Suboptimal financial policies and executive ownership in the UK: evidence from a pre-crisis

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Abstract

Purpose – *The purpose of this paper is to identify firms in the UK adopting a policy of high cash and low leverage and investigate how executive ownership contributes to this decision.*

Design/methodology/approach – *Firms following this policy are identified both by using a fixed classification approach and the analysis of the distribution of cash and leverage. Logit analysis is then used to estimate the probability of adopting the policy as a function of executive ownership.*

Findings – *Extreme financial policies are suboptimal as firms adopting these policies tend to undershoot (overshoot) their target leverage (cash holdings) ratios. The impact of the executive ownership on the probability of adopting this policy is U-shaped, in line with the alignment–entrenchment hypothesis.*

Practical implications – *Despite the substantial presence of non-executive directors in the boards and a significant amount of shareholdings by executive directors, the firms under analysis have adopted suboptimal financial policies possibly because poorly governed or because executive ownership is the range where entrenchment is feasible.*

Originality/value – *This is the first attempt at recognising policies of high cash and low leverage as being explicitly interdependent. It is also the first study focussing on the UK, a country of interest, because ownership structure is relatively dispersed. Moreover, instead of choosing fixed threshold levels of the variable in defining the extreme financial policy, this paper proposes the analysis of the distribution of cash holdings and leverage and accounts for target levels of cash and leverage.*

Keywords *Executive ownership, Extreme financial policy*

Paper type *Research paper*

1. Introduction

The aim of this paper is to identify firms adopting financial policies of high cash and low leverage and study the potential alignment/entrenchment role of executive ownership in the probability of firms adopting such policies in the UK. To this aim, a sample of non-financial UK firms adopting what we define extreme financial policy is identified, via both the classification rules proposed in the literature and the analysis of the distribution of cash and leverage. Then, a logit framework is used to estimate the likelihood of firms adopting extreme financial policies as a function of executive ownership, holding constant a number of other potential determinants.

Results suggest that a relevant proportion of firms in the UK adopts extreme cash and leverage policies, and that these policies are suboptimal as these firms tend to undershoot (overshoot) their target leverage (cash holdings) ratios. Results also suggest that the impact of executive ownership on the probability of adopting an extreme cash and leverage policy is non-monotonically U-shaped. Hence, in line with the alignment-entrenchment hypothesis, results suggest that executive incentives towards extreme cash and leverage policies depend on the level of executive ownership. The main implication of these findings is that, despite the presence of a substantial representation of non-executive directors in the UK boards and a large amount of shares held by executive directors, these firms have

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adopted suboptimal financial policies either because of poorly governed or because of executive ownership being in the range where entrenchment is feasible.

This paper adds to the existing literature on four main grounds. First, when the scope of the researcher is identifying extreme financial policies, high-cash and low-leverage policies have typically been used independently from each other. To the best of our knowledge, this is the first attempt to study the extent to which the two policies co-exist. This decision is theoretically well grounded. The pecking order theory predicts that firms should exhaust internally available funds first and then resort to more expensive external debt and equity financing (Myers, 1977; Myers and Majluf, 1984). Similarly, the agency theory suggests that these policies are likely to coexist because managers have incentives to stockpile cash to avoid the use of debt financing (Jensen and Meckling, 1976; Jensen, 1986). It is also argued that, to the extent that substantial cash holdings point to current (or even expected) financial constraints, firms with large cash balances are more likely to be restricted in the access to external finance and hence follow low-leverage policies (Kim *et al.*, 1998; Bates *et al.*, 2009). Hence, in an attempt to take a closer look at what constitutes a suboptimal financial policy we take these theoretical suggestions on board and investigate high cash and low leverage policies jointly.

Second, to the best of our knowledge, this is the first study analysing the impact of executive ownership on financial policies of high cash and low leverage in the UK. The only relevant studies in the area are Ozkan and Ozkan (2004), focussing on cash policy and managerial ownership, and Florackis and Ozkan (2009), focussing on leverage policy instead. The interest in the UK comes both from the relative scarcity of previous studies, and because of the more dispersed ownership structure in this economy with respect to all OECD countries that, in turn, makes the shareholders control over managerial opportunism more difficult (Short and Keasey, 1999; Faccio and Lasfer, 1999). The peculiarity of this economy also explains the choice of focussing on executive ownership, where higher executive ownership and lack of efficient monitoring by financial institutions in the UK is thought to lead to entrenchment (Franks *et al.*, 2001; Goergen and Renneboog, 2001). In addition, executive directors dominate boards in the UK (Vafeas and Theodorou, 1998; Pass, 2004), and non-executives have an advisory role (instead of the disciplinary role) with respect to the USA (Franks *et al.*, 2001; Petra, 2005). Our study focuses on the role of executive ownership, by holding as constant a number of variables which proxy for financing frictions and precautionary motives to hold high cash and low leverage (Myers and Majluf, 1984; Kim *et al.*, 1998; Graham and Harvey, 2001; Hermalin and Weisbach, 2003; Bates *et al.*, 2009). In a final attempt of isolating the impact of executive ownership on cash and leverage policies from the impact of financing frictions and precautionary motives, we exclude the period of the financial crisis which caused an immediate increase (decrease) in cash reserves (leverage).

The third contribution our paper provides is methodological. When it comes to define the extreme financial policies, previous empirical studies adopt fixed threshold levels of either cash holdings or leverage. Building on this approach, the analysis used in this paper is based both on these rules and on the non-parametric estimated distribution of cash holdings and leverage. The latter enables the researcher to decide the point at which the sample is split (cut-off point) based upon the shape of the distribution of the variable without imposing any particular shape to the distribution and without imposing any priori (and somewhat arbitrary) threshold. Not least, the approach based upon fixed classification rule cannot account for the evolution of the distribution of leverage and cash holdings over time that allows the cut-off points to change over time instead. This approach is convenient because the distribution of these variables may change not because of the role of executive ownership, but because of exogenous shocks to the economy.

Finally, we provide some evidence on whether extreme policies of high cash or low leverage are optimal for these firms. Prior literature provides evidence that firms behave as they have target levels of leverage and cash holdings (Opler *et al.*, 1999; and

Shyam-Sunder and Myers, 1999, Gao *et al.*, 2013; Pinkowitz *et al.*, 2013). This paper investigates whether firms following the extreme financial policy also deviate from their estimated optimal target. We adopt two alternative approaches to estimate target cash holdings and leverage. We compare the mean ratios of firm *i*'s cash holdings and leverage with those of the industry where the firm operates (Harford *et al.*, 2008). Second, we compare the observed values of cash and leverage with their target levels derived from standard theoretical models in the literature (Opler *et al.*, 1999 for cash holdings and Rajan and Zingales, 1995 for capital structure).

The remainder of the paper proceeds as follows. Section 2 discusses the relevant literature and motivation of the paper. Section 3 presents the empirical model and the hypotheses we test. Section 4 describes data and the classification methodology. Section 5 presents empirical results. Section 6 concludes.

2. Theory and motivation

2.1 How do managers achieve financial flexibility? A snapshot at the debate

Motivated by the evidence that corporations have been holding increasingly high amounts of cash and low levels of leverage, the determinants of cash and leverage policies has been a topic of increasing academic interest over the past 30 years. A strand of corporate finance theory refers to the manager-shareholder agency conflict in explaining why some firms choose to hold substantial cash reserves and/or spare debt capacity. Easterbrook (1984) and Jensen (1986) argue that self-interested manager values financial flexibility, which allows him/her to escape the capital market discipline. Therefore, in trading-off investment and dividends versus financial flexibility, the manager tends to give higher weight to the latter.

One way to achieve financial flexibility is accumulating cash reserves. A relatively large empirical literature provides evidence that firms that are subject to the manager-shareholder agency conflict tend to hold cash. The value of cash is lower for cash-rich firms and large cash holdings reduce the pressure on managers to perform well. This also allows them to consume large amounts of perks and/or to invest in negative net present value projects that provide personal diversification benefits at the expenses of shareholders (Myers and Rajan, 1998; Harford, 1999; Dittmar *et al.*, 2003; Ferreira and Vilela, 2004; Pinkowitz *et al.*, 2013; Kalcheva and Lins, 2007; Dittmar and Mahrt-Smith, 2007; Harford *et al.*, 2008). Contrary to the majority of these studies, Mikkelson and Partch (2003) show that firms holding large amounts of cash persistently do not perform any worse than other firms and high cash policies do not necessarily lead to value decreasing investments. They conclude that conservative cash policies are optimal for these firms.

The literature suggests that financial flexibility is also achieved through spare debt capacity. The capital structure research follows Jensen and Meckling (1976) and argues that when managers are entrenched (that is when they have more discretion and are relatively free of disciplining and monitoring mechanisms) tend to choose sub-optimal (or conservative) leverage policies (Friend and Lang, 1988; Friend and Hasbrouck, 1988; Mehran, 1992; Berger *et al.*, 1997). It is argued that entrenched managers prefer less leverage than the optimal because of a preference for lower risk (Amihud and Lev, 1981; Friend and Hasbrouck, 1988; Harris and Raviv, 1988; Berger *et al.*, 1997; Fosberg, 2004; Sheikh and Wang, 2012). Minton and Wruck (2001) examine firms that adopt a persistent policy of low leverage and they call these firms financially conservative firms. They show that a conservative leverage policy is not optimal, as the level of leverage appears to be below the amount predicted to be optimal by the capital structure theory.

Being the managers the main players in the adoption of the financial policy, a long-standing question in corporate finance has been whether managerial ownership can affect the choice of a high cash or low leverage policy. Corporate governance theory argues that, if interests of managers are different from those of shareholders, shareholders can use

managerial ownership to make managers acting in the best interest of shareholders. It is also suggested that, while at low levels, managerial ownership may ensure the alignment of managers and shareholders' interests, at high levels, it may lead to managerial entrenchment (Jensen and Meckling, 1976; Morck *et al.*, 1988; McConnell and Servaes, 1990; Stulz, 1990; Jensen, 1993). As a result, the corporate governance debate on the incentive effect of managerial ownership has investigated the potential role of the alignment-entrenchment effect of managerial ownership on cash or leverage policies. The evidence the literature provides is somewhat mixed. Some studies find an inverse relationship between managerial ownership and debt (Friend and Lang, 1988; Bathala *et al.*, 1994; Fosberg, 2004); other studies report a positive (Mehran, 1992; Berger *et al.*, 1997; Bokpin and Arko, 2009; Sheikh and Wang, 2012) or even a non-monotonic relationship between managerial ownership and debt (Wansley *et al.*, 1996; Awasthi *et al.*, 1997; Brailsford *et al.*, 2002; Florackis and Ozkan, 2009; Ruan *et al.*, 2011). Similar mixed evidence is reported for the impact of managerial ownership on cash holdings (Opler *et al.*, 1999; Ozkan and Ozkan, 2004; Dittmar *et al.*, 2007; Harford *et al.*, 2008, Bates *et al.*, 2009; Farre-Mensa, 2012; Kahle and Stulz, 2012; Akguc and Choi, 2013; Gao *et al.*, 2013).

2.2 Motivation

Previous literature suggests that financial flexibility can be achieved through either substantial cash balances or spare debt capacity. However, it is possible that firms adopt both forms of policies and, at a closer look, it is not obvious why they should not do so. According to the main theoretical capital structure theories, cash-rich firms should not have high leverage. The pecking order theory predicts that firms should first exhaust internally available funds and then resort to more expensive external debt and equity financing. It is similarly not easy to explain why firms having low leverage should not hold large cash balances in case they have, for example, sufficient growth opportunities.

From a different perspective, it is argued that financially constrained firms have incentives to hold large cash reserves (Myers, 1977; Kim *et al.*, 1998). To the extent that substantial cash holdings signal to current or possibly expected financial constraints, firms with large cash balances are more likely to be restricted in the access to external finance and hence in a sense forced to follow low-leverage policies. Some argue that greater asset liquidity can reduce the firm's capacity to raise external finance (Myers and Rajan, 1998); others show that levered firms, having a demonstrated ability to raise debt capital should hold less cash (Ferreira and Vilela, 2004). Acharya *et al.* (2007) present a theoretical model where cash and debt substitute for each other and are jointly determined within the firm's intertemporal investment problem. They show that firms anticipating financing constraints boost their cash balances and debt capacity. Cash and (negative) debt can both be used to transfer resources across time. Bates *et al.* (2009) shows that cash and leverage are negatively related because financially constrained firms hold cash to avoid issuing more of the riskier debt.

Managerial incentives are also related to the use of both persistent high-cash and low-leverage policies simultaneously. These policies may coexist because, for example, managers have incentives to stockpile cash to avoid the use of debt financing. Alternatively, one could simply argue that, other things being equal, managers have sufficient incentives to have low-leverage and high-cash policies and they are able to do so when they are entrenched. Myers and Rajan (1998) argue that the effect of asset liquidity on leverage is positive only when managers have no discretion over the firm's assets, which reduces the risk of wealth expropriation. Taken together, these arguments possibly point to a significant interaction between cash balances and leverage in shaping firms' extreme financial policies.

Despite the insights above, empirical research on cash and leverage policies has not considered the possibility that policies of high-cash holdings and low-leverage are used simultaneously. This paper fills this gap by treating substantial cash holdings and

low-leverage policies jointly, and estimates the impact of executive ownership on the probability of adopting such policies by UK firms. We focus on the UK because of a number of reasons. The relative lack of previous studies on cash and leverage policies for the UK makes the UK of interest. Ozkan and Ozkan (2004) focuses on cash policy and Florackis and Ozkan (2009) on leverage, but to the best of our knowledge, this paper is the first to combine the two policies. Second, the more dispersed ownership structure of UK firms, with respect to all OECD countries, makes it more difficult for shareholders to exercise effective control over managerial opportunism (Short and Keasey, 1999; Faccio and Lasfer, 1999). This argument, coupled with a stronger minority investors' protection in the UK, discourages the shareholders' coalition and boost the discretionary power of the executive directors.

The above is the reason why we distinguish managerial ownership in executive and non-executive ownership. The choice of focussing on the executive ownership is reinforced by the fact the UK boards are dominated by executive directors who are the main persons responsible for the financial policies (Vafeas and Theodorou, 1998; Pass, 2004), and non-executives have an advisory role (instead of the disciplinary role) with respect to the USA (Franks *et al.*, 2001; Petra, 2005). Second, there is evidence that higher executive ownership and lack of efficient monitoring by financial institutions in the UK lead to entrenchment rather than to alignment (Franks *et al.*, 2001; Goergen and Renneboog, 2001). Therefore, if ownership is concentrated in the hands of executives, this may result in inefficient monitoring and sub-optimal financial policies if executives' interests are not aligned with those of the majority of shareholders. This is one of the hypotheses we want to test (Pergola and Verreault, 2009).

3. Empirical model and hypotheses

3.1 The empirical model

We estimate the following probability model:

$$\Pr(\textit{extreme financial policy}_{i,p}) = f(\textit{executive ownwership}_{i,p}) + \sum_{j=1}^{A} \beta_j \textit{Precautionary}_{j,i,p} + \sum_{j=A+1}^{j} \beta_j \textit{Agency}_{j,i,p} + \sum_{s=1}^{s} \gamma_s D_s + \varepsilon_{i,p}$$

Where the dependent variable, $extremefinancialpolicy_{i,p}$ equals 1 if firm i is classified as adopting the extreme financial policy of high cash and low leverage in panel p and zero otherwise; $f(executiveownwership_{i,p})$ is a function of the amount of shares outstanding held by managers; D_s are sector dummies (S = 10); D_p are panel dummies (p = 6); and $\varepsilon_{i,p}$ is the error term – see below for the motivation of the approach based on panels instead of year observations. Executive ownership is defined as the sum of shares outstanding held by executive managers.

$\Sigma_{j=1}^{A} Precautionary_{j,i,p}$ is a set of A variables borrowed from the finance literature to proxy for precautionary motives to hold high cash and low leverage. It is argued that firms can adopt financial policies of high cash and low leverage to cope with adverse income shocks, to reduce the firm's dependence on the costly external finance, and to have financial flexibility for potential profitable investment opportunities (Myers and Majluf, 1984; Kim *et al.*, 1998; Opler *et al.*, 1999; Graham and Harvey, 2001; Almeida *et al.*, 2004; Han and Qiu, 2007; Gamba and Triantis, 2008; Bates *et al.*, 2009; Riddick and Whited, 2009). There is evidence that older and larger firms are more likely to have easier access to capital markets and to face lower costs of temporary shortages in liquid funds (Hennessy and Whited, 2007; Hadlock and Pierce, 2010). In addition, firms paying dividends have lower benefits from holding cash as they cannot use cash in excess to face unexpected adverse shocks (Fazzari *et al.*, 1988; Kim *et al.*, 1998; Riddick and Whited, 2009). Previous research also suggests that the higher the firm's growth opportunities, the higher the need of accumulating cash and debt capacity (Kim *et al.*, 1998; Opler *et al.*, 1999; Bates

et al., 2009). We, therefore, add age, size, dividend and market-to-book ratio to the set of regressors.

$\Sigma_{j=A+1}^{J} Agency_{j,i,p}$ is a set of *J-A* variables we take from the finance theory to proxy for agency conflicts that are likely to influence the use of high cash and low leverage. According to the corporate governance literature, the shareholder can reduce agency costs by restructuring the board of directors or reshaping managerial incentives (Gillan, 2006). It is argued that the higher the board independence, that is the percentage of non-executive directors in the board, the less severe the agency conflicts between executive managers and shareholders as independent managers increase the boards' monitoring effectiveness which, in turn, decreases managerial opportunism (Mayers *et al.*, 1997; Rosenstein and Wyatt, 1997; Holderness, 2003; Pass, 2004; Petra, 2005; Harford *et al.*, 2008; Ameer *et al.*, 2010; Sheikh and Wang, 2012). Moreover, it is known that the shareholder's incentive to monitor the manager depends on the shareholder's stake into the company. The larger the shareholder's stake, the greater his/her incentive to play a role in the corporate control and reduce the scope for managerial opportunism (Shleifer and Vishny, 1986, 1997; Demsetz and Lehn, 1985; McConnell and Servaes, 1990; Pergola and Verreault, 2009). Ownership concentration is, therefore, a crucial variable in the analysis of managerial incentives and, to a certain extent, it can also exacerbate the firm's agency problems. On the one hand, larger stakes into the company allow major shareholders to have greater incentives to monitor managers; on the other hand, as the major shareholders gain control of the firm, they can generate private benefits that are not shared with minority shareholders (Shleifer and Vishny, 1997). Corporate governance literature also shows that, despite the fact that large blockholders and institutional investors both have a strong motivation to exert monitoring on managers, they do not always engage in activities that result in efficient monitoring (McConnell and Servaes, 1990; Pergola and Verreault, 2009 among others). Hence, we consider the case in which the largest shareholder is an institutional investor. We add these control variables to the regressors' set.

3.2 Hypotheses development

The first hypothesis we test is that, as managerial ownership increases, managers are less likely to adopt the extreme financial policy of high cash and low leverage, as, to the extent that the alignment of interests is achieved, they will be less likely to divert resources away from value maximization (Jensen and Meckling, 1976; Morck *et al.*, 1988; McConnell and Servaes, 1990; Ozkan and Ozkan, 2004; Florackis and Ozkan, 2009; Bates *et al.*, 2009; Farre-Mensa, 2012) and may like aggressive investment and increased use of leverage (Leland and Pyle, 1977; Amihud and Lev, 1981; Stulz, 1988; Harris and Raviv, 1988, Berger *et al.*, 1997 Awasthi *et al.*, 1997; Bokpin and Arko, 2009; Sheikh and Wang, 2012).

H1. Other things being equal, higher managerial ownership aligns interests of managers and shareholders and the likelihood of adopting the extreme financial policy of high cash and low leverage reduces. We test for *H1* by imposing:

$$f(managerial\ ownership_{i,p}) = \alpha_1 managerial\ ownership_{i,p}$$

to model (1) and testing for $\alpha_1 < 0$.

The second hypothesis we test is whether there exists an entrenchment effect when the manager holds a large fraction of shares. The corporate finance literature suggests that higher ownership gives managers a stronger control over the firm, and this increases their ability to resist to disciplinary pressure (Stulz, 1988). Higher ownership may give managers the opportunity to accumulate cash to pursue their own agendas (McConnell and Servaes, 1990; Hermalin and Weisbach, 1991; Dittmar and Mahrt-Smith, 2007; Harford *et al.*, 2008) and favour a reduced level of debt because managers may become overly concerned with the firm's unsystematic risk (Amihud and Lev, 1981; Friend and Lang, 1988; Harris and Raviv, 1988; Berger *et al.*, 1997; Fosberg, 2004; Sheikh and Wang, 2012). Therefore, for sufficiently high levels of managerial ownership, the larger the amount of shares the managers hold, the more likely they pursue a policy of high cash and low leverage.

Taken together with the discussion for *H1*, this suggests that the impact of managerial ownership on the probability of choosing such a policy is likely to be non-monotonic:

H2. Other things being equal, for sufficiently high levels, managerial ownership misaligns interests of managers to those of shareholders and increases the likelihood of adopting the policy of high cash and low leverage. We test for *H2* by imposing:

$$f(\textit{managerial ownership}_{i,p}) = \alpha_1 \textit{managerial ownership}_{i,p} + \alpha_2 \textit{managerial ownership}^2_{i,p}$$

to model (1) and testing for $\alpha_1 < 0$ and $\alpha_2 > 0$.

It is known that the role and incentives of the executive directors are different from those of the non-executive directors – who are appointed in the shareholders' interests to perform monitoring over the executives (Rosenstein and Wyatt, 1997; Hermalin and Weisbach, 2003; Pass, 2004; Petra, 2005; Davies *et al.*, 2005; Ameer *et al.*, 2010; Sheikh and Wang, 2012). Corporate finance studies, hence, suggest that a broad classification of managerial ownership is not sufficient to assess managerial ownership as an adequate incentive mechanism (Pergola and Verreault, 2009). The effective monitoring is more likely if the ownership is in the hands of non-executive directors. Moreover, concentrated ownership in the hands of executives may also result in inefficient monitoring and sub-optimal financial policies, if the interests of executives are not aligned with those of the shareholders.

Mixed evidence is reported on the relationship between executive (insider) ownership and leverage. On the one hand, Agrawal and Mandelker (1987) and Berger *et al.* (1997) find a positive relationship between insider ownership and debt ratio. They argue that, the greater is the top management's equity stake, the greater is the managers' willingness to accept the increased financial risk associated with an increase in leverage. Managerial shareholdings lessen, to some extent, the potential agency problems between managers and shareholders. On the other hand, Friend and Lang (1988) find a negative relationship between insider ownership and debt ratio arguing that managerial shareholdings do not reduce the agency conflict. This result holds only for their "closely-held" group of firms where the equity holdings of managerial insiders exceed 13.8 per cent. For their non-closely held group of firms, where the equity holdings of managerial insiders is less than 13.8 per cent, they find a positive relation between managerial holdings and leverage which seems counter to the managerial self-interest hypothesis. A negative relationship between insider ownership and level of debt is confirmed by Friend and Lang (1988), Friend and Hasbrouck (1988) and Fosberg (2004).

The conflicting empirical evidence on the relationship between insider ownership and leverage is not as surprising as it might seem. Jensen and Meckling (1976) already stressed that insider ownership and financial leverage are jointly determined so as to minimize the total agency costs incurred in external financing. If these variables are jointly endogenous, then their relationship will depend on, among other things, the level of insider ownership. Kang and Horowitz (1993) study the possible switching points of the relationship between insider ownership and financial leverage by running regressions on various subsets of US firms divided according to levels of insider ownership. They find a non-linear relationship between insider ownership and leverage in line with the alignment–entrenchment theory: if insider ownership produces alignment of interests, then managers will use more debt because they are less likely to incur the debt agency costs associated with the asset substitution effect or the takeover defence role of bond financing. Instead, if managerial ownership produces entrenchment, managers will use less debt because they are more likely to incur debt agency costs. Thus, the alignment–entrenchment hypothesis implies a concave relationship between insider ownership and leverage. Grullon *et al.* (2001) for American firms and Brailsford *et al.* (2002) for Australian firms conclude in favour of a nonlinear relation between managerial ownership and debt, positive at the beginning but turning negative at a certain point of control. Similarly, Florackis and Ozkan (2009), for a sample of UK firms during the period of 1999-2004, find a non-monotonic relationship between leverage and executive ownership.

If cash policy is concerned, Ozkan and Ozkan (2004), using a sample of UK firms during the period of 1984-1999, find a non-linear relationship between cash and managerial ownership (without distinguishing between executive and non-executive ownership) according to the idea that with increased managerial ownership, managers avoid high cash policies (Jensen and Meckling, 1976). However, at very high levels of managerial ownership, managers can accumulate cash in excess for their own interests. Consistently with this, Harford *et al.* (2008) find a positive relationship between insider ownership and cash holdings in the US firms, but the coefficient of insider ownership turns out to be significant only at the fourth quartile of the cash holdings distribution. They argue this suggests that the true relationship between cash and managerial ownership may be asymmetric and non-linear. Therefore, the third hypothesis we test is that the impact of executive ownership on the probability of adopting an extreme financial policy of high cash and low leverage is non-linear:

H3. Other things being equal, executive ownership aligns interests of executive managers to those of shareholders and reduces the likelihood of adopting the policy of high cash and low leverage. For sufficiently high levels, executive ownership entrenches executive managers and increases the likelihood of adopting such a policy. We test for *H3* by imposing:

$$f(\textit{managerial ownership}_{i,p}) = \alpha_1 \textit{executive ownership}_{i,p} + \alpha_2 \textit{executive ownership}^2_{i,p} + \alpha_3 \textit{nonexecutive ownership}_{i,p,}$$

to model (1) and to test the null hypothesis that $\alpha_1 < 0$, $\alpha_2 > 0$ and $\alpha_1 = 0$.

4. Sample and classification procedure

4.1 Data

Our sample of firms includes all publicly traded UK firms from Datastream. We exclude financial firms from the sample. We also exclude missing firm-year observations for any variable included in the model during the sample period. We do not use observations belonging to the period of the financial crisis as the decision regarding the financial policies might have been heavily affected by the market conditions (data are from 1990 to 2007). Finally, from these firms, we choose only those with at least six continuous time series observations. These criteria provide us with an unbalanced panel of 1,196 firms and 14,317 firm-year observations. Definition of the variables is given in the Appendix A1.

The choice of analysing the UK economy is not without cost for data collection as detailed information on board composition, managers' compensation and executive and non-executive ownership is not freely available. Ownership data are collected from many editions of the Price Waterhouse Corporate Register. Data on equity ownership are collected for each group of directors separately. We collect information on the size of the board, the ratio of non-executive directors in the board to the total number of directors, and ownership concentration. Further, we provide three alternative proxies of ownership concentration:

1. Herfindhal index, taken as the sum of the squares of shares for each firm held by all shareholders with at least 5 per cent of the total shares;
2. the percentage of shares held by the largest shareholder; and
3. the sum of the percentage of shares held by shareholders with at least 5 per cent of the total shares.

4.2 Classification scheme

Prior research considers fixed classification rules to identify extreme financial (cash or leverage) policies. For example, Mikkelson and Partch (2003) define a firm as being financially conservative if it holds more than 25 per cent of its assets in cash and cash equivalents for five consecutive years (fixed cash classification rule; hereinafter, FCCR). On

the other hand, Minton and Wruck (2001) define a firm as financially conservative if its annual ratio of total debt to total assets belongs to the first 20 per cent of all firms for five consecutive years (fixed leverage classification rule, hereinafter FLCR).

In this paper, we identify firms that adopt either extreme cash policy or extreme leverage policy and firms following an extreme financial policy, based on the adoption of both financial policies. Moreover, in classifying firms, we use both fixed classification rules and our preferred classification analysis. For a firm to be classified into one of these categories, we impose that firms must display the required characteristics for at least three consecutive years. To avoid overlapping observations, we split the entire time span in six panels using three years to build each panel (Table I).

We carry out our classification analysis as follows. First, we provide a statistical analysis based on the non-parametric estimates of the distribution of leverage and cash holdings, which are obtained using a Gaussian Kernel and a Least-Squares Cross-Validation bandwidth (Silverman, 1981). More specifically, we estimate T densities of both cash balances and leverage for each year in the sample period to account for changes over time of the point at which the sample is split. Second, we define a firm in a particular year as following an extreme cash policy (extreme leverage policy) if its cash holdings to assets (leverage) ratio is higher (lower) than the last (first) interior minimum of the cash holdings (leverage) distribution for that year. Finally, in a particular year, a firm is classified as following an extreme financial policy if it displays both extreme cash and leverage policies in that year. Persistency is captured by requiring firms to remain in the same panel for three consecutive years.

There are three important features of the classification approach adopted in this paper, which makes it superior to the fixed classification approach adopted in prior research. First, because we are interested in studying the shape of the density function, we do not impose any particular shape for the density to be estimated, in adopting a fully non-parametric approach. Second, we argue that fixed thresholds of cash and leverage are discretionary. For example, it is difficult to justify why a 25 per cent cut-off point for cash holdings ratio is more appropriate than, say, a 20 per cent in classifying cash-rich firms. Therefore, in our analysis, we allow the distribution of the relevant variable to determine the cut-off level. Third, the approach using a fixed classification rule does not account for the evolution of the distribution of leverage and cash holdings over time. We instead allow the cut-off points, which help us split the firms into two groups, to change over time simply because the distribution of these variables may change.

5. Empirical results

5.1 Classification results

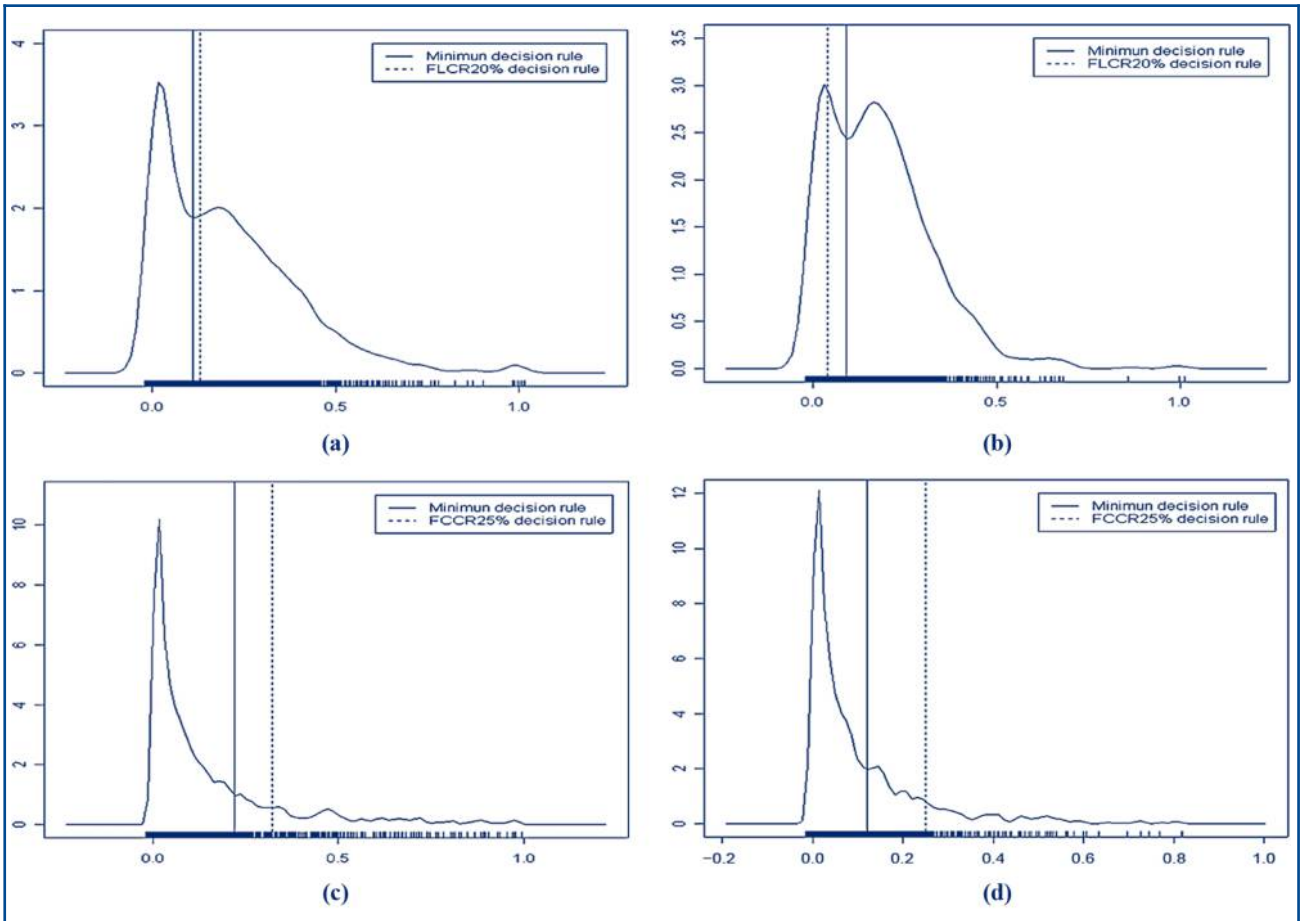
We present, in Figure 1, four examples of the discriminant analysis based on the estimated distributions of leverage and cash holdings. Figure 1(a) shows the estimate of the leverage distribution for 1999. The solid line represents the cut-off point for leverage, where firms whose leverage is located to the left of this point are defined as adopting an extreme leverage policy for this year. For comparison purposes, the dotted line represents the splitting point resulting from the FLCR. In Figure 1(b), we present the results for 1990. Note that the two alternative criteria of extreme leverage may lead to similar results as in

Table I Panel formation

	A	*B*	*C*	*D*	*E*	*F*
Panel years	[1990-1992]	[1993-1995]	[1996-1998]	[1999-2001]	[2002-2004]	[2005-2007]

Notes: In each panel, each firm has three years of complete information on each variable; firms are required to survive at least six years, two non-overlapping periods, throughout the sample period 1990-2007

Figure 1 Examples of cash holdings and leverage densities



Notes: (a) Leverage distribution in 1999; (b) leverage distribution in 1990; (c) cash holdings distribution in 1999; (d) cash holdings distribution in 1990. Estimates are performed using the Gaussian Kernel and the Least-Squares Cross-validation bandwidth. Figures 1(a) and 1(b) [figures 1(c) and 1(d)] report estimates of the leverage (cash holdings) ratio distribution in 1999 and 1989, respectively; the fixed classification ratios for cash holdings and leverage, FCCR25% an FLCR20%, respectively, are also reported on each distribution for comparison purposes

Figure 1(a) or rather different ones as in Figure 1(b). We carry out a similar exercise for cash holdings. As it can be seen from Figure 1(c), our approach, represented by the solid line, identifies a cut-off level of cash holdings, above which firms are classified as adopting an extreme cash policy, which points to a lower level of cash than that suggested by the fixed cash classification rule (FCCR). Furthermore, Figure 1(d) reveals that our criterion may suggest a splitting point that is significantly different from that suggested by the FCCR.

Table II reports the total number of firm-year observations we have in each year and firms classified according to its financial policy. For comparison purposes, we also present results arising from using the FCCR and FLCR. To take an example, in 1998, we have a total number of 920 firms. Of these, 184 are classified as following an extreme leverage policy according to the FLCR criterion; 100 are classified as following an extreme cash policy according to the FCCR criterion; and only 52 firms satisfy both criteria. According to our analysis that is based on the non-parametric estimation of cash holdings and leverage distributions, however, they are recorded as 135 (LEV), 129 (CASH) and 54 (EFP, standing for extreme financial policy), respectively. In this case, our criterion on leverage is stricter than the FLCR and less strict than the FCCR in 1998. Overall, our preferred classification approach leads to a greater number of firms getting classified as following an extreme

Table II Time distribution of firms according to alternative classification criteria

Year	Total	FLCR	FCCR	FLCR and FCCR	LEV	CASH	EFP
1990	147	30	6	5	30	11	7
1991	205	41	16	9	54	25	16
1992	246	49	24	11	61	27	13
1993	489	98	62	32	142	101	53
1994	786	153	92	48	234	129	76
1995	848	170	87	51	227	153	85
1996	882	176	97	54	134	180	72
1997	902	180	105	55	202	213	91
1998	920	184	100	52	135	129	54
1999	956	191	117	61	184	255	105
2000	1,012	202	120	77	215	213	109
2001	1,069	214	126	75	191	158	81
2002	1,141	228	136	85	228	181	99
2003	1,115	223	162	100	245	211	121
2004	1,033	207	147	84	191	196	102
2005	924	185	118	64	163	145	72
2006	849	170	105	59	199	137	76
2007	793	159	106	63	128	109	58
Total	1,4317	2,860	1,726	985	2,963	2,573	1,290

Notes: The total number of firms is 1,196 for the period 1990-2007; the column (Total) reports the number of observations in each year. Column (FLCR) represents firms belonging to the first quintile of the leverage distribution. Column (FCCR) gives firms having a cash holdings-total assets ratio higher than 25%. Column (FLCR and FCCR) reports firms satisfying both criteria; a firm is classified as LEV if its leverage is smaller than the first interior minimum of the leverage distribution; a firm is classified as CASH if its cash holdings ratio is greater than the last interior minimum of the cash holdings-total assets ratio distribution. A firm is classified as EFP (standing for extreme financial policy) if it satisfies the conditions for both LEV and CASH

financing policy. Out of 14,317 firm-year observations throughout the sample period, it classifies 1,290 firm-year observations as following an extreme financial policy, whereas the corresponding number under the fixed classification rule is 985.

From the analysis in Table II, we generate the panels we use in the subsequent empirical analysis. As reported in Table III, we have six non-overlapping panels, A to F. It is the case to note that the number of firms recorded in each year is different from that for the corresponding panel. To take an example, consider years 1996, 1997 and 1998, which compose our Panel C in Table I. The number of firms available to analyse in this panel is 878 that is lower than that for each individual year. This is because, for a firm to be included

Table III Panel formation and distribution of firms across panels

Panel formation		Total # of observations	LEV	CASH	EFP	Leverage level		Cash level	
						LEV	Control firms	CASH	Control firms
A	1990-1992	147	19	5	4	0.009	0.167	0.412	0.060
B	1993-1995	489	76	41	19	0.013	0.174	0.381	0.074
C	1996-1998	878	85	91	38	0.006	0.210	0.375	0.071
D	1999-2001	949	109	90	45	0.005	0.193	0.392	0.082
E	2002-2004	1003	117	89	49	0.005	0.200	0.447	0.086
F	2005-2007	793	69	59	26	0.004	0.225	0.462	0.085
	All Panels	4,259	475	375	181	0.007	0.201	0.411	0.079

Notes: In each panel, each firm has three years of complete information on each variable; firms survive at least six years–two non-overlapping periods - throughout the sample period 1990-2007. Column (Total) reports the total number of observations in each panel; a firm is classified as LEV if its leverage is smaller than the first interior minimum of the leverage distribution for all years of a panel; a firm is classified as CASH if its cash holdings ratio is greater than the last interior minimum of the cash holdings distribution for all years of a panel; a firm is classified as EFP if it satisfies the conditions for both LEV and CASH; column (Leverage level) reports the leverage level of firms classified as LEV and control firms; column (Cash level) reports the cash level of firms classified as CASH and control firms

in the panel, we require that it survives in all the years composing this panel. We are able to classify 475 firms as following an extreme leverage policy and 375 firms as following an extreme cash policy across all panels. We also observe that 181 firms are following both policies. This table also presents the average value of cash holdings and leverage ratios for firms following an extreme financing policy and other firms in the sample, which are called control firms. The average ratio of cash holdings to total assets of extreme cash firms is about 41 per cent, remarkably higher than the 25 per cent assumed by Mikkelson and Partch (2003), whereas the corresponding value for the other firms in the sample is 7.9 per cent. The average ratio of leverage of firms following an extreme leverage policy is 0.7 per cent, remarkably lower the 2.73 per cent estimated by Minton and Wruck (2001), whereas the corresponding value for other firms in the sample is 20 per cent. Clearly, the average cash and leverage values for firms following an extreme financing policy vary across panels. For example, the average value of the cash holding ratio of firms using an extreme cash policy is 38 per cent in Panel B, and it increases to above 46 per cent in Panel F.

5.2 Is the extreme financial policy suboptimal?

In this section, we provide a descriptive analysis of the main characteristics of firms adopting an extreme financial policy. We start by reporting, for all samples of firms, descriptive statistics based on the average values from the six non-overlapping three-year panels, covering the period 1990-2007. Table IV shows that the mean value of the cash holdings and leverage ratios is 16.3 and 19.2 per cent, respectively. These values, along those of cash flow, liquidity and size are in line with Short and Keasey (1999) and Ozkan and Ozkan (2004). The market-to-book ratio (1.62 per cent) is slightly lower than the 2.47 per cent as reported by Doukas *et al.* (2005).

As far as ownership is concerned, the mean of managerial ownership, 13.27 per cent, is consistent to that reported in other UK studies (Faccio and Lasfer 1999; Ozkan and Ozkan, 2004; Davies *et al.*, 2005). The percentage of shares held by executive directors (10.72 per cent) is consistent with Florackis and Ozkan (2009). The average blockholders' ownership in our sample (23.82 per cent) is somewhat lower than that reported by comparable UK studies (Davies *et al.*, 2005 and Faccio and Lasfer, 1999). However, ownership concentration, as measured by the Largest_Own (%) is 19.03 per cent, in line with Davies *et al.* (2005). Finally, non-executive directors are about 40 per cent of the board. The recommendation in the Hempel Committee Report, where non-executive directors in the

Table IV Descriptive statistics

Variables	*Minimum*	*25%*	*Median*	*Mean*	*75%*	*Maximum*
Cash holdings	0.000	0.026	0.089	0.163	0.215	0.927
Leverage	0.000	0.018	0.144	0.192	0.277	1.000
Market-to-book	0.203	1.029	1.328	1.622	1.813	9.894
Cash flow	−2.000	0.047	0.088	0.058	0.127	1.396
Liquidity	−2.000	−0.068	0.037	0.036	0.157	0.605
Size	1.778	9.704	10.816	10.963	12.168	17.750
Profitability	−2.000	0.077	0.131	0.102	0.180	0.418
Dividend	0.000	0.089	0.162	0.123	0.232	1.120
Cap_Ex	0.000	0.039	0.064	0.089	0.103	0.679
Fixed assets	0.000	0.193	0.315	0.356	0.477	0.953
Ex_Own (%)	0.000	0.197	2.676	10.722	15.124	83.434
NonEx_Own (%)	0.000	0.022	0.170	2.552	1.599	67.225
Block_Own (>5%)	0.000	9.300	21.205	23.826	35.030	100.000
Largest_Own (%)	5.000	10.093	14.685	19.039	22.912	100.000
Herfindahl	294.547	398.818	571.334	295.897	945.200	7,038.160
Board size	1	5	7	7.269	9	22
NonEx_Ratio	0.000	0.310	0.417	0.412	0.500	1.000

Note: The descriptive statistics for financial variables are presented on the basis of six non-overlapping panels during the period 1990-2007

UK must make up at least one-third of the board, is, on average, met. The value in our sample is in line with Pass (2004).

Tables V and VI reports correlation coefficients among the variables used in the analysis. Results point out that cash holdings and leverage of firms are, as in previous literature, negatively correlated (Kim *et al.*, 1998). Cash balances are positively correlated to the market-to-book ratio, supporting the view that firms with greater growth opportunities tend to hold more cash (Myers, 1977; Almeida *et al.*, 2004; Gao *et al.*, 2013). The negative correlation between market-to-book ratio and leverage is also in line with the prediction that firms may wish to have financial flexibility when they expect to face valuable investment opportunities (Almeida, Campello and Weisbach 2004; Han and Qiu, 2007; Gamba and Triantis, 2008; Bates *et al.*, 2009; Riddick and Whited, 2009). Moreover, it seems that small and young firms hold larger ratios of cash holdings to total assets. These firms also have lower leverage ratios.

As for the ownership characteristics, both executive and non-executive shareholdings are negatively and significantly correlated with leverage (Friend and Lang, 1988; Friend and Hasbrouck, 1988; Mehran, 1992; Berger *et al.*, 1997). Furthermore, leverage is positively related with both board size and the ratio of non-executive directors in the board. As far as

Table V Correlation coefficients

Variables	*Cash holdings*	*Leverage*	*Market-to-book*	*Cash flow*	*Liquidity*	*Size*	*Profitability*	*Dividend*	*Cap_Ex*	*Fixed assets*	*Age*
Cash Holdings	1.000										
Leverage	−0.327*	1.000									
Market-to-book	0.356*	−0.087*	1.000								
Cash Flow	−0.014	−0.077*	−0.119*	1.000							
Liquidity	−0.084*	−0.215*	−0.204*	0.762*	1.000						
Size	−0.1748*	0.1572*	−0.114*	0.238*	−0.037	1.000					
Profitability	−0.013	−0.074*	−0.110*	0.997*	0.746*	0.264*	1.000				
Dividend	0.004	−0.003	−0.005	0.013	0.001	0.037	0.015	1.000			
Cap_Ex	−0.109*	0.108*	0.085*	0.053*	−0.124*	0.027	0.057*	0.002	1.000		
Fixed assets	−0.297*	0.235*	−0.202*	0.051*	−0.164*	0.102*	0.049*	0.000	0.506*	1.000	
Age	−0.094*	0.022	−0.137*	0.020	0.063*	0.186*	0.017	−0.022	−0.079*	0.010	1.000
Ex_Own (%)	0.029	−0.096*	−0.008	0.044	0.080*	−0.364*	0.051*	0.016	−0.001	−0.089*	−0.194*
NonEx_Own (%)	0.008	−0.053*	0.066*	−0.027	−0.015	−0.231*	−0.028	−0.008	0.030	0.003	−0.073*
Block_Own (>5%)	0.002	−0.016	−0.082*	−0.108*	0.021	−0.251*	−0.128*	−0.024	−0.064*	−0.028	0.062*
Largest_Own (%)	0.056*	−0.029	0.014	0.006	−0.028	−0.222*	0.004	−0.003	−0.025	−0.018	−0.060*
Herfindahl	0.034	−0.040	0.027	−0.004	0.007	−0.258*	−0.003	0.001	−0.024	−0.038	−0.083*
Board size	0.014	0.115*	0.107*	0.108*	−0.135*	0.620*	0.123*	0.023	0.040	0.120*	0.046
NonEx_Ratio	−0.016	0.157*	0.107*	−0.036	−0.131*	0.198*	−0.044	−0.022	0.056*	0.105*	0.107*
Largest_Ex	0.006	−0.083*	0.026	0.017	0.042*	−0.134*	0.015	0.016	−0.016	−0.037	−0.027
Largest_Ins	−0.030	0.040*	−0.043*	0.017	0.007	0.132*	0.013	0.013	−0.029	0.024	0.125*

Notes: Correlations are estimated on the basis of six non-overlapping panels; * stands for significance at the 1% level

Table VI Correlation coefficients

Variables	*Ex_Own (%)*	*NonEx_ Own (%)*	*Block_Own (>5%)*	*Largest_ Own (%)*	*Herfindahl*	*Board size*	*NonEx_ Ratio*	*Largest_ Ex*	*Largest_ Ins*
Ex_Own (%)	1.000								
NonEx_Own (%)	0.051*	1.000							
Bock_Own (>5%)	−0.241*	−0.072*	1.000						
Largest_Own (%)	0.484*	0.146*	0.317*	1.000					
Herfindahl	0.512*	0.162*	0.332*	0.959*	1.000				
Board size	−0.274*	−0.079*	−0.165*	−0.114*	−0.161*	1.000			
NonEx_Ratio	−0.412*	0.135*	0.113*	−0.032	−0.035	0.176*	1.000		
Largest_Ex	0.581*	0.024	−0.229*	0.193*	0.199*	−0.154*	−0.197*	1.000	
Largest_Ins	−0.380*	−0.207*	0.191*	−0.335*	−0.268*	0.005	0.116*	−0.265*	1.000

Notes: Correlations are estimated on the basis of six non-overlapping panels; *stands for significance at the 1% level

the correlations between cash holdings and ownership characteristics are concerned, the only significant coefficient is the one between the largest owner's shareholdings and the firm's cash holdings, which is positive.

In Table VII, we report tests for differences in mean values of the main variables used in our analysis for firms adopting an extreme financial policy and for control firms. Consistent with Mikkelson and Partch (2003), firms adopting an extreme financing policy seem to have superior growth opportunities than the control firms, as indicated by the significantly higher value of the market-to-book ratio. Moreover, according to Minton and Wruck (2001), these firms are smaller, younger and they invest less than those in the control group. However, it is important to point out that firms in our sample are of a large size overall.

Notice that firms adopting an extreme financing policy and control firms have significantly different ownership structure. Executive directors in the former firms have greater shareholdings than those in the control sample. However, the shareholdings of non-executive directors of firms adopting an extreme financing policy are not significantly greater when compared with the non-executive directors' holdings in the control group. It is also interesting to note that the ratio of non-executive directors in the board of firms adopting an extreme financing policy is smaller. This, along with the large voting rights, possibly provides executive directors with greater power and discretion. Furthermore, the board size in firms adopting an extreme financing policy is significantly smaller than that in the firms belonging to the control group. This is a result consistent with our evidence that each director owns a large fraction of shares.

Table VII Test for difference of means

Variables	*EFP firms*	*Control firms*	t-*stat*
Cash holdings	0.46	0.09	−46.13***
Leverage	$4.3e^{-0.3}$	0.19	18.28***
Size	9.37	11.03	11.31***
Market-to-book	2.60	1.58	−13.23***
Age	6.75	9.26	4.54***
Profitability	0.13	0.10	−0.69
Cap_Ex	0.05	0.08	6.26***
Dividend	0.14	0.12	−0.22
Fixed assets	0.19	0.36	10.23***
Cash Flow	0.11	0.07	3.26***
Liquidity	−0.03	0.04	2.40**
Board size	6.42	7.31	4.01***
NonEx_Ratio	0.35	0.41	4.53***
Largest_Ex	0.18	0.11	–
Largest_Ins	0.25	0.30	–
Ex_Own (%)	17.14	10.43	−4.69***
NonEx_Own (%)	3.45	2.51	−1.64
Block_Own (>5%)	21.41	18.92	−2.05**
Largest_Own (%)	25.77	23.74	−1.28
Herfindahl	962.78	869.64	−1.14
Deviation from optimal investment[a]	$8.1e^{-0.03}$	$8.1e^{-0.03}$	0.27
Deviation from optimal leverage[a]	−0.17	0.01	15.00***
Deviation from optimal leverage[b]	−0.05	1.9^{e-04}	4.62***
Deviation from optimal cash holdings[a]	0.32	−0.02	−38.55***
Deviation from optimal cash holdings[b]	0.23	−0.01	−29.59***

Notes: [a]Deviations are calculated as differences between the mean value of variables in industry *j* and firm *i*, where firm *i* belongs to *j*; [b]deviations are calculated as the difference between estimated and observed variable; a firm is classified as following an extreme financial policy (EFP) if its leverage is below the first interior minimum of the leverage distribution and if its cash holdings is above the last interior minimum of the cash holdings distribution for three consecutive years and it is classified as control firm otherwise; ***; **, and * indicate that the test for difference in mean is rejected at the 1, 5 and 10% levels, respectively

Table VII also provides insights into the behaviour of firms adopting an extreme financial policy with regard to optimal levels of leverage and cash holdings. Prior work provides evidence that firms, in general, behave as though they have target levels of leverage and cash holdings (Opler *et al.*, 1999; and Shyam-Sunder and Myers, 1999 among others). It is, therefore, essential to investigate whether these firms also deviate from their optimal behaviour (Gao *et al.*, 2013). We use two different measures for target cash holdings and leverage. First, we compare the mean ratios of firm i's cash holdings and leverage with those of the industry in which firm I operates.

Second, we estimate target levels of cash holdings and leverage and compare them with the observed values of these variables, where the deviation is calculated as the difference between the actual value of cash and leverage and their predicted values. The model we use to estimate target levels of cash holdings and leverage are borrowed from the existing literature on cash holdings and capital structure (Opler *et al.*, 1999 for cash holdings and Rajan and Zingales, 1995 for capital structure) (see Appendix A2 for the details of the specifications).

This analysis provides strong evidence that firms adopting an extreme financial policy undershoot their leverage target and overshoot their target for cash holdings. While the deviation from the sector mean might be not surprising because driven to some extent by the way we have constructed the sample of extreme financial policy firms, it is interesting to notice that these firms are also deviating from their estimated optimal behaviour predicted by the theory of capital structure. This suggests that extreme financial policies of high cash and low leverage are suboptimal.

Finally, we investigate the investment expenditure of firms adopting an extreme financial policy. We first compute the deviation of the average investment expenditure of a firm from that of the industry in which the firm operates. This is done for both firms adopting an extreme financial policy and those in the control group. Then, we compare the deviations. Although firms adopting an extreme financial policy invest less than those in the control sample, the deviation of the average investment by the former firms from industry average is not significantly different from that of the firms in the control sample. It is beyond the scope of this paper to investigate the investment behaviour of firms adopting an extreme financial policy. However, one could argue that, combined with the fact that the profitability of firms adopting an extreme financial policy is not significantly different from that of the control firms, this finding may possibly indicate that firms adopting an extreme financing policy are not financially constrained in the capital market. Therefore, it is more likely that the suboptimal financial policy of high cash and low leverage is driven by the managers' opportunism.

5.3 Regression results

In the following, we present the results of our logit regression analyses predicting the likelihood of firms adopting an extreme financial policy. Results are mainly based on pooled logit regression estimations where, we take the average values of variables over the three years composing each panel and use panels as independent observations. We also include time and industry dummies in all specifications. Comparisons across alternative specifications are performed by means of both pseudo-R^2, which is based on the log-likelihood, and R^2_{count}, which instead is based on the percentage of corrected predictions. Finally, it is worth noting that, as we include non-linear models in our specifications, i.e. interaction and squared terms, marginal coefficients with regard to such terms would not be calculated by standard software (Ai and Norton, 2003). To be consistent across all models, we choose not to report marginal coefficients for any of the models we estimated.

Turning to the estimation results, we report in Table VIII the results regarding the alternative models that estimate the impact of managerial ownership on the probability of adopting an extreme financial policy. The dependent variable is a binary variable, which is set to be equal

Table VIII Estimation results for firms adopting EFP

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Constant	5.30 (4.47)***	6.01 (4.92)***	6.24 (4.88)***	6.44 (5.11)***	19.14 (3.84)***	7.08 (5.15)***
Size	−0.78 (−8.02)***	−0.80 (−8.17)***	−0.82 (−8.22)***	−0.82 (−8.27)***	−2.08 (−4.81)***	−1.02 (−9.03)***
Market-to-book	0.50 (6.04)***	0.50 (6.01)***	0.49 (5.99)***	0.50 (5.99)***	0.89 (4.14)***	0.46 (5.06)***
Age	−0.01 (−0.63)	−0.01 (−0.69)	−0.02 (−0.79)	−0.02 (−0.83)	−0.05 (−0.97)	$-9.1e^{-06}$ (0.01)
Profitability	5.888 (6.46)***	5.948 (6.50)***	6.028 (6.56)***	5.956 (6.47)***	12.669 (4.80)***	6.326 (6.51)***
Cap_Ex	−6.540 (−2.10)**	−5.616 (−1.82)*	−6.202 (−1.99)**	−6.379 (−2.02)**	−8.691 (−1.24)	−7.386 (−2.06)**
Dividend	0.633 (1.08)	0.696 (1.16)	0.594 (1.02)	0.557 (0.97)	0.350 (0.54)	0.245 (0.56)
Fixed assets	−4.321 (−4.72)***	−4.618 (−4.94)***	−4.538 (−4.86)***	−4.498 (−4.80)***	−16.696 (−4.04)***	−4.319 (−4.27)***
Board Size	0.390 (0.99)	0.361 (0.91)	0.373 (0.94)	0.369 (0.93)	0.850 (0.83)	0.987 (2.25)**
NonEx_Ratio	−1.201 (−1.65)*	−1.336 (−1.81)*	−1.389 (−1.87)*	−1.600 (−2.06)**	−2.009 (−0.86)	−1.304 (−1.56)
Largest_Ex	0.13 (0.40)	−1.32 (−2.16)**	0.25 (0.78)	0.42 (1.16)	0.43 (0.61)	0.25 (0.62)
Largest_Ins	0.053 (0.201)	−0.083 (−0.24)	−0.072 (−0.26)	−0.068 (−0.25)	−0.581 (−0.91)	0.119 (0.40)
Largest_Ex*Man_Own		0.05 (2.84)***				
Largest_Ins*Man_Own		−0.009 (−0.31)				
Man_Own	−0.001 (−0.14)	−0.015 (−1.36)	−0.042 (−1.97)**			
Man_Own^2			$6.4e^{-04}$ (2.14)**			
Ownership Concentration	−0.017 (−1.69)*	−0.025 (−2.36)**	−0.023 (−2.23)**	−0.026 (−2.45)***	−0.079 (−2.92)***	−0.012 (−1.17)
Ex_Own				−0.06 (−2.69)***	−0.09 (−1.64)	−0.06 (−2.27)**
Ex_Own^2				$9.5e^{-04}$ (3.07)***	$17.2e^{-04}$ (2.44)**	$7.8e^{-04}$ (2.24)**
NonEx_Own				−0.002 (−0.09)	0.012 (0.30)	−0.013 (−0.67)
Pseudo R^2	0.099	0.102	0.100	0.101	0.128	0.092
$R^2_{\text{Count-adj}}$	0.956	0.956	0.955	0.956	–	0.954

Notes: Models (1) to (5) refer to the distribution-based definition of EFP; Model (6) refers to EFP as defined by means of fixed rules; all models are estimated by means of a pooled logit model, except Model 6 that is estimated by means of a random-effects panel model. All models include time and sectoral dummies; *T*-statistics are reported in brackets; ***; **and; *indicate that the coefficient is statistically significant at the 1, 5 and 10% levels, respectively

1 if the firm is classified as following an extreme financial policy and zero otherwise. We start with our basic specification (Model 1) in which we do not distinguish between executive and non-executive shareholdings and include total managerial ownership as a proxy for managerial incentives. Under this basic model, when we control for precautionary and agency problems, managerial ownership does not affect the probability of adopting an extreme financial policy: the estimated coefficient of managerial ownership is negative but insignificant.

Estimated coefficients of control variables proxying for precautionary motives for firms following an extreme financial policy, show that larger firms are less likely to follow an extreme financial policy (Minton and Wruck, 2001; Fosberg, 2004; Sheikh and Wang, 2012), providing evidence for the view that the cost of external financing for large firms is likely to be lower than that for smaller firms and hence they have less incentives to stockpile cash and have spare debt capacity. In addition, market-to-book ratio is positively associated with the probability of adopting an extreme financial policy, while capital expenditures is negatively associated with it (Minton and Wruck, 2001 and Mikkelson and Partch, 2003). We do not observe any significant association between the age of firms, their dividend payments and the probability of using an extreme financial policy. The results we discuss above remain unchanged across the alternative specifications in Table VIII and hence we do not discuss them again in what follows.

Instead, we focus on the results with regard to ownership and board characteristics of firms. These show that board size does not exert a significant impact. In addition, the ratio of non-executive directors on the board exerts a negative influence on the probability of adopting an extreme financial policy. We take this evidence in support of the view that non-executive directors play a role in monitoring of executive managers and helping the alignment of managers and shareholders' interests (Anderson *et al.*, 2004; Abor, 2007; Sheikh and Wang, 2012). Ownership concentration is negatively associated to the probability of adopting the extreme financial policy of high cash and low leverage. This is consistent with the view that blockholders are able to control the managerial opportunism (Mehran, 1992; Berger *et al.*, 1997; Brailsford *et al.*, 2002; Fosberg, 2004, and Sheikh and Wang, 2012).

However, the results suggest that the identity of the largest shareholder, captured by the dummy variables, Largest_Ex and Largest_Ins, which takes the value of 1 if the largest

shareholder is an executive director and financial institution respectively and 0 otherwise do not have a significant impact on the likelihood of using an extreme financial policy. This result is inconsistent with a number of corporate governance studies (Shleifer and Vishny, 1986, 1997; Demsetz and Lehn, 1985; McConnell and Servaes, 1990; Pergola and Verreault, 2009).

In Column (2), we further investigate the issue of managerial incentives by interacting managerial ownership with the identity dummy variables, namely, Largest_Ex and Largest_Ins. In doing so, we aim to study whether the impact of managerial ownership on the probability of firms adopting an extreme financial policy changes with the identity of the largest shareholder. As a result of this exercise, we observe interesting findings. The estimated coefficient of Largest_Ex is negative and significant, which may suggest that, as managerial ownership increases, managers who are the largest shareholders are less likely to choose an extreme financial policy. However, the probability of adopting such a policy increases in the size of the stake held by managers as suggested by the positive and significant coefficient of Largest_Ex × Man_Own. In other words, the impact of managerial ownership on the probability of adopting an extreme financial policy may be nonlinear.

To further investigate the non-monotonic impact of managerial ownership, we include, in Column (3), the managerial ownership term squared, Man_Own^2, among the regressors. The results suggest that at lower levels of managerial ownership the impact of managerial ownership on the probability of adopting an extreme financial policy, given by the estimated coefficient of Man_Own, is negative and significant. However, the conditional impact of managerial ownership, given by the coefficient of Man_Own^2, is significantly positive. That is, if the negative sign of Man_Own points to any alignment of interests between managers and shareholders, it seems that at higher levels of managerial ownership this effect disappears. In fact, the results possibly suggest that, at higher levels of ownership, managers are entrenched, and hence are more likely to choose the extreme financial policy. This result is consistent with the non-monotonic relationship between managerial ownership and debt found in a number of UK studies (Friend and Lang, 1988; Fosberg, 2004; Sheikh and Wang, 2012).

So far, we have used the sum of executive and non-executive shareholdings as a proxy for managerial incentives. In Column (4), we distinguish between executive and non-executive directors by measuring equity ownership of each group of directors separately. Initially, we consider non-linearity with respect to both executive and non-executive shareholdings. However, we find a significant non-linear impact only with respect to the ownership of executive directors and hence do not report the non-linear results for non-executive directors. Turning to the findings, we observe that evidence for the non-linear impact of executive directors' ownership on the likelihood of adopting an extreme financing policy is strong. The estimated coefficients of Ex_Dir and Ex_Dir^2 are significant at 1 per cent level and in line with the expected signs, negative and positive, respectively (Brailsford *et al.*, 2002).

5.4 Robustness checks

In an attempt to deal with unobserved firm heterogeneity, we also estimate a random-effects panel data model for each type of financial policy. We prefer to use the random-effects probit model over fixed-effects models. The random-effects analysis, though based on several strong assumptions, is said to be superior to the fixed-effects analysis for panel data with large units and small time period; in our case, the largest value of T is 4 (Guilkey and Murphy, 1993). However, both approaches are based on the strict exogeneity assumption of the independent variables conditional on unobserved effects, ruling out explanatory variables from the analysis, whose future movements depend on current and past outcomes of the dependent variable. For these reasons, we provide panel data results only for robustness reasons. Column (5) reports results obtained via this

approach, very much in line with our previous results. Notable exceptions relate to the impact of the non-executive directors and executive shareholdings.

To further examine the robustness of our findings, we also carry out our estimations by changing the definition of extreme financial policy. Specifically, in classifying firms adopting an extreme financial policy, we adopt fixed classification rules for both cash and leverage. Note that we now define a firm in a particular year as following an extreme cash policy (leverage policy) if its cash holdings to assets (leverage) ratio is more than 25 per cent (in the first 20 per cent of all firms) for that year. Finally, in a particular year, a firm is classified as adopting an extreme financing policy if it displays both kind of leverage and cash policies. Similar to the above analysis, persistency is captured by requiring firms to follow these policies for three consecutive years. The estimation results under this classification are reported in Column (6), and, overall, they remain very similar to the findings we report above. However, in this model, Board size is positively related to the probability of adopting an extreme financial policy of high cash and low leverage (Anderson *et al.*, 2004; Abor, 2007; Bokpin and Arko, 2009; Sheikh and Wang, 2012).

As a further robustness check, we have regressed the dependent variable coming from the last year in each of the panels against the average of the independent variables at time $t-1$ and $t-2$ in the same panel. The use of using lagged independent variables reduces the possibility the parameter being potentially biased because of reverse causality and endogeneity. It is useful, as it exploits the panel structure of the data, in cases where it is difficult to imagine a clean and undisputable instrumental variable approach, as it is often the case when using balance sheet data. For the sake of brevity, we do not report these results that largely confirm our previous findings.

As a final robustness check, we re-examine all our results using only one type of extreme policy to define our dependent variable: we investigate the determinants of the probability of adopting extreme leverage and extreme cash policies separately. We draw similar inferences as those reported earlier. Though not reported, the findings reveal that the likelihood of adopting one type of policy is related to the likelihood of adopting the other type. Second, larger firms are less likely to use extreme cash and leverage policies. Third, the probability of pursuing an extreme leverage policy is positively related to the firm's profitability and its market-to-book ratio. Finally, in line with the findings reported earlier, corporate ownership structure exerts significant influence in determining both policies. We still observe a non-linear influence exerted by executive shareholdings on the probability of both types of extreme policies.

6. Conclusions

In this paper, by using a large sample of non-financial UK firms during the period of 1990-2007, we have identified firms adopting extreme financial policies of high cash and low leverage. Then, we have examined the impact of managerial ownership on the probability of adopting the extreme financial policy of high cash and low leverage. There are important features of our analysis, which, we believe, significantly extend the literature on extreme and conservative financial policies. First, in describing the firm's financial status, differently from previous empirical studies and in line with the corporate finance theory, we combine both high cash and low leverage, which leads to what constitutes a firm following an extreme financial policy. Second, as opposed to the existing studies that choose fixed threshold levels of cash holdings or leverage to identify firms adopting an extreme financing policy, we estimate the appropriate cut-off points without imposing a priori arbitrary threshold levels. Moreover, to allow these cut-off points to vary over time, we carry out this analysis for each year throughout the sample period. Third, we show that EFPs are suboptimal: firms following extreme financial policies tend to be persistently off-target with regard to both leverage and cash holdings decisions. They persistently hold larger than target-cash balances and lower than target-levels of debt than predicted by theories of capital structure.

Moreover, our results indicate that the probability of adopting an extreme (or suboptimal) financial policy is significantly related to the firm's executive ownership. However, this relationship is non-monotonic. More specifically, results are in line with the alignment–entrenchment hypothesis, as they suggest that the impact of executive ownership on the probability of adopting such a policy in the UK is either negative or positive depending on the level of executive ownership: at lower levels of ownership, the relationship between executive shareholdings and the probability of adopting an extreme financial policy is negative, possibly supporting the incentive–alignment view of managerial ownership. However, at higher levels the relationship becomes positive.

Despite the presence of a substantial representation of non-executive directors in the UK boards and large amounts of shares in the hands of executive directors, the evidence suggests that some UK firms have adopted suboptimal financial policies because the level of executive ownership possibly in the range where entrenchment becomes feasible. This explanation is consistent with the evidence that in the UK non-executive directors and directors with large shares tend to entrench management by reducing board turnover (Franks *et al.*, 2001). It is also consistent with the evidence that, differently from the USA, in the UK the ineffective implementation of fiduciary responsibilities results in non-executive directors playing a primarily advisory rather than a disciplinary role (Hermalin and Weisbach, 1991; Franks *et al.*, 2001; Pass, 2004; Petra, 2005). Finally, this result is in line with the evidence that in the UK a lack of external market discipline and efficient monitoring by financial institutions makes executives more likely to be entrenched (Franks *et al.*, 2001; Goergen and Renneboog, 2001).

The main implication of our findings is that further increase in the executive ownership may increase executive opportunism and the use of suboptimal financial policies. Our results suggest that the ownership is a controversial corporate governance mechanism as it may enter the range where entrenchment becomes feasible and generates sub-optimal levels of cash holdings and leverage. An alternative explanation of our findings is that suboptimal financial policies of high cash and low leverage are not only driven by poor corporate governance but also by the interplay between the agency costs of managerial opportunism and the cost of the external finance. It is known that the cost of equity capital affects the firm's ability to raise equity funds, and investors will charge a higher cost of equity capital for firms, which they believe their funds might be expropriated or wasted by managers (Huang *et al.*, 2009). Therefore, when a substantial increase in the executive ownership introduces an entrenchment effect, investors will charge the firm a higher cost of equity capital for taking the severe agency risk (Huang *et al.*, 2009). This, in turn, will reduce the ability to raise debt and will raise the need of accumulating cash holdings. In an effort to control parameters for the impacts other than those we are interested in, we have kept constant variables measuring both the cost of external finance and the degree of agency problems. However, further research is needed to explore the potential role of alternative explanations of our findings.

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Appendix 1

Table AI Definition of variables

Variable	*Definition*
Cash holdings	The ratio of holdings of cash and cash equivalents to total assets
Leverage	The ratio of total debt to total assets
Market-to-book	The ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets
Cash flow	The ratio of pre-tax profits plus depreciation to total assets
Liquidity	The ratio of current assets minus current liabilities and total cash to total assets
Size	The logarithm of total assets in constant prices
Profitability	The ratio of earnings before interest payments and tax to total assets
Dividend	The ratio of dividend payments to total assets
Cap_Ex	The ratio of capital expenditures to total assets
Fixed assets	The ratio of tangible assets to total assets
Age	Age of the firm, calculated as 2007 minus the first year in which the firm was publicly traded
Ex_Own (%)	Percentage of shares held by executive directors
NonEx_Own (%)	Percentage of shares held by non-executive directors
Block_Own (>5%)	Percentage of shares held by the largest shareholder
Largest_Own (%)	Sum of the percentage of shares held by all shareholders with at least 5% of the shares
Herfindahl	Sum of the squares of the shares held by all shareholders with at least 5% of the shares
Board size	The logarithm of the total number of directors in the board
NonEx_Ratio	The ratio of the number of non-executive directors to the total number of directors in the board
Largest_Ex	Dummy which takes the value of 1 if the largest shareholder is an executive director and 0 otherwise
Largest_Ins	Dummy which takes the value of 1 if the largest shareholder is a financial institution and 0 otherwise

Appendix 2: The estimation of deviations from target cash holdings and leverage

The model we use to estimate optimal level of cash holdings for each panel takes the form of:

$$CASH_i = \beta_0 + \beta_1 CFLOW_i + \beta_2 LIQ_i + \beta_3 LEV_i + \beta_4 CAPEX_i + \beta_5 MTB_i + \beta_6 SIZE_i + \varepsilon_i \quad \text{(A1)}$$

where CASH stands for the ratio of holdings of cash and cash equivalents to total assets; CFLOW is the ratio of pre-tax profits plus depreciation to total assets; LIQ is the ratio of current assets minus current liabilities and total cash to total assets; LEV is the ratio of total debt to total assets; CAPEX stands for the ratio of capital expenditures to total assets; MTB is the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets; and SIZE is the logarithm of total assets in constant prices.

The leverage model we estimate is:

$$LEV_i = \pi_0 + \pi_1 FIXAST_i + \pi_2 MTB_i + \pi_3 CASH_i + \pi_4 PROFIT_i + \pi_5 SIZE_i + \rho_i \quad \text{(A2)}$$

where FIXAST denotes the ratio of tangible assets to total assets and PROFIT denotes the ratio of earnings before interest payments and tax to total assets.

To help controlling the parameters for endogeneity, the dependent variable is from the last year in the panel; the independent variables are taken as average from the remaining two years. The estimated parameters from models (A1) and (A2) are then used to calculate the target levels of leverage LEV_p^* and cash holdings $CASH_p^*$ for each panel. We next use these values to calculate deviations of the observed leverage and cash holdings of firms, DLEV and DCASH, respectively, from the target values as follows:

$$DLEV_i = LEV_i^t - LEV_p^*$$

and

$$DCASH_i = CASH_i^t - CASH_p^*$$

Where firms are represented by subscript i, time by t, and non-overlapping panels by $p = 1\ [. . .]\ 6$. This enables us to identify firms that are cash rich and low leverage and that deviate from their targets in a particular way. For example, by doing so, one would be able to identify those firms that are cash rich according to the distribution criterion and for which $DCASH_i > 0$ for all years in a panel. Similarly, the same classification for leverage leads to the identification of firms that are low leverage and $DLEV_i < 0$ for all years in a panel. Finally, we are also able to identify firms that are both cash rich and low leverage and for which $DLEV_i < 0$ and $DCASH_i > 0$ for each year in a panel.