market. The

coefficients on DUMMY 2008 are positive and significant under FE and RE methods in both panels, suggesting that the net effect of 2008 is the increased leverage ratios in the UK.

The statistically significant coefficient on DUMMY PDM shows that a distinction exists between firms with and without access to PDMs. However, as seen above, this distinction is not related specifically to any factors resulting from the 2008 time period. The positive DUMMY PDM coefficient shows that, after controlling for various factors, having no access to PDMs actually increased those firms' leverage ratios in both panels. This finding also shows that the degree of access to PDMs can be considered as a factor that determines the amount and type of leverage. Additionally, the FTAS and GDP coefficients tend to suggest that the higher activity level in the stock market and economy increases book leverage ratios. However, for the MDR in Panel B, FTAS has no influence, and more interestingly higher GDP growth rates reduced market leverage.

The results suggest that overall leverage relates inversely to growth options in both panels. The positive and significant coefficient on GROWTH*DUMMY PDM in Panel A suggests that the negative influence of GROWTH on book leverage is lessened for firms without PDM access. On the other hand, the negative and significant coefficient on GROWTH*DUMMY 2008 in Panel B reveals that the negative influence of GROWTH on market leverage is stronger for firms without PDM access. Therefore, the influence of the 2008 crisis and the PDM access on financing choices of firms also depends on the degree of growth opportunities.

As for the control variables, the coefficient estimates on GROWTH, SIZE and TANGIBILITY in both panels confirm the theories; PROFIT and NDTS provide mixed results; and BETA coefficients are always positive and significant across leverage definitions and estimation methods.

**[INSERT TABLE 4 HERE]**

## 6. Conclusion

This study shows that the recent business cycle shifts and economic contractions affect UK firms' leverage ratios. In the case of capital market supply frictions, the findings reveal that although a distinction exists between the leverage ratios of firms with access to PDMs and those without, this distinction is not related specifically to the 2008 crisis. Notwithstanding this occurrence, the findings show an upward trend in the leverage ratio of firms with PDM access occurring between 2007 and 2008. Further evidence of this is that there has been a recent surge in UK corporate bond issues. In line with Leary (2009), Graham and Harvey (2001) and Barry et al. (2008), this finding indicates that as a result of the 2008 crisis and the contraction, UK firms with PDM access are substituting bank debt with non-bank public debt sources and possibly timing their debt issuances to take advantage of the historically low interest rates.

The results also show that some distinctions exist between the leverage patterns of FUCs and FCCs following shifts in the business cycle. FCCs have a counter-cyclical book leverage pattern, indicating that their book debt ratios decrease during expansions and increase during contractions. According to Kiyotaki and Moore (1997), this result implies that FCCs in the UK do not reduce their borrowing when collateral values are low, which generally occurs due to falls in equity market returns and corporate profits. As the majority of FCCs do not have access to PDMs (91%), as in Faulkender and Petersen (2006), one would normally expect a reduction in leverage stemming from the current market constraints FCCs are facing to obtain financing through bank loans. Therefore, this is a surprising finding, noting also that no cyclicality is reported for market leverage.

In line with Levy and Hennessy (2007), FUCs in the UK have a counter-cyclical book leverage pattern with debt ratios decreasing (increasing) during expansions (contractions). These findings suggest that FUCs are following the pecking order hypothesis and thus resorting to more external financing as a result of reductions in retained earnings subsequent to the contraction (Korajczyk and Levy, 2003). It may be that managers' incentives are being realigned

with shareholders through an increase in leverage as a result of the greater relative reduction in managers' wealth during downturns. As previously seen, FUCs are issuing more bonds during recessions than at any time in history, thus complementing the overall upward shift in debt ratios.

Appendix B suggests a decreasing trend in mean leverage ratios of FCCs from 2008 onwards, which can have an impact on the real investment made by these firms (Duchin et al., 2010; Gertler and Gilchrist, 1993; Kashyap et al., 1994; Levy and Hennessy, 2007). This reduction, in turn, may negatively affect the real activity in the economy thus prolonging the recovery. On the other hand, increases in the leverage of FUCs during contractions may be controversial as these firms are actually increasing their leverage ratios when solvency matters most. Firms' decreasing debt capacity and increasing default threshold during downturns amplifies increasing debt financing that causes fragility in the economic system (Hackbarth et al., 2006; Shleifer and Vishny, 1992). However, increasing debt financing during downturns may have a positive effect on real investment made by such companies, which in turn stimulates the recovery. This possibility raises the question of whether the benefits resulting from increasing debt during downturns outweigh the drawbacks, which would be an interesting topic to address in future work.

In examining empirically the effects of business cycle shifts on the debt maturity structure, this study shows that the business cycle shifts and macroeconomic factors affect the short-term debt ratios of both FUCs and FCCs differently. For instance, FCCs showed a pro-cyclical pattern and reduced their short-term financing in 2008. However, FUCs increased their short-term leverage in the same period. Furthermore, none of the macroeconomic factors seem to affect long-term borrowing of FUCs.

The regression results for the full sample suggest that the net effect of 2008 is the increased leverage ratios in the UK, and the influence of the 2008 crisis and the PDM access on financing choices of firms also depends on the degree of growth options.

Our theoretical model suggests that when the economy is booming financially unconstrained firms finance the project with internal cash flow whereas constrained firms finance the project by issuing bonds. On the other hand, during recessions, firms with constraints should not invest in the project but firms having no financial constraints should issue bonds to invest in the project.

Several factors exist beyond the traditional firm, industry, and country specific variables that influence firms' financing decisions. Factors such as economic cycles, market timing opportunities, bank loan supply contractions, financial constraints, PDM access and their association with corporate growth options seem to affect corporate capital structure, and all seem to interact with one another, to complicate the capital structure puzzle.

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Table 1. Descriptive statistics for the firm-specific factors

| Variable | All | FCC | FUC | PDM | No PDM | All | FCC | FUC | PDM | No PDM |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean | | | | | Standard deviation | | |
| *B*DR | 0.26 | 0.18 | 0.29*** | 0.36 | 0.23*** | 0.21 | 0.21 | 0.20 | 0.18 | 0.20 |
| *MDR* | 0.24 | 0.20 | 0.26* | 0.32 | 0.22*** | 0.21 | 0.25 | 0.20 | 0.20 | 0.21 |
| SDR | 0.04 | 0.04 | 0.05 | 0.05 | 0.04 | 0.07 | 0.06 | 0.07 | 0.06 | 0.07 |
| LDR | 0.21 | 0.15 | 0.24*** | 0.31 | 0.19*** | 0.20 | 0.21 | 0.20 | 0.18 | 0.20 |
| GROWTH1 | 0.22 | 0.22 | 0.22 | 0.22 | 0.21 | 0.21 | 0.22 | 0.21 | 0.20 | 0.21 |
| GROWTH2 | 1.93 | 1.74 | 2.01 | 1.82 | 1.97* | 1.84 | 1.20 | 2.04 | 1.25 | 1.98 |
| PROFIT | 0.11 | 0.02 | 0.15*** | 0.12 | 0.11 | 0.23 | 0.35 | 0.14 | 0.12 | 0.25 |
| SIZE | 13.15 | 12.05 | 13.59*** | 14.21 | 12.84*** | 2.14 | 2.05 | 2.01 | 2.81 | 1.79 |
| TANGIBILITY | 0.31 | 0.24 | 0.35*** | 0.40 | 0.29*** | 0.28 | 0.27 | 0.27 | 0.29 | 0.27 |
| NDTS | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 | 0.03 |
| BETA | 1.19 | 1.59 | 1.03** | 1.07 | 1.23 | 1.16 | 1.89 | 0.62 | 0.65 | 1.27 |

| Variable | All | FCC | FUC | PDM | No PDM | All | FCC | FUC | PDM | No PDM |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Minimum | | | | | Maximum | | |
| *B*DR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.91 | 0.98 | 0.94 | 0.98 |
| *MDR* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.97 | 0.98 | 0.97 | 0.98 |
| SDR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.82 | 0.56 | 0.82 | 0.36 | 0.82 |
| LDR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.91 | 0.99 | 0.91 | 0.99 |
| GROWTH1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.82 | 0.80 | 0.82 | 0.77 | 0.82 |
| GROWTH2 | 0.37 | 0.37 | 0.58 | 0.73 | 0.37 | 31.87 | 9.58 | 31.87 | 10.85 | 31.87 |
| PROFIT | -5.29 | -5.29 | -1.00 | -0.75 | -5.29 | 1.56 | 0.38 | 1.56 | 0.44 | 1.56 |
| SIZE | 0.69 | 0.69 | 0.69 | 0.69 | 0.69 | 17.51 | 16.46 | 17.51 | 17.51 | 16.88 |
| TANGIBILITY | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 | 0.98 | 0.99 | 0.96 | 0.99 |
| NDTS | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.25 | 0.21 | 0.15 | 0.25 |
| BETA | -6.20 | -6.20 | -0.38 | -0.06 | -6.20 | 18.39 | 18.39 | 4.25 | 4.25 | 18.39 |

*Notes*:
*** (**) (*) indicates that, using t-test, the mean difference of variables between two groups (i.e., FCC vs. FUC, and PDM vs. no PDM) is significant at the 1%, 5% and 10% level, respectively. See Appendix A for the definition of the variables.

Table 2. The effect of firm- and market-specific factors on overall leverage

| *Panel A* | *Financially constrained companies* *Dependent variable: BDR* | | | *Financially unconstrained companies* *Dependent variable: BDR* | | |
|---|---|---|---|---|---|---|
| | OLS | RE | FE | OLS | RE | FE |
| CONSTANT | -0.427(0.063)*** | -0.080(0.080) | -0.034(0.099) | -0.014(0.034) | 0.213(0.165) | 0.437(0.393) |
| GROWTH | -0.015(0.005)*** | -0.006(0.004) | -0.003(0.004) | -0.001(0.003) | -0.012(0.007)* | -0.014(0.070)** |
| PROFIT | 0.009(0.015) | -0.005(0.017) | -0.012(0.018) | 0.003(0.064) | -0.030(0.071) | -0.028(0.073) |
| SIZE | 0.024(0.004)*** | 0.014(0.006)** | 0.012(0.007)* | 0.014(0.002)*** | 0.003(0.011) | -0.010(0.027) |
| TANGIBILITY | 0.510(0.045)*** | 0.343(0.087)*** | 0.212(0.108)** | 0.252(0.018)*** | 0.090(0.047)** | -0.053(0.147) |
| NDTS | -0.708(0.228)*** | 0.182(0.301) | 0.473(0.355) | -0.152(0.203) | 0.055(0.587) | 0.307(0.889) |
| BETA | 0.001(0.003) | -0.001(0.003) | -0.001(0.003) | 0.034(0.012)*** | 0.020(0.011)* | 0.018(0.014) |
| FTAS | 0.001(0.001) | 0.001(0.001) | 0.001(0.001) | 0.002(0.001)** | 0.002(0.001)** | 0.001(0.0006)* |
| GDP | 0.012(0.005)** | 0.011(0.005)** | 0.011(0.005)** | -0.002(0.001)** | -0.005(0.003)* | -0.002(0.001)** |
| DUMMY 2008 | 0.035(0.016)** | 0.052(0.030)* | 0.055(0.028)** | 0.036(0.013)** | 0.038(0.015)*** | 0.039(0.015)*** |
| *Adjusted* $R^2$ | 0.467 | 0.447 | 0.057 | 0.131 | 0.111 | 0.042 |
| *F* ($\chi^2$) *statistic* | 48.31*** | 31.48*** | 2.08* | 31.61*** | 28.52*** | 2.83*** |
| *N* | 468 | 468 | 468 | 1162 | 1162 | 1162 |
| *Panel B* | *Financially constrained companies* *Dependent variable: MDR* | | | *Financially unconstrained companies* *Dependent variable: MDR* | | |
| | OLS | RE | FE | OLS | RE | FE |
| CONSTANT | -0.431(0.078)*** | -0.129(0.127) | -0.099(0.166) | 0.057(0.034)* | 0.121(0.099) | 0.093(0.247) |
| GROWTH | -0.034(0.008)*** | -0.026(0.011)** | -0.023(0.011)** | -0.008(0.005)* | -0.017(0.010)* | -0.018(0.010)* |
| PROFIT | -0.038(0.042) | -0.043(0.042) | -0.047(0.040) | -0.355(0.054)*** | -0.296(0.046)*** | -0.288(0.046)*** |
| SIZE | 0.031(0.005)*** | 0.021(0.01)** | 0.020(0.012)* | 0.008(0.002)*** | 0.007(0.006) | 0.011(0.017) |
| TANGIBILITY | 0.526(0.055)*** | 0.396(0.081)*** | 0.294(0.143)** | 0.351(0.019)*** | 0.251(0.060)*** | 0.123(0.125) |
| NDTS | -0.687(0.295)** | 0.496(0.428) | 0.914(0.487)* | -0.489(0.196)** | -0.360(0.425) | 0.156(0.600) |
| BETA | -0.005(0.003)* | 0.001(0.005) | 0.002(0.005) | 0.076(0.009)*** | 0.062(0.012)*** | 0.060(0.012)*** |
| FTAS | -0.001(0.001) | -0.001(0.001) | -0.001(0.001) | 0.001(0.001) | 0.001(0.001) | 0.001(0.001) |
| GDP | 0.003(0.007) | 0.002(0.006) | 0.001(0.006) | -0.013(0.003)*** | -0.012(0.003)*** | -0.011(0.003)*** |
| DUMMY 2008 | 0.024(0.067) | 0.039(0.039) | 0.041(0.038) | -0.012(0.032) | -0.014(0.021) | -0.011(0.021) |
| *Adjusted* $R^2$ | 0.434 | 0.451 | 0.128 | 0.445 | 0.477 | 0.294 |
| *F* ($\chi^2$) *statistic* | 35.10*** | 67.74*** | 3.93*** | 80.55*** | 187.20*** | 16.68*** |
| *N* | 468 | 468 | 468 | 1162 | 1162 | 1162 |

*Note*s:
*** (**) (*) indicates the significance at the 1%, 5% and 10% level, respectively. The standard errors that are reported in the brackets are robust to heteroscedasticity for OLS, and they are clustered at firm level for the RE and FE estimates. Industry and time dummies are considered for the OLS method. See Appendix A for the definition of the variables.

Table 3. The effect of firm- and market-specific factors on short-term and long-term leverage

| *Panel A* | *Financially constrained companies* *Dependent variable: SDR* | | | *Financially unconstrained companies* *Dependent variable: SDR* | | |
|---|---|---|---|---|---|---|
| | OLS | RE | FE | OLS | RE | FE |
| CONSTANT | 0.005(0.026) | 0.006(0.040) | 0.032(0.075) | 0.004(0.013) | 0.041(0.036) | 0.163(0.103) |
| GROWTH | -0.006(0.002)*** | -0.004(0.002)** | -0.003(0.002)* | -0.001(0.001) | -0.007(0.003)** | -0.015(0.007)** |
| PROFIT | 0.006(0.006) | -0.002(0.007) | -0.004(0.009) | 0.026(0.042) | 0.033(0.043) | 0.022(0.036) |
| SIZE | 0.003(0.002)* | 0.002(0.003) | 0.001(0.006) | 0.003(0.001)*** | 0.001(0.002) | -0.006(0.007) |
| TANGIBILITY | 0.012(0.014) | 0.016(0.023) | 0.036(0.103) | -0.022(0.005)*** | -0.035(0.013)*** | -0.049(0.028)* |
| NDTS | 0.197(0.092)** | 0.224(0.131)* | 0.250(0.126)** | 0.207(0.094)** | 0.249(0.145)* | 0.304(0.360) |
| BETA | 0.002(0.002) | 0.001(0.002) | -0.001(0.002) | -0.004(0.003) | -0.002(0.003) | -0.002(0.004) |
| FTAS | -0.001(0.0001)*** | -0.001(0.0001)*** | -0.001(0.0001)*** | -0.001(0.001) | -0.001(0.001) | -0.001(0.001) |
| GDP | 0.003(0.002)* | 0.003(0.002)* | 0.003(0.002)* | 0.002(0.001)** | 0.003(0.001)*** | 0.003(0.001)*** |
| DUMMY 2008 | -0.041(0.020)** | -0.036(0.017)** | -0.034(0.017)** | 0.028(0.013)** | 0.028(0.011)*** | 0.029(0.011)*** |
| *Adjusted $R^2$* | 0.083 | 0.128 | 0.064 | 0.033 | 0.035 | 0.065 |
| *F ($\chi^2$) statistic* | 6.09*** | 25.61*** | 1.91* | 9.62*** | 38.01*** | 1.93* |
| *N* | 468 | 468 | 468 | 1162 | 1162 | 1162 |
| *Panel B* | *Financially constrained companies* *Dependent variable: LDR* | | | *Financially unconstrained companies* *Dependent variable: LDR* | | |
| | OLS | RE | FE | OLS | RE | FE |
| CONSTANT | -0.135(0.042)*** | -0.100(0.064) | -0.066(0.069) | -0.018(0.033) | 0.111(0.134) | 0.257(0.351) |
| GROWTH | -0.018(0.004)*** | -0.002(0.003) | -0.001(0.003) | 0.001(0.003) | 0.001(0.004) | 0.001(0.005) |
| PROFIT | -0.017(0.011) | -0.002(0.012) | -0.008(0.012) | -0.013(0.059) | -0.052(0.052) | -0.046(0.056) |
| SIZE | 0.017(0.003)*** | 0.013(0.005)*** | 0.012(0.005)** | 0.010(0.002)*** | 0.005(0.003)* | 0.002(0.001)** |
| TANGIBILITY | 0.425(0.032)*** | 0.301(0.072)*** | 0.176(0.104)* | 0.275(0.018)*** | 0.147(0.069)** | 0.022(0.013)* |
| NDTS | -0.564(0.219)*** | -0.031(0.232) | -0.223(0.251) | -0.360(0.182)** | -0.226(0.509) | -0.078(0.858) |
| BETA | 0.002(0.002) | 0.001(0.002) | 0.001(0.002) | 0.040(0.012)*** | 0.023(0.011)** | 0.021(0.010)** |
| FTAS | 0.002(0.001)** | 0.001(0.0001)*** | 0.001(0.0001)*** | 0.001(0.001) | 0.001(0.001) | 0.001(0.001) |
| GDP | 0.010(0.005)** | 0.009(0.004)** | 0.009(0.004)** | -0.004(0.004) | -0.004(0.003) | -0.003(0.003) |
| DUMMY 2008 | 0.078(0.045)* | 0.086(0.028)** | 0.089(0.027)*** | 0.009(0.036) | 0.010(0.015) | 0.011(0.015) |
| *Adjusted $R^2$* | 0.380 | 0.417 | 0.052 | 0.146 | 0.213 | 0.031 |
| *F ($\chi^2$) statistic* | 38.05*** | 63.44*** | 4.02*** | 33.76*** | 14.77* | 1.89* |
| *N* | 468 | 468 | 468 | 1162 | 1162 | 1162 |

*Notes:*
*** (**) (*) indicates the significance at the 1%, 5% and 10% level, respectively. The standard errors that are reported in the brackets are robust to heteroscedasticity for OLS, and they are clustered at firm level for the RE and FE estimates. Industry and time dummies are considered for the OLS method. See Appendix A for the definition of the variables.

Table 4. The effect of loan supply contractions on leverage using full sample

| *Panel A.* *Dependent variable: BDR* | OLS | RE | FE | Censored Tobit |
|---|---|---|---|---|
| CONSTANT | -0.082(0.028)*** | 0.077(0.080) | 0.201(0.124) | -0.163(0.036)*** |
| GROWTH | -0.007(0.002)*** | -0.012(0.005)** | -0.013(0.008)* | -0.016(0.004)*** |
| PROFIT | 0.044(0.017)*** | -0.020(0.021) | -0.029(0.021) | 0.079(0.030)*** |
| SIZE | 0.018(0.002)*** | 0.009(0.005)* | 0.004(0.002)** | 0.023(0.002)*** |
| TANGIBILITY | 0.309(0.015)*** | 0.144(0.055)*** | -0.023(0.107) | 0.328(0.016)*** |
| NDTS | -0.140(0.146) | 0.279(0.333) | 0.620(0.442) | -0.182(0.153) |
| BETA | 0.006(0.003)** | 0.007(0.004)* | 0.004(0.002)** | 0.006(0.003)** |
| FTAS | 0.001(0.001) | 0.001(0.0006)* | 0.002(0.001)** | 0.001(0.001) |
| GDP | 0.001(0.003) | 0.002(0.001)** | 0.005(0.003)* | 0.001(0.003) |
| DUMMY 2008 | 0.020(0.044) | 0.014(0.006)** | 0.017(0.008)** | 0.023(0.049) |
| DUMMY PDM | 0.002(0.001)** | 0.070(0.041)* | - | 0.012(0.006)** |
| DUMMY INTER | 0.014(0.037) | 0.007(0.023) | 0.006(0.022) | 0.016(0.038) |
| GROWTH*DUMMY PDM | 0.037(0.010)*** | 0.018(0.011)* | 0.017(0.010)* | 0.043(0.012)*** |
| GROWTH*DUMMY 2008 | 0.001(0.023) | 0.016(0.016) | 0.017(0.015) | 0.006(0.026) |
| *Adjusted (Pseudo) $R^2$* | 0.252 | 0.267 | 0.034 | 0.380 |
| *F (LR)($\chi^2$) statistic* | 65.80*** | 81.68*** | 2.42** | 58.88*** |
| *N* | 1630 | 1630 | 1630 | 1630 |
| *Panel B.* *Dependent variable: MDR* | OLS | RE | FE | Censored Tobit |
| CONSTANT | 0.041(0.032) | 0.027(0.085) | 0.029(0.144) | 0.008(0.040) |
| GROWTH | -0.021(0.006)*** | -0.021(0.009)** | -0.021(0.008)*** | -0.061(0.007)*** |
| PROFIT | -0.067(0.041)* | -0.100(0.054)* | -0.105(0.051)** | -0.031(0.018)* |
| SIZE | 0.011(0.002)*** | 0.013(0.006)** | 0.017(0.010)* | 0.018(0.003)*** |
| TANGIBILITY | 0.370(0.017)*** | 0.248(0.050)*** | 0.083(0.101) | 0.363(0.018)*** |
| NDTS | -0.573(0.172)*** | -0.269(0.309) | 0.968(0.394)** | -0.467(0.166)*** |
| BETA | 0.012(0.006)** | 0.021(0.010)** | 0.018(0.010)* | 0.013(0.005)** |
| FTAS | 0.001(0.001) | 0.001(0.001) | 0.001(0.001) | 0.001(0.001) |
| GDP | -0.013(0.003)*** | -0.011(0.003)*** | -0.010(0.003)*** | -0.009(0.003)*** |
| DUMMY 2008 | 0.036(0.052) | 0.032(0.014)** | 0.035(0.015)** | 0.061(0.055) |
| DUMMY PDM | 0.049(0.021)** | 0.087(0.043)** | - | 0.013(0.005)** |
| DUMMY INTER | 0.017(0.037) | 0.012(0.025) | 0.012(0.025) | 0.009(0.037) |
| GROWTH*DUMMY PDM | -0.006(0.008) | -0.019(0.017) | -0.019(0.017) | -0.012(0.010) |
| GROWTH*DUMMY 2008 | -0.035(0.017)** | -0.024(0.011)** | -0.023(0.010)** | -0.042(0.026)* |
| *Adjusted (Pseudo) $R^2$* | 0.366 | 0.392 | 0.177 | 0.074 |
| *F (LR) statistic* | 71.18*** | 184.48*** | 12.59*** | 75.81*** |
| *N* | 1630 | 1630 | 1630 | 1630 |

*Notes:*
*** (**) (*) indicates the significance at the 1%, 5% and 10% level, respectively. The standard errors that are reported in the brackets are robust to heteroscedasticity for OLS and Tobit, and they are clustered at firm level for the RE and FE estimates. Industry and time dummies are considered for the OLS and Tobit methods. Dummy PDM is dropped from the FE regressions as it is a firm-specific dummy variable. See Appendix A for the definition of the variables.

## Appendix

Appendix A. Definition of the variables

| *Name* | *Definition* |
|---|---|
| BDR | The ratio of book value of total debt to book value of total assets |
| MDR | The ratio of book value of total debt to book value of total debt plus market value of equity; market values are matched to the firm's financial year end |
| SDR | The ratio of short-term debt to total assets |
| LDR | The ratio of long-term debt to total assets |
| GROWTH | The ratio of intangible assets to total assets (GROWTH1).<br>Total assets minus book value of equity plus market value of equity, scaled by total assets (GROWTH2); market values are matched to the firm's financial year end |
| PROFIT | The ratio of earnings before interest, taxes, depreciation and amortisation to total assets |
| SIZE | The natural logarithm of deflated total sales in 2001 prices |
| TANGIBILITY | Net fixed assets divided by total assets |
| NDTS | The ratio of depreciation expenses to total assets |
| BETA | Time-varying historical beta based on the CAPM theory. |
| FTAS | One-year growth rate of the FTSE All-Share Index to measure equity market return; matched to the firm's financial year end |
| GDP | The growth rate of real GDP over the previous year by comparing quarterly figures; matched to the firm's financial year end |
| DUMMY 2008 | Binary variable: 1in 2008; 0 in other years |
| DUMMY PDM | Binary variable: 1 for firms without public debt markets access; 0 for firms with access. The quoted bonds on the LSE is used to ascertain the presence of this access, where segregation by presence of a bond rating is adopted |
| DUMMY INTER | Interacted variable, which is the product of DUMMY 2008 and DUMMY PDM |

Appendix B. Mean value of the leverage ratios across years for the full sample

| | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Panel A. Full sample* | | | | | | | | | | | |
| BDR | 0.26 | 0.27 | 0.26 | 0.26 | 0.25 | 0.26 | 0.26 | 0.28 | 0.27 | 0.24 | 0.23 |
| MDR | 0.23 | 0.26 | 0.25 | 0.21 | 0.20 | 0.19 | 0.21 | 0.31 | 0.30 | 0.25 | 0.26 |
| SDR | 0.06 | 0.05 | 0.05 | 0.04 | 0.03 | 0.04 | 0.05 | 0.05 | 0.03 | 0.04 | 0.04 |
| LDR | 0.20 | 0.22 | 0.21 | 0.21 | 0.22 | 0.22 | 0.22 | 0.23 | 0.24 | 0.20 | 0.20 |
| *Panel B. Financially constrained companies* | | | | | | | | | | | |
| BDR | 0.19 | 0.21 | 0.19 | 0.21 | 0.20 | 0.19 | 0.18 | 0.17 | 0.16 | 0.15 | 0.16 |
| MDR | 0.20 | 0.25 | 0.22 | 0.17 | 0.16 | 0.14 | 0.17 | 0.26 | 0.23 | 0.19 | 0.20 |
| SDR | 0.07 | 0.07 | 0.05 | 0.03 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.04 |
| LDR | 0.12 | 0.14 | 0.14 | 0.17 | 0.18 | 0.16 | 0.15 | 0.15 | 0.15 | 0.13 | 0.11 |
| *Panel C. Financially unconstrained companies* | | | | | | | | | | | |
| BDR | 0.29 | 0.29 | 0.29 | 0.28 | 0.28 | 0.29 | 0.30 | 0.32 | 0.32 | 0.27 | 0.26 |
| MDR | 0.24 | 0.26 | 0.26 | 0.23 | 0.21 | 0.20 | 0.22 | 0.34 | 0.33 | 0.27 | 0.28 |
| SDR | 0.06 | 0.05 | 0.05 | 0.05 | 0.04 | 0.05 | 0.05 | 0.06 | 0.04 | 0.04 | 0.03 |
| LDR | 0.23 | 0.24 | 0.24 | 0.23 | 0.24 | 0.24 | 0.24 | 0.26 | 0.28 | 0.23 | 0.23 |
| *Panel D. Companies with PDM access* | | | | | | | | | | | |
| BDR | 0.36 | 0.38 | 0.37 | 0.37 | 0.37 | 0.36 | 0.35 | 0.38 | 0.36 | 0.32 | 0.31 |
| MDR | 0.32 | 0.34 | 0.34 | 0.31 | 0.29 | 0.26 | 0.27 | 0.40 | 0.36 | 0.30 | 0.30 |
| SDR | 0.07 | 0.06 | 0.07 | 0.04 | 0.04 | 0.06 | 0.06 | 0.07 | 0.04 | 0.03 | 0.04 |
| LDR | 0.29 | 0.32 | 0.31 | 0.32 | 0.33 | 0.31 | 0.30 | 0.31 | 0.33 | 0.30 | 0.28 |
| *Panel E. Companies with no PDM access* | | | | | | | | | | | |
| BDR | 0.23 | 0.23 | 0.23 | 0.23 | 0.22 | 0.23 | 0.24 | 0.25 | 0.25 | 0.21 | 0.20 |
| MDR | 0.20 | 0.23 | 0.22 | 0.18 | 0.17 | 0.16 | 0.19 | 0.29 | 0.28 | 0.24 | 0.25 |
| SDR | 0.06 | 0.05 | 0.05 | 0.04 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.04 | 0.04 |
| LDR | 0.17 | 0.18 | 0.18 | 0.18 | 0.19 | 0.19 | 0.19 | 0.20 | 0.22 | 0.17 | 0.17 |

*Notes:*
See Appendix A for variable definitions

Appendix C. Correlation matrix for the firm-specific factors

| | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |
|---|---|---|---|---|---|---|---|---|---|---|
| *1. BDR* | | | | | | | | | | |
| *2.MDR* | 0.74** | | | | | | | | | |
| 3. SDR | 0.26** | 0.17** | | | | | | | | |
| 4. LDR | 0.95** | 0.70** | -0.06 | | | | | | | |
| 5. GROWTH 1 | 0.03 | -0.04 | 0.04 | 0.02 | | | | | | |
| 6. GROWTH 2 | -0.13** | -0.35** | -0.02 | -0.13** | -0.06 | | | | | |
| 7. PROFIT | 0.09* | -0.11** | 0.07 | 0.07 | -0.02 | 0.29** | | | | |
| 8. SIZE | 0.22** | 0.16** | 0.14** | 0.18** | 0.23** | -0.18** | 0.24** | | | |
| 9. TANGIBILITY | 0.42** | 0.50** | 0.00 | 0.43** | -0.50** | -0.20** | 0.02 | 0.02 | | |
| 10. NDTS | 0.11** | 0.02 | 0.12** | 0.07 | -0.19** | 0.02 | 0.17** | 0.14** | 0.24** | |
| 11. BETA | -0.05 | 0.00 | 0.00 | -0.05 | 0.03 | 0.01 | -0.08* | -0.05 | -0.12** | 0.00 |

*Notes:*
** (*) indicates that the correlation coefficient (two-tailed, Pearson) is significant at the 1%, 5% level, respectively. See Appendix A for variable definitions

# Appendix D

Figure 1

Quarterly and annual GDP % growth rates in the UK during 2001-2011, using seasonally-adjusted quarterly data at current prices (*Source*: Office for National Statistics, UK)

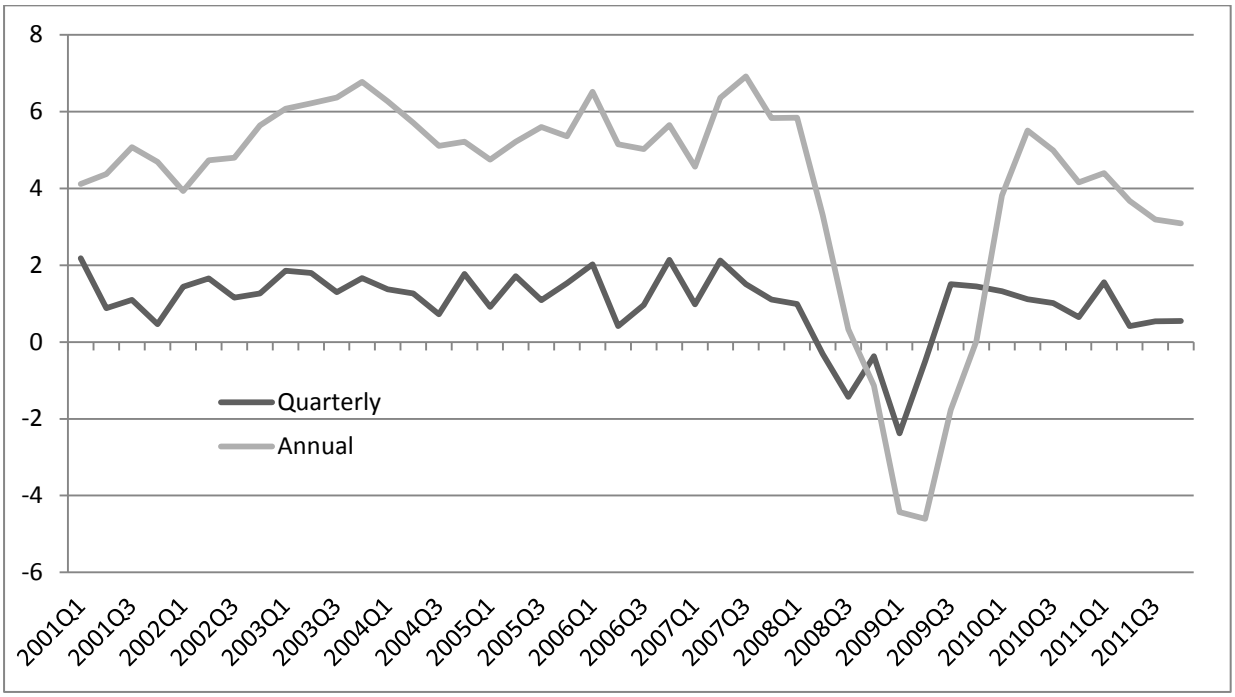


Figure 2

Monthly and annual % change in the FTSE All Share Index during 2001-2011 (*Source*: Datastream)

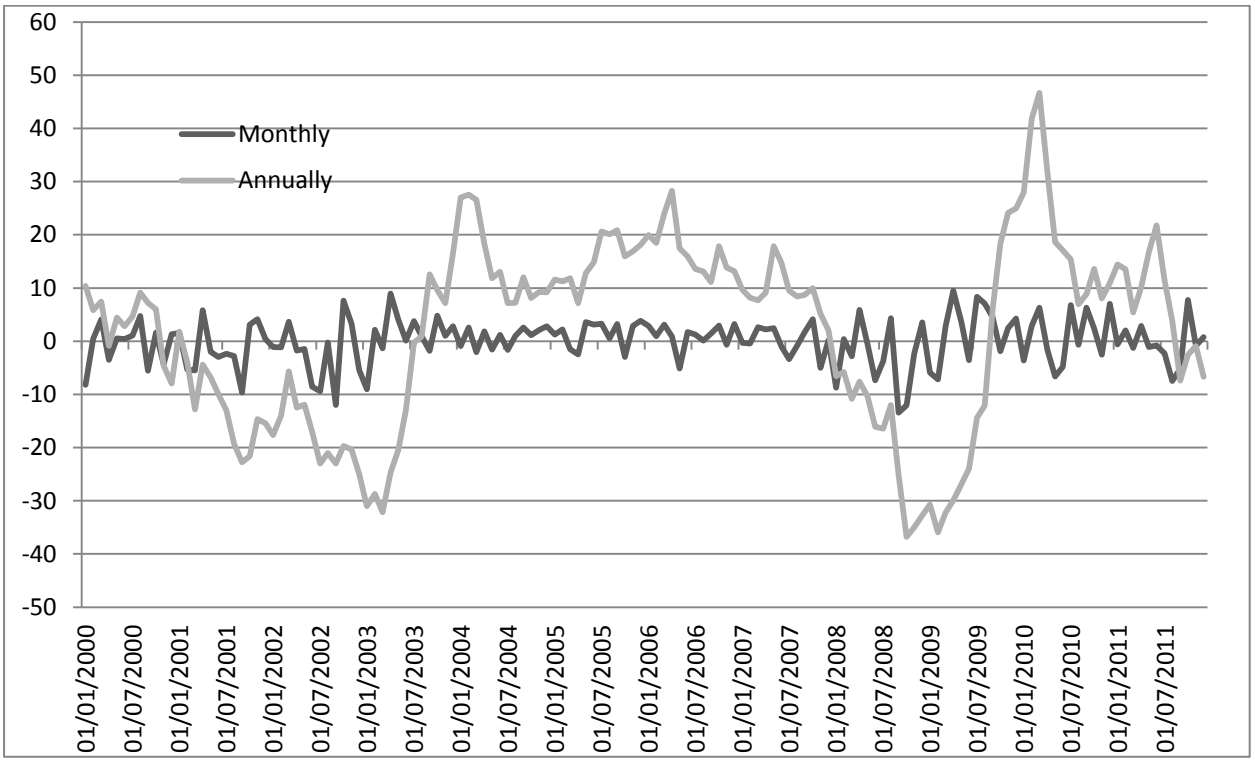

Figure 3

Net funds raised by UK businesses, in billons £, January 2007-April 2012 (*Source*: Bank of England)

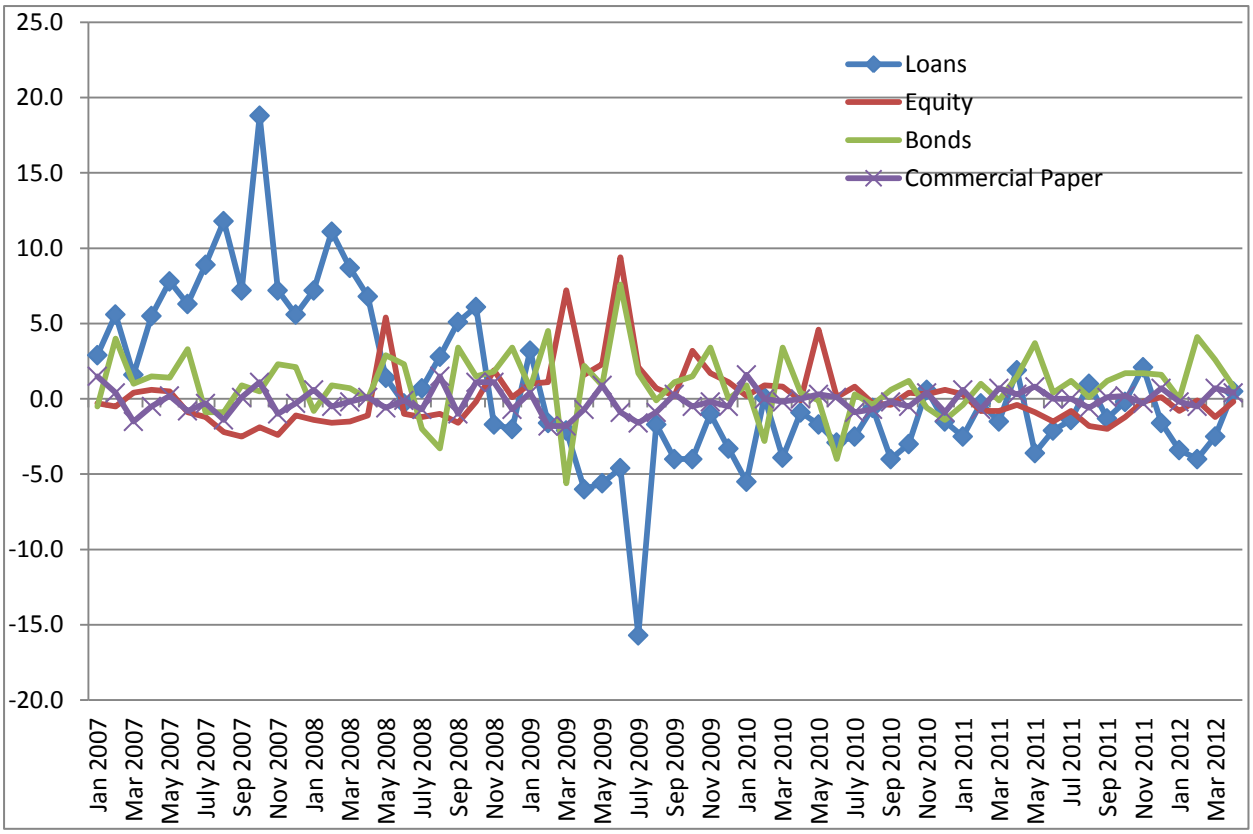


Figure 4

Lending to UK businesses (Source: Bank of England Trends in Lending, April 2009)

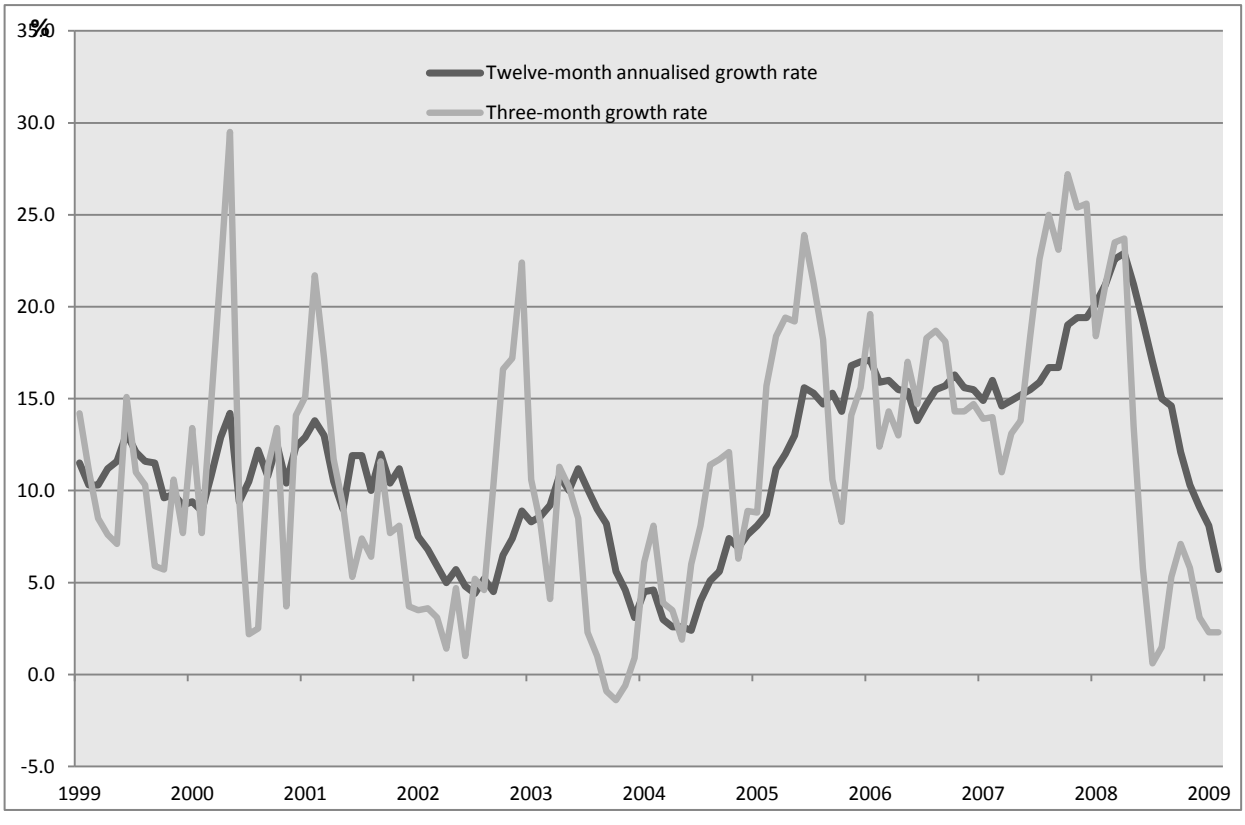

Figure 5

Contributions to growth in lending to UK businesses, January 2007- February 2012; 12 month-growth percentage points (Source: Bank of England)